

PARADOXICAL NATURE

IN CITIES

By

JOHN BUCHKO

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The members of the Committee appointed to examine the
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it be accepted.

Dr. Robert Scarfo, Ph.D., Co-Chair

Jolie Kaytes, Co-Chair

Dr. Kerry Brooks, Ph.D.

PARADOXICAL NATURE

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Abstract

by John Buchko, D.Des.
Washington State University
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Co-Chairs: Robert Scarfo & Jolie Kaytes

Literature supports an inherent human connection with nature, and this relationship has numerous documented health benefits to humans. For generations, land planning professionals have been responsible for the creation of cities. Despite the known benefits of the human-nature connection, incorporating naturally-occurring ecosystems into urban fabric is not common. Although there is legislation at various levels of government to protect the natural environment, naturally-occurring ecosystems are still lost at alarming rates. Using analyses of urban development projects in three western Canadian municipalities, this research explores the dynamic tension between three interrelated processes - the human-nature relationship, design processes conducted by land planning professionals, and the overarching institutional framework.

At least six paradoxes that have arisen through this research, with human preference for nature not being reflected in land planning. Land planning professionals have been entrusted by the public to create vibrant cities, yet opportunities to promote a human-nature connection are lost. This research helps to understand the challenge of providing for a strong human-nature connection in urban environments and makes recommendations to encourage the inclusion of naturally-occurring environments in our cities.

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Research findings suggested four prominent variables that inhibit a strong human-nature connection in western Canadian municipalities, including a lack of place attachment, absence of local knowledge in planning processes, landowner rights to alter natural areas, and the lack of public education and consultation in land planning processes.

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CHAPTER ONE: INTRODUCTION

1. BACKGROUND

The need for humans to interact with nature is embodied within, what various professional fields now call, the biophilia hypothesis (Kellert, 1993). In essence, the biophilia hypothesis states a love for nature that is shared by all people across all cultures and economic classes (Pliska, 2006). The benefits of human contact with nature are well documented (Berto, 2005; Herzog, 2002; Jacobs, 2008; van den Berg, 2007), for reasons such as maintaining biodiversity and fulfilling the inherent need we have to interact with the natural world. Nearly every culture - from the early Aboriginal tribes of Australia to the most devoted urbanites of post-industrial Europe or America - has recognized that contact with nature is critical to human survival (Besthorn, 2003). As numerous disciplines support the validity of biophilia, they also endorse the health benefits afforded by routine contact with nature such as improved mental well-being (Kaplan, 2001; Kaplan, 1998), restorative experiences involving the renewal of depleted psychological resources (Hartig, 2001) and stress reduction (Orsega-Smith, 2004; Wells, 2003).

For decades, literature has debated the ideal definition of nature, while rarely has it been explicated (Mausner, 1996). This dissertation is based on the premise that there are varying views of what the terms 'nature' and 'natural' mean to each individual, and these views are predicated by personal values, childhood experience, place of inhabitation, and other influencing factors (Mausner, 1996). While these terms are ambiguous (Zube, 1984), dominant perspectives such as natural simply being anything in contrast to the human-built environment are supported by researchers. In literature that explicitly defines these terms, they are commonly equated with

landscapes that humans have little to no influence and are untouched (Kaplan, 1972; Zube, 1976). Greene (1977) acknowledges that a “relative degree of man’s influence” (p. 64) must be considered in defining nature. Nature has also been described as being in contrast to the built environment (Kaplan, 1972; Ulrich, 1981), and defining it in such a way to not discourage the possibility of integrating the human and natural realms (Mausner, 1996). Such scientific fields as urban planning often define nature as places where humans are not, and as environments where an intricate system of complex biological processes co-exist without human influence (Nature, 2008). For the purpose of this dissertation, the term nature is defined as ecosystems that are in contrast to the human-built environment, and through limited human disturbance there exist an array of biological processes that include interactions between non-human species and non-living elements.

Today, cities are owned, controlled and influenced by all sorts of people, who are sometimes motivated by conflicting and sometimes harmonizing mindsets (Westworth, 2001). Since the beginning of civilization, land planning professionals have been responsible for providing oversight in developing new and expanding existing communities (Sahely, 2003). There are endless examples of urban growth patterns to study as precedents of human imposition on natural landscapes. Contemporary practice in professional fields of land planning has been strongly influenced by these past developments – the way in which urban centers grow and affect social construct, ranges of land use designation and zoning strategies to private, professional, and institutional attitudes toward the composition of these growth areas to name only a few. Despite comprehensive plans being available to design professions, there is, with limited best practice standards available, a gap in knowledge about the quality of those plans (Berke, 2009) as it

relates to natural area preservation and the public's ability to interact with those areas. While there is public demand for nature in western Canadian municipalities there is a surprisingly miniscule amount of natural areas retained in the cities for people to enjoy (Pearsel, 2010); there is also limited knowledge or research on the quality of the human-nature interaction in those that are retained. Throughout North America, natural landscapes are rapidly diminishing while agricultural, industrial, urban and recreational areas are substantially increasing (Geowest, 1997).

Living organisms have demonstrated through their evolution that a key part of survival is their ability to adapt to their surrounding environment, not only in the way they live as individuals but how they interact with other living things. Humans, however, seem to be the only living species that attempts to counteract the elements of the world and move away from adapting to it (Benyus, 1997).

Throughout western Canada, contemporary urban development trends reveal little regard to the preservation of natural landscapes, as demonstrated by ecosystems being fragmented and lost at alarming rates (City of Edmonton, 2009). Even public amenities such as passive trails can have detrimental effects on natural ecosystems and species richness (Fernandez-Juricic, 2000). Trends of urbanization demonstrate a rapid movement towards dispersion (Filion, 1996; Filion, 1999), where development is less compact and urban sprawl occurs. Conventional patterns of sprawl are not compatible with preserving natural areas within the urban fabric, particularly at the rural and urban fringe of cities where most new growth is occurring (Ryan, 2006).

Unlike many other human activities, urban development has direct impacts on the long-term function of natural ecosystems with an increased rate of species invasion and species extinctions (Wardle, 2005). The way in which we now plan our cities results in an increasing

divide between people and nature, and we are not taking advantage of the information that we have at hand related to benefits afforded to our society.

“Humankind is undergoing an unprecedented and totally unsustainable growth in numbers, technology, consumption, and economic demand. Environmental degradation is a direct consequence. Without a fundamental understanding of our utter dependence on nature for our physical, social, economic and spiritual sustenance and health, we become predators embarked on a suicidal path” (Boyd, 2003, para. 1).

2. RESEARCH SUMMARY

Goal of This Research

The main question and the final goal of this study is to determine if biophilia can be supported through governmental policies and local design interventions, in light of the complexities and challenges in contemporary planning in urban areas. To answer this question, three interrelated processes are outlined. These include human value systems related to the human-nature relationship, design processes conducted by land planning professionals, and the overarching institutional framework in effect. The dynamic tensions of this interrelationship highlight the complexities and challenges in contemporary planning. The literature review outlines several topics that form this complex interrelationship. To further explore these interrelationships, this research investigates the retention or loss of human-natural interaction opportunities in three western Canadian municipalities as case study examples.

Contributions

Unprecedented growth of some urban centers across western Canada is having alarming impacts on natural areas (Zang, 2011). Given the innumerable negative impacts that human development have on natural areas (Dale, 1998, Koellner, 1998, Pater, 2009), preservation of these ecosystems as part of urban development is increasingly challenging. Policy frameworks

related to natural area protection vary significantly between jurisdictions in these urban centers, and as a result design professionals lead varying roles – from advocacy of seemingly new ideas to the promotion of pilot implementation projects. This study articulates ways in which land planning professionals and municipalities can more effectively promote natural area protection as part of contemporary development in response to varying policy frameworks.

Open space within our cities has been used to address urban concerns such as health (Butterworth, 2000) and sanitation (Bachin, 2003), suburban concerns of exclusionary zoning (Babcock, 1973), and more recently to protect ecological functions and guide urban development (DeFries, 2007). Natural area preservation is construed and justified as serving social ends (parks, recreational play fields, picnic areas) sustaining ecological systems (forests, riparian areas) or local economies (farmland preservation), or to protect quality of life (amenity creation or property value protection) as part of a larger “smart growth” agenda (Schmidt, 2008). As cities increase in size, peripheral natural areas are often consumed by new urban development. Sometimes these natural areas are incorporated into the parks and open space network of modern cities, rather than providing open space that is entirely contrived. The current generation of city dwellers seek recreational opportunities closer to home (Moorman, 2007), in response to a need for escaping urbanity and reducing their reliance on vehicles to leave the confines of the city (Farthing, 1996). With extensive growth of urban centres across western Canada (Statistics Canada, 2012b), the timing could not be better for research that focuses on more effective developments that take advantage of naturally-occurring ecosystems as a venue for passive recreation.

Natural ecosystems are dynamic, and over time adapt to changing environmental conditions change (Dawson, 2010; Margalef, 1994). These changes are incremental (Hartley, 2003), in that many ecosystem processes are unseen to the naked eye and can take many decades to be even measurable. Cities, on the other hand, evolve at a much faster rate as to not allow natural systems to self-adjust to new environmental conditions (Domosh, 1996). Understanding how urban fabric can be developed to be compassionate to a much slower rate of resiliency seen within nature would be very valuable to the field.

Across western Canada the land planning consulting industry is becoming more and more interdisciplinary in service delivery models (Bates, 2011). Bringing together perspectives from a range of disciplines is becoming more commonplace in resolving complex problems. There are calls for more integrated discussions in which planning strategies evolve from two or more perspectives (Schein, 2007). Over the past five years, many land planning firms have taken on a new brand that brings together practitioners from engineering, planning, landscape architecture and environmental management to resolve planning in urban areas. This research demonstrates a connection between human health and the natural environment (Croucher, 2008), which is a perspective that is not prevalent in the influences of public land planners. People often feel that interdisciplinarity is simply thinking outside the box, while when the box is a discipline, it is often difficult to identify the outside (Lawrence, 2010). This research serves as a model of an interdisciplinary mindset that brings health considerations into land planning practice.

Given case study evidence found in three selected western Canadian municipalities, there is a need for concern that the planning and design professions are not meeting their ethical responsibility to protect natural areas in urban centers as a means of ensuring long term, effective

human-nature contact and promoting human health. Based on the premise that nature contact has direct physical and mental benefits to humans (Berto, 2005; Herzog, 2002; Jacobs, 2008; van den Berg, 2007), providing natural areas in close proximity to dense urban populations will promote opportunities for improved health benefits to these people. One result of conducting this research will be a set of recommendations for municipalities to use for incorporating natural areas within urban environments, so that residents can enjoy natural areas for years to come.

To date, the focus of scientific fields such as biology, ecology and agrology has been in rural areas where nature is more prevalent. Understanding nature within the confines of our cities is becoming more urgent, with most of the Canadian population living in, or being directly affected, by cities. As noted by Statistics Canada (2012) not only did four Canadians in five (81%) live in a metropolitan area in 2006, but one Canadian in three (34.4%) lived in one of Canada's three largest metropolitan areas, namely Toronto, Montreal and Vancouver. Of the 19% of Canadians living in rural areas, close to two-thirds lived in an area subject to the strong or moderate influence of one of Canada's metropolitan areas. Thus, 60% of the rural population was living in areas in which at least 5% of the employed labour force was commuting on a daily basis to the city for work purposes. Thus, less than 8% of Canada's population in 2006 was living in areas where direct metropolitan influence was low or non-existent.

Assumptions

This study assumes that the benefits of preserving natural areas in urban environments are twofold. First, anthropocentric-based strategies will promote a stronger connection between humans and nature based on the premise that this connection is a means of promoting social and mental well-being (Barton, 2009; Brown, 2005). Second, from an ecocentric perspective,

retaining natural areas increases biodiversity and supports stronger ecological networks within urban landscapes (Pearsell, 2011; Spencer, 2007).

Foreseen Conclusions

Foreseen conclusions at the onset of this research were that contemporary society highly values access to natural areas in urban environments, and that land planning professionals and supporting government policies require additional knowledge to support a deep-seated inter-relationship and interdependence between humans and nature.

Limitations

Throughout the course of this research, numerous documents were identified that were not authorized for use due to confidentiality. In particular, a significant amount of information related to the three case studies was not permitted for use in this research. A lot of this information would have richly portrayed the dialogue between residents, land planning professionals, land owners, developers, municipalities and other government institutions. The interrelationship between these different groups may have revealed additional challenges in providing for biophilia in contemporary urban settings. This dialogue would demonstrate the tensions between human values for nature contact, the lack of knowledge amongst design professionals, the economic disadvantage to developers in retaining natural areas, and the challenge of legislative bodies to regulate natural area retention.

This study did not include direct contact with local residents or other interest groups and was purely based on personal experience, desktop studies, and on-site investigations. Desktop studies did, however, provide for some interchange between residents, municipal representatives, land planning professionals, land owners and government agencies.

Background information and the literature review were based on predominantly peer-reviewed articles and reputable sources. Some case study information, such as planning documents and project files from land planning consultants, may be perceived to be less reliable given the lack of peer-review. Every attempt was made to ensure that all sources of information were reliable, unbiased, accurate, and endorsed by land planning professionals.

Document Structure

Chapter Two: Literature Review. Chapter two provides background information on nine topics that relate to this research, and throughout the text of this chapter twelve questions are highlighted (indicated in text boxes). With the goal of outlining how each theory and topic applies to western Canadian cities, these twelve questions will then be applied to the three case studies in Chapter Four: Case Studies, and further described in Chapter Five: Case Study Question Comparisons and Discussion.

The first three of nine topics included in the literature review are based on interrelated processes that take place in contemporary land planning. These topics include human value systems, design processes and the overarching institutional framework.

Theories of human connection to nature as well as human attachment to particular aspects of nature are introduced, followed by a discussion of how these theories either support or compete with one another. Benefits of nature in our cities are then summarized, building the case for the need to retain natural areas in urban centers. The human-nature relationship has evolved over generations of inhabitation in western Canada, and the evolving paradigms are outlined to show how human values have changed over time. The way in which land planning professionals approach urban planning is then discussed, to demonstrate contemporary strategies

that deal with the human-nature connection in either supportive or counter-productive ways. The third section of this chapter includes an overview of the overarching legislative framework that guides land planning in western Canada, exploring legislation and policies at three levels of government.

This literature review then includes the other six of nine topics to support the overarching question of this research, and these topics are presented in the form of paradoxes. These six topics include recreational trends and the rise of technology, the role of land planning professionals, influence of changing global trends, minimizing ecosystem degradation, varying perception of nature, and our reliance on nature. Recognizing the dynamics between opposing views and actions, this study builds its case by identifying social trends and human values that have led to the current conditions evident in three western Canadian municipalities.

Chapter Three: Research Process and Methodology. Within this chapter, the process and methodology of this research is further elaborated on. In doing so it utilizes the preceding background information, as a basis for the analytical categories applied to these case study analyses.

Chapter Four: Case Studies. The three case study municipalities include:

- Fort McMurray City Centre, located in the Regional Municipality of Wood Buffalo in northern Alberta;
- various suburban developments in the City of Edmonton, located in central Alberta; and
- rural and suburban development in Strathcona County, located in central Alberta.

Background information provided for the three case studies explores the influences of changing human values related to nature on current development patterns, and the benefits and

liabilities of those patterns on urban residents. Case study examples include a discussion on the societal influences – from world views to governance – that led to the landscapes we see today in western Canadian municipalities. The end of each case study includes a discussion on each of the twelve questions that were first outlined in Chapter Two: Literature Review.

Chapter Five: Case Study Question Comparisons and Discussion. This chapter outlines the twelve case study questions and provides recommendations that combine information from the three case studies. The recommendations bring together findings from the three case study assessments.

Chapter Six: Conclusion. The final chapter includes a summary of the main findings resulting from this research.

CHAPTER TWO: LITERATURE REVIEW

The three interrelated processes introduced in Chapter One that support the research question include human value systems, design processes, and the institutional framework. This literature review assembles background information that provides the context for the main research question, and influence what was assessed within the three case studies. A concluding sub-section has been included after each of each literature review topic. These summations give rise to a series of questions (included in text boxes) that will be posed during case study assessments:

- Human Value Systems:
 - human preference for nature – what elements or aspects of nature humans are most and least attracted to, and how sense of place supports human affinity for nature;
 - biophilia – a theory that suggests our inherent connection with nature;
 - competing theories – how various theories of human preferences and our connection with nature conflict;
 - benefits of nature in our cities – various arguments to support the preservation of natural areas in our cities, ranging from ecocentric to anthropocentric considerations;
 - evolving paradigms – the way in which the human-nature connection has changed over time as a result of various influencing factors;
- Design Processes:

- o contemporary philosophies in altering the landscape – various approaches and tactics that land planning professionals currently use in promoting a human-nature connection; and
- Institutional Framework:
 - o legislative framework and governance – laws, legislation and policies that are overarching to the land planning process as it relates to natural areas in urban environments.

The investigation of human values and actual conditions seen in the land planning process illuminated six paradoxes, a discussion of which is included in the literature review.

1. HUMAN VALUE SYSTEMS

Human Preference For Nature

There are various competing theories related to human preferences for nature, with a significant amount of evidence that demonstrates the benefits of human contact with nature. Those considered here include the savanna biome theory, place attachment, prospect and refuge, among others. At the same time, it is not known whether human appreciation of nature is innate and inherent (Bourassa, 1990), is cultural and learned (Bourassa, 1990), or is a mixture of both (Home, 2009). Home (2009) notes that research into people's landscape preferences has identified a remarkable consistency in human preference for natural landscapes (Hartig & Staats, 2005) and have been found to be those that:

- are natural, as opposed to urban (Hartig, 2005; Kaplan, 1989; Lamb, 1990; Ulrich, 1983);
- contain a variety of landscape elements and plant species (Misgav, 2000);
- display a degree of management (Gobster, 1995; Ulrich, 1986); and

- are open (although not exposed) while containing a high degree of depth and a moderate-to-high degree of complexity (Hunziker, 1995; Hunziker, 1999; Kaplan, 1989; Ulrich, 1983).

While the focus of each of the human-nature interaction theories differs, each one supports the primary thesis of this research that some degree of a human affinity for nature exists. This research did not assess the validity of any of these theories, but proceeded on the basis that there are various reasons why people are attracted to particular elements of nature. Regardless of which theories are most accurate, each one validates a documented benefit of human exposure to the natural world. Therefore there is support for protecting the environment and a need for municipalities to ensure adequate actions are taken to retain nature within these urban centers.

Prospect-Refuge and the Savanna Biome Theory. Physical features within both indoor and outdoor environments have a direct impact on human preferences, comfort and perceived danger (Blobsaum, 2005). In the 1970s, British geographer Jay Appleton advanced the Prospect-Refuge Theory. The theory indicated people have a preference for specific places in the outdoor environment that include both prospect and refuge (Appleton, 2006). Appleton's Darwinian theory is based on comparing human preferences for particular landscapes to habitat selection in animal behaviour (Appleton, 2006). As an example, in the research conducted by Balling and Falk (1982), preference for five different biomes were compared amongst different age groups to find that, while preferences varied somewhat amongst these groups, savannah-like scenes were preferred (Balling, 1982). Appleton's theory is widely supported by numerous studies (Clamp, 1982; Hagerhall, 2000; Mealey, 1995).

Beyond the edges of forests are savanna ecosystems, which predominantly include grasslands with scattered trees (Botkin, 1995). The Savanna Biome Theory is integrally linked to research results from the prospect and refuge theory, as this ecosystem provides extensive views over the grassland prairie (Allan, 2003) with sporadic features for refuge. Prospects can be either direct or indirect, and include panoramas and vistas. Refuges can be classified by function (i.e. hides and shelters), origin (natural or artificial), substance (in the earth such as caves or in vegetation), accessibility, and efficiency (Lothian, 2011). In light of the Prospect-Refuge Theory, there are many studies that correlate characteristics of different physical features of the built environment with personal perceived danger (Herzog, 2002). Nasar (2000) outlined the benefits of having both prospect and refuge in one location as “offering the observer perceived protection or refuge; but . . . affording concealment of a potential attacker” (p. 128). The notion of prospect and refuge is a key premise to the savannah biome theory, and supports the notion that the savanna-like landscape - consisting of low shrubs and clumps of trees divided by open spaces - offers an attractive combination of prospect and refuge symbolism (Falk, 2009)

While the Savanna Biome Theory has been widely supported for many years, various other studies demonstrate that alternate biomes or ecosystem types are preferred (Kaltenborn, 2002, Williams, 2002). Han (2007) studied the six major terrestrial biomes – including desert, tundra, grassland, coniferous forest, deciduous forest, and tropical forest. This research sought to determine which natural setting would evoke the most positive reactions from people, and to contradict the savanna biome theory. The results demonstrated a much higher preference for coniferous forests, as compared to the least preferred grasslands (Han, 2007). It should be noted that neither theory precludes the fact that humans want to interact with nature.

Place Attachment. Place attachment is a positive connection or emotional bond between a person and a particular place (Williams & Vaske, 2003), and is an important element of community planning (Manzo, 2006). Attachment suggests people's rootedness to a location based on involvement, ties, sentiments, and interactions with local elements (Matarrita-Cascante, 2009) and experiences that they have with various other people (Scopelliti, 2004). In the context of attachment to the natural environment, place attachment is a complex construct that is affected by the physical characteristics of the landscape itself, the experiences that people have within these natural areas, and their knowledge of natural areas in general (Ryan, 2005). People's sense of place may be largely formed in early childhood (Frumkin, 2011), meaning we may develop a higher sense of place where we grow up, and an attachment to the communities that we lived in.

It is argued that seasonal and permanent residents to a particular community are not distinct in their biophysical-related factors determining community attachment (Matarrita-Cascante, 2009). On the other hand, tourists and infrequent visitors are at a disadvantage in developing place attachment compared to these residents (Drenthen, 2009; Milligan, 1998; Ryden, 1993; Stedman, 2003; Vorkinn, 2001). If an environment is understood by its participants, it will be experienced as familiar, and this will be associated with higher preference. Familiarity, however, can also decrease involvement that will decrease preference (Peron, 1998). Local, long-term residents have the benefit of time to become familiar with their surroundings, yet because it becomes routine they may become less intrigued in participating in it. Landscape-based interactions are directly correlated as predictors of community attachment (Matarrita-Cascante, 2009).

Tourism destinations are traditionally framed as products to be marketed (Heath, 1992), such as an experience within the urban fabric or the opportunity to participate in the surrounding environment (Beeton, 2002). Tourism destinations are also framed as narratives (Lichrou, 2008), by portraying a story that participants can imagine themselves a part of. Two common themes promoted by western Canadian municipalities are the way in which urban fabric melds into the surrounding landscape, and various ‘escapes’ that can be found in and around the community (Gauthier, 2011). Whether this escape involves just viewing a natural scene, or being a direct participant of the natural area, promotional material relies on people imagining the qualities of a place.

Place attachment literature suggests that sense of place is more prevalent for those individuals with more endearing and long-lasting connection to a particular location (Brown, 2007; Lewicka, 2008). Promotional material used by community organizations oftentimes demonstrates the residents’ perspective – “come live in a local’s shoes” - such as the experience of local events and hidden gems, or from their own back yard. Some argue that sense of place is not intrinsic to the physical setting itself, but resides in human interpretations of the setting, which are constructed through experience with it (Stedman, 2003; Tuan, 1977). Ryden (1993) suggested that, “a place . . . takes in the meanings which people assign to that landscape through the process of living in it” (pp. 37-38). Promoting a community from the perspective of a local resident may be one way to convey sense of place to visitors – these perspectives are some of the intangible elements that local promotional groups convey. Place attachment often emerges as individuals get to know the setting and endow it with value (Milligan, 1998). Local residents are therefore expected to develop attachment to the areas to a larger degree (Vorkinn, 2001).

Promotional material such as imagery used by community organizations do in fact try to portray these intangible experiences (Shortridge, 1983) and give viewers a perception of being a local. As a marketing strategy, this approach is consistent with insight provided by place attachment literature and the more fundamental theories of biophilia and human-nature connectedness (Horton, 2009).

Biophilia: The Human-Nature Relationship

The need for humans to interact with nature is driven by what various professional fields now call biophilia (Kellert, 1993). The concept of biophilia was popularized by entomologist E.O. Wilson in the mid-1980s, while it was originally conceived in the 1960s by German psychologist Erich Fromm. This theory is widely accepted by such disciplines as cetacean sciences, social ecology, biology, human behaviour and anthropology (Kellert, 1993). In essence, the Biophilia Hypothesis states a love for nature that is shared by all people across all cultures and economic classes (Pliska, 2006). The Biophilia Hypothesis suggests that our affinity for nature is inherent (Hansen-Ketchum, 2009) and universal to all people to some degree (Orians, 2008). Nearly every culture, from the early Aboriginal tribes of Australia to the most devoted urbanites of post-industrial Europe or America, have recognized that contact with nature is critical to human survival (Besthorn, 2003).

Much of the literature available on biophilia includes qualitative studies, with very few examples of quantitative research (Van Den Born, 2000). Studies of our connection to nature seem to favour personal accounts (Frumkin, 2008) whereas qualitative methods are used to identify biophilic tendencies. Khan (1997) effectively frames human sensation of biophilia using analogies that relate to human passion for nature “for reasons that they can’t put into words” (p.

2). This passion for nature, as the author recognizes, is a phenomenon that is studied by numerous different disciplines. The fact that so many different disciplines have a genuine interest in this theory, along with the analogy of this phenomenon often being difficult or impossible to explain, speaks to the complexity of biophilia.

As numerous disciplines support the validity of biophilia, they also endorse the health benefits afforded by routine contact with nature such as improved mental well-being (Kaplan, 2001), providing restorative experiences involving the renewal of depleted psychological resources (Hartig, 2001) and stress reduction (Orsega-Smith, 2004; Wells, 2003). Consistent with the theory, all people need contact with nature precisely because of the genetically encoded adaptive benefits nature has on us physically, emotionally, and intellectually (Kahn, 2002; Kellert, 1997). Based on these principles, accommodating natural areas within our urban fabric is an essential contributor to healthy urban populations.

Frumkin (2011) suggests that for more than 99 percent of the past 2 million years of the existence of humans and their immediate predecessors, human lives were embedded in the natural environment. Those who could navigate it well – who could smell the water, find the plants, follow the animals, and recognize the safe haven – likely enjoyed survival advantages. Organisms, including people, thrive best in settings that resemble those in which they evolved, giving environmental context to biophilia (Irons, 1998).

Competing Theories

There are also competing views that challenge the validity of biophilia and its premise that humans have an inherent connection with nature. Orr (1993) argues that biophilia is not an inherent phenomenon between humans and nature, rather that it is a choice made by humans on

whether or not to connect with nature. He also builds a case toward regional- and societal-based support for the existence of biophilia, opposed to it being a phenomenon prevalent amongst all humans.

Ultimately, the concept of biophilia supports our love for nature, which presumes human's perceived comfort in nature settings (Gerber, 2002). In order to demonstrate biophilic tendencies, a person must obviously feel connected and comfortable with the natural feature. The Savannah Biome Theory and other research in landscape preferences such as prospect-refuge challenge the basic premise of biophilia. Research related to biophila suggests that our love for nature is inherent, and universal to all humans to some degree (Besthorn, 2003; Heerwagen, 2008; Kahn, 1997). Research related to the Savannah Biome Theory and human preferences for particular environmental features demonstrates that not all aspects of nature are inherently loved equally by all people (Perrin, 2009; Smardon, 1988; van den Berg, 2003) and in some cases feared by many people. Numerous studies have shown that certain features of natural landscapes do engender deep, affective and spiritual connotations (Ashley, 2007). These features include mountains (Rossler, 2003; Taylor, 2004); forests (Seed, 2000; Taylor, 2004; Williams, 2001); deserts (Taylor, 2004), and others.

Studies in human preference within various outdoor environments demonstrate considerable variation between different individuals. People demonstrated a stronger affinity to elements such as water (Han, 2007; Mador, 2008), tree forms that have large canopies and small trunks (Sommer, 1999; Summit, 1995), as well as natural features compared to built ones (Smardon, 1988; Ulrich, 1981). Van den Berg (2003) noted, "environmental preference is determined by environmental properties that possess a potential functional significance for the

perceiver” (p. 136). Various visual elements in landscapes influence affective and aesthetic responses (Fischer, 2006). These properties can include complexity, the presence of a focal point, legibility, coherence, visual depth or openness, ground surface texture, and mystery or a promise of information (Daniel, 2001; Kaplan, 1992). Theories of landscape preference have indicated that inherent connections are not universal to all people.

Some researchers that currently study landscape preference claim natural ecosystems are often considered less attractive than more manicured environments (Williams, 2002). Others, such as Nassauer (1995) and Thayer (1989), claim that the appearance of natural habitats is preferred over formally design and manicured environments. The preference for natural over man-made environments may be due to variations in recovery potential from undesirable states in which functional abilities of the ecosystem are compromised (Purcell, 2001; Staats, 2003) during the implementation of newly constructed or reclaimed landscapes. Hill (2008) noted:

“Ecological restoration and protection requires alteration of existing environmental conditions. Sometimes the necessary changes are quite dramatic and highly visible to the public. Frequently objections are raised because current / recent conditions, though ecologically inappropriate, are perceived as “natural” or at least normal. Public acceptance and support are crucial for restoration efforts on public lands. In many cases support will hinge on the public’s willingness to tolerate short-term disruption or even permanent alteration of valued landscapes in order to achieve ecological goals” (p. 34).

In light of these varying preferences, land planners are challenged to determine those landscapes that humans most prefer. Further, in the creation of new landscapes designers struggle to create conditions that are agreeable to a majority of end users. Oftentimes a client or municipality will provide a design criterion that represents personal biases in landscape preference based on public outcry (EDS Group, 2003; EDS Group 2010), therefore prejudicing one type over another.

Benefit of Nature in Our Cities

Various bodies of knowledge support that the human race has evolved from a deep-seated interrelationship and interdependence with nature (Appleton, 1996; Daily, 1998; Kellert, 1993; Williams, 2002). Numerous theories suggest a positive health benefit to humans as a result of this interrelationship (Butterworth, 2000), yet current urban development patterns do not necessarily demonstrate support for citizens' inherent reliance on routine access to nature (Alberti, 2005). This is measured by the lack of natural areas that are found in many western Canadian municipalities, which will be highlighted in case studies chapter four.

World view deviates from person to person. These perspectives vary from culture to culture, and also within populations of people with similar cultural experiences. There are two generalised world views with respect the human-nature relationship (Curry, 2011). In principle, ecocentric values consider humans to be only one of millions of species within a complex system (Gersdorf, 2006), whereas anthropocentric benefits suggest that the world exists for human benefit (Kortenkamp, 2001).

Anthropocentrism. Anthropocentrism is a world view that supports a human-centered value system, wherein nature is important as it relates to human benefit (Brown, 1995). Anthropocentric values are often correlated with human dominance and control over nature. The title of the book *Nature by Design*, (Higgs, 2003), in itself suggests a human dominance over nature. Higgs recognizes this world view as part of the movement toward technological restoration, wherein humans claim the ability to design nature through replication of its components. He recognizes that this very concept causes reason for a drastic change in the way

humans feel dominant over nature, and to revert to past interests in traditional restoration practices that were more sincere to the unknown complexities of natural environments.

For many generations, the provision of public open space in our cities has been predominantly for human benefit. The inception of Central Park in New York City was based on Fredrick Olmsted and Calvert Vaux's desire for social reform, and achieving social change in the city through an aesthetic experience (Fisher, 1994). This park was envisioned to have the ability to bring together the working class with those individuals who had a higher standard of living and who were more accustomed to a lifestyle of leisure. Olmsted was influenced by many authors, professionals and scholars, and in particular by a critic by the name of John Ruskin. Ruskin supported that the beauty of the natural landscape scenery must be the means to improve quality of life for people (Fisher, 1994). Olmsted insisted upon several benefits to humans in the development of Central Park. As an example, he argued that air is disinfected by sunlight and foliage, and that parks would serve to supply the lungs with air screened and purified by trees (Olmsted, 1971). While never labeling it as diversity, both Ruskin and Olmsted recognized the aesthetic niceties and healthy qualities of diverse landscapes.

Biodiversity. Biodiversity is the variability among living organisms from all sources. Ecosystems may include terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part. Biodiversity also includes diversity within species, between species, and within and between ecosystems (Convention on Biological Diversity, 2012). In essence, biodiversity is the number and type of plants, animals, microorganisms and their genes, as well as the habitats and ecosystems where they live.

Biodiversity is a global concern, and is an indicator of ecosystem health and vitality. An ecosystem with a higher biodiversity is often more resilient to change and disturbance than one that has a low number of species. This phenomenon can more easily be thought of as an effective insurance policy (CNRS, 2012) - the greater variety in species and the roles they play in the ecosystem, the less chance that the whole system can collapse.

Humans depend on a sustainable and healthy environment (Horn, 2004), and yet we have damaged the environment in numerous ways. The human population now demonstrates something unique within world history, in that never before has one species had such a great impact on the environment in such a short time and continued to increase at as rapid a rate (Botkin, 1995). Until recently, humans have assumed that our ecosystems will continue to fulfill our needs, much like machines, provided a few of the variables are optimized. For example, undesirable species (usually native) are often replaced with more commercially valuable species that have higher yields (Khachaturov, 2010), growth rate or other similar characteristics. This is very common practice across western Canada in the boreal forest region where timber harvesting is prevalent. Cut down trees are replaced with a singular species of faster growing trees that are more compatible with lumber and pulp supply (Schuler, 2008). This continued manipulated reduction in the diversity of ecosystems for society's benefit ignores the complex relationships that exist in an ecosystem and the key to biodiversity. Each species has a role in the environment and removing one or more of these roles can throw the balance off (Clement, 2002).

At least 40 per cent of the world's economy and 80 per cent of the needs of the poor are derived from biological resources. In addition, the richer the diversity of life, the greater the opportunity for medical discoveries, economic development, and adaptive responses to such new

challenges as climate change (Convention on Biological Diversity, 2012). Some economic and social arguments by the Capital Regional District of British Columbia for the importance of biodiversity (CRD, 2012) include:

- the monetary value of the world's ecosystem services has been (conservatively) estimated at \$33 trillion per year;
- over 75% of staple food crops and 90% of flowering plants worldwide depend on pollination by insects and other animals. Between 100,000 and 200,000 species of animals act as pollinators, and their populations are declining;
- non-timber forest products such as wild foods, floral greens, herbal medicines and edible and medicinal mushrooms may be sustainably harvested from a healthy forest. If carried out with respect for the environment and for First Nations knowledge, this emerging industry may be worth many millions of dollars to the economy in BC. These plants and fungi are part of natural diversity in forests, and are less abundant in areas that have been clear-cut;
- virtually all natural and pharmaceutical medicines are composed of (or derived from) natural compounds of plants, fungi, microbes and animals. In areas of severe environmental degradation, many species with known or undiscovered healing properties are threatened with extinction; and
- the highly biodiverse coastal environment of BC contributes 4.5% to the provincial GDP.

Human Health Benefits. Although the epidemics and infectious diseases targeted by public health organizations over the past 140 years have largely been eradicated in the Western world, preventable lifestyle diseases have replaced them (Moore, 2008). It has been well

documented and concluded that nature in urban areas has a direct and significant benefit to promoting human health and well-being (Tzoulas, 2007). The World Health Organization (WHO, 1986) states that health promotion is the process of enabling people to increase control over, and to improve, their health. Promoting human health is not simply a practice in curing ills with various treatments, rather promotion provides the skills and settings for health to be achieved (Coutts, 2011).

Evidence from the discipline of clinical epidemiology is used as a basis toward linking evidence-based medicine to health through nature contact (Frumkin, 2008; Patil, 2009). Epidemiology, which is the study of disease in human populations and their causes, primarily focuses its research within clinical settings. Frumkin (2008) notes various observational studies that incorporate nature as an independent variable in the assessment of human health. He indicates that human contact with nature indeed provides positive indicators of health in conjunction with other variables. Research conducted by Patil (2009) suggests that the visual absence of plants has an undesirable impact on health or quality of life, however may be “ameliorated by adding elements of nature, i.e. by creating parks, by offering a view through windows, and by potted plants” (p. 2332).

Since the 1970s, research has been conducted on the use of animals within healthcare facilities as a means of improving patient condition and recovery. Outside healthcare facilities, animals and human health have also been studied to help both functional and mental disorders for human participants. In the many examples cited by Katcher (1993) there is proven evidence that animals have a positive impact on human health.

Our relationship with natural landscapes has proven benefits to human health and more effective recovery from various illnesses. Khan (1997) provides insight to numerous studies that suggest the roots of human connection to nature, and that indicate improved health and well-being as a result of exposure to it. Benyus (1997) discusses how in recent years our society has once again begun to turn to nature for cures to various illnesses and diseases. Comparing primates such as lemurs to humans, she claims that with a significant parting from dependence on nature, humans have lost their ability to understand natural elements that can be used for healing in the world around us.

Our Spiritual Connection. While spiritual connection is in itself an abstract topic, and spiritual values are very difficult to measure, various authors have suggested definitions of nature-based and wilderness spirituality (Johnson, 2002; Porteous, 1996; Timmerman, 2000).

For the purpose of this research, spirituality will be defined as noted by Fox (1999) noting that:

“(spirituality is) an altered state of consciousness where an individual may experience a higher sense of self, inner feelings, inner knowledge, awareness and attainment to the world and one’s place in it, knowledge of personal relations and the relationship with the environment, or a belief in a power greater than imaginable” (p. 455).

Common ways to describe spiritual connections between humans and nature include words such as connection, interrelationship, portrayals of the transcending the self, and the quality of compassion (Ashley, 2007). It is important to make the distinction between spirituality and religion, as the two are entirely different (Kumar, 2004; Perschel, 2004). Maslow (1970) states that:

Spiritual values have naturalistic meaning . . . they are not the exclusive possession of organized churches . . . they do not need supernatural concepts to validate them . . . they are well within the jurisdiction of a suitably enlarged science and . . . therefore, they are all the general responsibility of all mankind (p. 4).

For centuries, many cultures around the world have demonstrated a strong spiritual connection to nature. Spirn (1998) opens her book by stating that, “the language of landscape is our native language” (p. 15). This author speaks of the importance of landscape to human life, not from the basis of everyday survival but on a spiritual basis. She argues that there is much to be learned from landscapes, both natural and constructed, which is supported by a claim made early on in the book that landscapes are a vast library of literature (Spirn, 1998). By using the word ‘language’, Spirn suggests an interaction between humans and nature, or an exchange of information from one to the other. As humans we seem to have lost our spiritual connection with the Earth. We have lost the inner ground of our being, and lost sight of the reciprocal interrelatedness of all life (Ashley, 2007).

The cultural composition of many western Canadian cities is extremely diverse. According to Statistics Canada (2012):

“Strong immigration to Canada in recent decades has led to a rise in the number of foreign-born persons and the portion of the population that they represent. Thus, from 1986 to 2006, the immigrant population went from 3.9 million to 6.2 million, accounting for respectively 15.6% and 19.8.% of the Canadian population. If current immigration trends were to continue in the coming years, the proportion of immigrants in Canada could reach slightly over 22% by 2017. This would be equal to the highest level observed since the beginning of the last century, namely the 22% recorded between 1911 and 1931. Few countries have a larger proportion of foreign-born than Canada. In the United States, for example, the proportion of foreign-born was 12.5% in 2006.”

That said, land planning professionals are faced with implementing strategies that accommodate a very wide cross section of cultural views. Some of the more common world-wide cultures that are most prevalent in western Canadian municipalities include South Asian, Chinese, West Asian, Korean and Arab (Statistics Canada, 2012), and one can appreciate the varying world views that each of these cultures bring to a new and collective community. If there

was only one strategy land planners could employ to the benefit of such a diverse society, equal access to nature would be it.

The works of Aldo Leopold describe how wild nature can act to renew the spirit (Potter, 1987). In western Canada, one way in which humans demonstrate a spiritual interaction with nature is through actively restoring natural systems through personal participation. This act may be a source of spiritual renewal through the realization that one is an active and essential member of the ecosystem (Clewett, 2006). The most common way in which humans demonstrate a spiritual connection to nature is through exploring nature for self-fulfillment. The effect of the wilderness landscape, particularly via sensation (Ashley, 2007), is possibly best described by Johnson (2002) as:

“We enter wilderness with all our senses and all our being: feeling the rain or breeze; smelling its pine and sage; hearing the water, the crack of lightning; seeing the world anew with each shift of light or perspective; not least, we know in our elemental core how our journey has entwined us- our comfort and our fate – with this landscape” (p. 30).

The term “value” as a verb certainly encapsulates spirituality and personal belief systems. As a noun, this term is often correlated with monetary value. To this point, this text has described value in an intrinsic manner, while in land planning economic considerations are very important in development processes.

Nature for Economic Wealth. Supporting a strong economy within our cities is a primary concern for local governments. The natural environment represents the main resource for many tourism destinations and tourists are increasingly interested in spending their vacation in unspoiled natural areas (Dolnicar, 2008). With the dominance of human-made objects surrounding us, and the decline of available natural resources, we lose the possibility of intimate

contact with nature. The focus of work conducted by Grinde (2009) explores “whether or not the concomitant depletion of natural elements has a negative impact on the human mind” (para. 1). As natural ecosystems degrade, become over-used or feel industrialized, so too does the prevalence of tourism and people’s desire to spend money travelling to these locations (Duim, 2002). Tourism activities can put enormous pressure on an area (Christofakis, 2010) and lead to impacts such as soil erosion , increased pollution, discharges into the sea, natural habitat loss, increased pressure on endangered species and heightened vulnerability to forest fires (Duim, 2002; GDRC, 2012).

Chamber of Commerce organizations are common throughout western Canadian communities. Chamber of Commerce mandates are commonly focused on bolstering communities through promoting local businesses, encouraging tourism and attracting new residents to their community (Canadian Chamber of Commerce, 2012). Today, the marketing of communities by local Chambers of Commerce in western Canada is place-based, highlighting the services and amenities offered rather than goods produced or local industries.

A contemporary trend in increasing economic wealth using imagery of the local environment is prevalent (Kavaratzis, 2008) throughout western Canadian communities, with two common trends found. First, images include views of urban fabric or social activity with natural elements as a backdrop or in the foreground. Intangible qualities of these places are portrayed through majestic views that provoke the imagination of viewers on how they can participate in that environment. The views help define a place (Lavoie, 2006), and also highlight the activities that the natural environment can host. Common imagery used often shows the natural environment intertwined with the urban fabric, suggesting that the natural environment is

immediately available to residents and tourists without leaving the sidewalk. A second trend found in place-based promotional imagery is to put tourists, or visitors to the community, in the shoes of residents (Fleury-Bahi, 2008). Place-based literature suggests that sense of place is often more substantive amongst residents or those more familiar with local elements (Buttimer, 1980), and putting guests to the community in a position similar to local residents can more effectively help convey the essence of place.

Case study examples in this research describe how the land development industry in western Canadian municipalities also uses nature as a theme for promoting the sale of residential units. While there are times where natural areas are in fact present in these subdivisions, marketing efforts embellish the natural experience as a means of setting a sense of place (Qualico, 2012). The use of nature to promote development is seen as antithetical to the “come enjoy nature” message when we consider the extent of the infrastructure needed to support that development. This manufactured theme (Birkeland, 2008) can lead to significant long-term problems when new residents find their perception of nature does not align with elements of nature made available to them in their community.

Benefits as Civic Infrastructure. Many western Canadian cities were built along strategic water systems (Hoyle, 2000), such as lakes and rivers, to ensure a reliable source of fresh water and in some cases for transportation. While the water is treated in primary and secondary treatment plants, cities rely on surface flowing water as a source of potable water (Kinkade-Kevano, 2007) and for non-potable uses such as commercial operations. Without water, no human can survive, and the viability of providing essential services to residents would be challenging without a reliable source. With the rise of the automobile and vehicular transport

(McShane, 2004), cities became less reliant on water as a means of transportation and movement of goods. The local economy of some cities, such as Vancouver, is still reliant on water systems for transport, especially in light of the challenges to move large volumes of goods through dense urban areas (Motavalli, 2001).

Municipalities across western Canada commonly struggle to minimize infrastructure maintenance costs for civic improvements and public amenities (Macleans, 2011). It is a straightforward concept that a highly manicured park will cost more to maintain than a natural area of the same size. Green infrastructure comes with a range of benefits, such as aesthetics, increasing ground permeability and improving stormwater management, reducing heat island effects and solar rebound from hard surfaces, etc. (Frumkin, 2011). Plants and trees filter pollutants from the air, act as buffers against the wind, add oxygen to the air, reduce summer temperatures by as much as five to six degrees Celsius, control noise, reduce rainfall runoff and attract birds and other wildlife (Schmelzkopf, 1995). It is challenging to provide only natural areas as park space, given many residents prefer more manicured and contrived landscapes (EDS Group, 2010; EDS Group, 2003).

In the early-2000s, the City of Edmonton adopted a new municipal standard that allows the design of stormwater management facilities to include more naturalized features, such as taking on many characteristics of a wetland (EDS Group, 2010b). While conventional stormwater management facilities functioned well through temporarily storing precipitation runoff and controlling its release into downstream rivers and streams, it was acknowledged that the new naturalized strategy drastically improved the overall function (Lilley, 2001). Wetlands are known as the kidneys of watersheds, by helping to collect deleterious substances that are

byproducts of urban areas (Hughes, 2001). Some of these substances include sediment that is captured in and amongst emergent vegetation, and hydrocarbons and nutrients that are collected through phytoremediation (Lilley, 2001). In Edmonton, even remnant natural systems are now being used as stormwater management systems with the belief that these natural areas can be sustained despite the introduction of new regimes of surface water.

Evolving Paradigms: Nature For Survival and Celebration

J.B. Jackson's *Westward Moving House* establishes a metaphorical relationship between man and nature through a progression of three successive generations of families (Zube, 1970) at the foundation of the United States. Through both space and time these families demonstrate a lessened dependence on nature with the rise of technology and the emergence of new ideals as a more modernized society. The time dependent phenomenon is a manifestation of the availability of new wealth and tools available to successive generations. The spatial change in privately owned land is a factor of the availability of new expanses of undeveloped territory and a promising improvement in quality of life. As each generation of this family moves further west over time, they demonstrate a more prominent control over nature, and less intrinsic knowledge of how nature operates. Jackson figuratively portrays a picture of the modern man dominating nature with little regard to connecting with it or respecting its long-term sustainability.

Although Jackson's story was fictitious, the phenomenon of western society losing its connection with nature is consistent with historical occurrence in numerous North American contexts, including cities across western Canada. Over successive generations, the western world has demonstrated a trend of moving further away from a connection with nature (Barlett, 2005). Barlett (2005) adds that the creation of the city – back to the time of the empires of many

generations ago – resulted in the accelerated estrangement of nature amongst people. She discusses trends over hundreds of years of our civilization, with much more detailed accounts of history related to our connection with nature post-World War II. While food production in Canada has continued to increase since 1900 the number of people directly involved with agricultural lands has dropped dramatically.

Nature as a Source of Life. Cities across the world began with humans settling close to elements of nature that facilitated survival (Storrie, 1972). Ultimately, having a reliable source of water was of primary concern to these settlements. Without water the human race would not exist, and the same goes for all other living things on earth. Water covers over 70% of our planet, while within the majority of populated areas around the world there is no view of surface water (USGS, 2012). Water does, however, persist even in inland areas through rivers and streams, subsurface water as well as in the atmosphere above evident by clouds and precipitation. Despite water being so prevalent in our surroundings, humans still demonstrate a fascination with it as if it is rarely encountered (Nelson, 2012). Although water is an element we are exposed to on a daily basis in some form or another, it still holds high spiritual value for humans and is demonstrated as the most prominent element of nature to which humans are most connected (Mador, 2008).

There are other facets of nature that have allowed the human race to survive and prosper. Across western Canada, First Nation people traditionally depended on wildlife as a source of food and for raw materials for daily living (Notzke, 1994; Stlund, 2009). Beyond meat and other edible aspects of an animal, materials such as bone and gut were used to make tools, weapons and other useful implements. Hides were used to make clothing and blankets. Nearly the entire

body of harvested wildlife served a function, whereas today's hunting practices by humans see significantly less proportions of these animals used with only select meat taken. Johns (2003) describes the significance of vegetation to the First Nation people of the Boreal forest region of western Canada, and collects an array of literature that outlines the various plant uses. Homes were once built of raw materials such as tree limbs and hides, and strategically positioned in order to maintain more desirable interior temperatures, ventilation and proximity to ideal sources of water (Finnigan, 1982). Today, homes are produced using an array of processed materials, both natural such as wood or synthetic including asphalt shingles and vinyl siding. Certainly with more technology we are able to mechanically control our homes to our comfort, with less reliance on strategic placement and construction methods.

As described in J.B. Jackson's work, human populations have become much less reliant on aspects of nature and increasingly distanced. The rise of technology has brought new materials and mechanized means of providing basic essentials for daily life, and has had an effect on the preservation of renewable resources (Shukla, 2012). While humans are still entirely dependent on water for consumption and other daily uses, we are able to locate our communities further away from water sources and to use less purified materials with the rise of mechanical purification systems. At the inception of many of our cities, growth targeted nearby water sources for transportation, food production, and water collection (Antoniou, 1994). Today, developments are far from the water's edge with reliance on deeper groundwater sources, and mechanical means of water distribution through underground piping. We also have the means of purifying less than suitable water in order to take advantage of water sources that at one time

were not potable: an advantage that enables large numbers of people to distance themselves from nature.

Human Inspiration: Celebration of Natural Elements. The design profession is well aware of the power that water has in captivating both humans and other creatures (Clayton, 2003). For wildlife, water is a source of life, providing both food as well as critical habitat. For humans, water is also a life-dependent element, while it is often incorporated into the built environment for aesthetic purposes. Water is an integral element of nature as it relates to biophilic design and our connection with nature (Mador, 2008).

In urban areas water not only provides a means of contemplation and spiritual connection with nature, but it is also used in an artistic and aesthetic sense in fountains, recreational areas, and other means of public display (Goetgeluk, 2006). In the arts, water is often a key element in paintings. In religion, water is characterized as a source of life and a metaphor of purity. Even in literature and movies, water is commonly the villain in the popular battle between man and nature.

The way in which we incorporate water as a feature in urban design can demonstrate an array of care and control over it. On one extreme, containing it and expressing water in a playful way such as in a public fountain (Simoson, 2009) demonstrates our control over nature and use of it for our pleasure and enjoyment. On the other hand, a subtle opportunity for us to experience water in a natural setting may demonstrate the opposite, whereas humans are humbled by the complexity of water and its importance to their survival.

The notion of replicated nature to compensate for lost natural elements (Ozguner, 2012) is common across western Canada. It is common practice to replicate natural features through

the development parks, open space, and even the creation of personal spaces such as yards or home interiors. Replicating nature and recreational activities within indoor environments (Thompson, 2011) is also a means of escaping to a more natural place. Humans in Western society spend the majority of their time – up to 90% - indoors (Evans, 1998; Hancock, 2002; Mayer, 2004), especially in winter conditions (Duffy, 2009). Because of this behaviour, access to natural features and getting away from urban living is more challenging. In the absence of windows within the workplace, it is common for workers to incorporate plants into their workspace, along with pictures of nature as a means of compensating for a lost connection with nature (Grinde, 2009). These efforts by individuals to bring nature back into daily living demonstrate a biophilic tendency.

Conclusion

Various theories argue for a human preference for nature. It is not conclusive whether or not the human affinity for nature is inherent to humans. Some of these theories compete with one another, such as the types of landscapes that people are most attracted to. Because the types of landscapes that people have the greatest affinity for are not conclusive, land planning professionals are not in tune with which natural landscapes are more likely to be accepted by people in our cities. Case study assessments will not test the validity of any of these theories, yet will indicate different ecosystem types and public reaction to these ecosystems that exist within urban areas.

Question One: What public reactions to different ecosystem types or characteristics of natural areas can be observed in case study assessments?

The values attributed to nature were described, and each of them can fall onto a scale that ranges from ecocentric to anthropocentric in principle. An example of an ecocentric value is to protect natural areas to promote biodiversity, while an anthropocentric value may include the need to retain nature in order to provide renewable resources that have a monetary value. The challenge to municipalities is ensuring that residents value these ecosystems to the extent that long-term protection can be assured, and in doing so publically supports the retention of natural areas.

Question Two: Is there a correlation between the human values observed in case studies and the protection of natural areas in urban environments?

Over time, human connection with nature has changed. The analogies presented in *Westward Moving House* show how human values have changed over time through successive generations, and as families progressed further west with more technology available to them. A close reliance on nature as seen with many First Nation cultures in western Canada was needed for survival, while today nature is valued in a much different way – for example by using natural elements such as water for celebration.

Question Three: What are the historic trends of natural area preservation and uses within the case study area?

2. DESIGN PROCESSES

Contemporary Philosophies in Altering the Landscape

Intersection of Natural Systems and Human Values: Competition and Planned

Adaptation. Competition in an ecological sense includes the interaction between species (Chase, 2002). This process involves one species taking advantage of introduced environmental changes to thrive, while other species experience less desirable conditions and may decline (Simberloff, 1983). Competition can also include the interaction between individuals within the same species. If the environmental changes occur at a slow enough rate, species may be able to adapt to again thrive under changing circumstances. Natural ecosystems are dynamic, and over time they adapt their complex state as environmental conditions change (Gunderson, 2002). These changes are incremental, in that many ecosystem processes are unseen to the naked eye and can take many decades to be even measurable (Chapin, 1996). The more rapid development of cities challenges natural systems' abilities to adapt (Brown, 2005; Marzluff, 2008).

Competition in the human sense can have numerous meanings. In the context of this research, human alterations of the landscape such as city building have a dramatic effect on natural processes of ecological competition (Liu, 2007). As an example, with trends in global warming, more arid conditions are found in the Canadian prairies and prairie pothole and lake levels are dropping at rates of several millimetres per year (Timoney, 2004). Timoney (2004) elaborates on how riparian species such as lichens in northern Alberta will change over time as water levels fluctuate, and adapt to new conditions if they occur at a slow enough rate. The development of a new suburban community may require water basins to be drained to accommodate development, and the surrounding species are not able to adapt with water levels suddenly changing by meters at one time.

Within cities, there is also competition between interest groups having varying points of view and competing interests in what amenities are built (Westworth, 2001). For example, there are pressures to retain natural areas that are supported by environmental groups, while there also may be competing pressure from community groups for the provision of more sports fields for active recreation. The design professions are often challenged to balance these public interests, and work within the legislative frameworks of local, provincial and federal governments (Boyd, 2003). These competing interests make design processes very complex.

Altering the Landscape: Role of Land Planning Professionals. The modification of the environment is done by all living species, but of course to varying degrees (Orr, 1993). Humans have undoubtedly altered the earth to a greater extent than any living creature, and on a regional basis varying cultures and generations have affected nature differently. Human's long-term impact upon the natural world, the violation of the laws under which it exists, and an ignorance of the consequences of man's influence on the environment has in a number of instances been responsible for the occurrence of irreversible ecological phenomena on this planet (Zverev, 2010). For primitive populations of people, understanding nature was a necessity to survive. Today, with the levels of technology available to us, humans have the luxury of ignorance toward understanding nature and the ability to displace it from our daily lives. For many generations of human occupancy in urban areas, city dwellers who have found urban areas to be absent of nature have attempted to improve life by creating space for nature to thrive, such as parks and gardens (James, 2009).

Urban development has obviously caused significant harm to natural environments beneath its footprint. Most municipalities in western Canada have existed for merely 150 years

and we can learn from our past decisions to improve planning processes. At the same time, there is much for land planning professionals to learn from other precedents from around the world. The origin of many worldwide cities dates back hundreds of years, and since their inception the natural environments within these cities have been eradicated, highly disturbed, or modified to suit human needs. Oliver (2006) describes the alteration of the Thames River in the late 18th and early 19th century that improved it as to create and exploit uneven patterns of development. The drastic difference between the natural world and human society is the patterns within which they both thrive; human development in its regular form is not compatible with the uncomfortable randomness of nature. Although randomness is in itself a pattern, it is one with which humans typically do not care to adorn the built world. As a result, complex ecosystems do not survive the test of time in established cities.

Schmidt (2008) stated:

“The nascent field of planning, which arose in the late nineteenth century, coincided with a period of rapid industrialization, political corruption, increased immigration, overcrowding, squalor, and perceived moral decay that characterized industrial cities. Influenced by technological advances, scientific intervention into social decision making, and the belief that a pleasant environment would foster healthy, responsible citizens, early planners and civic reformers incorporated open space and built environment in two different ways. The first was inherently social and inclusive (urban parks), and the second focused on exclusivity (suburban residential development)” (p. 96).

By better understanding the integration of cities and the intricacies of ecological systems, professionals can develop better strategies that are more sincere to natural areas (Bryant, 2004). As we learn more about ecological networks in our cities, the design professions are realizing that past tactics of retaining only remnant patches of natural areas is not a suitable practice. Maintaining the connectivity of habitat patches as to allow the exchange of individuals and

genes, and colonization processes is a way of slowing down the loss of biodiversity (Vuilluemier, 2002).

Human Attitudes About Restoration. Urban dwellers have developed a nonchalant attitude toward nature preservation and restoration, and urban development has contributed to an even more distant relationship between humans and the natural world (Oliver, 2006). With an increasing movement away from nature, over time we may also will lose interest in the preservation of nature and inevitably diminish our interest in protecting it (Orr, 1993). More recently, however, there is an apparent paradigm shift in the field of ecological restoration given a recent explosion of interest in restoring disturbed natural areas. This profound shift in cultural values is evident through grassroots efforts, such as volunteer organizations that adopt natural areas for the purpose of restoration (Higgs, 2003). Higgs (2003) terms this locally-based initiative focal restoration. He proposes that our society approaches restoration in two ways, including focal restoration (as previously defined) and technological restoration. With the rise of technology available to us, this new type of restoration will replace focal restoration, and may lead to artificiality in restoration efforts (Higgs, 2003). This new trend in restoration is of course less sincere to the natural characteristics of an ecosystem. Given our ability to replicate natural ecosystems or effectively restore disturbed ones, there is far less pressure placed on land planning professionals to retain naturally-occurring ecosystems.

Contemporary Design Strategies

Biomimicry. Biomimicry (also as biophilic design) is a design phenomenon wherein designers of various disciplines use nature and elements within nature as inspiration for the design of new technologies and material things for our society (Gearner, 2003; Reed, 2003). As

an example, Benyus (1997) introduces the development of a solar cell that was inspired by the complex makeup of a leaf. In essence, nature has evolved through 3.8 billion years in existence, and designs from solar cells to subdivisions can be inspired through studying its complexity and simplicity in natural forms. Biomimicry is characterized by two design approaches. One approach is an organic or naturalistic approach, with shapes and forms that reflect people's affinity for nature, such as water, sunlight, plants, and natural materials (Fumkin, 2011). In the above example of the solar cell, the function of the leaf was replicated as the panel gathers sunlight to convert this energy into a usable form. The second design approach is place-based or vernacular design, which connects to the culture and ecology of a locality; this approach could involve geography, landscape orientation, or a host of other landscape features (Joye, 2007).

Placemaking and Place Promotion. Sense of place is established through personal experience in a particular locale. Placemaking is a process in which land planning professionals attempt to create spaces that have physical qualities that encourage a positive experience for people (Schneekloth, 1995). Placemaking also includes the creation of opportunities for animating the public realm and creating memorable experiences for people. Successful places not only include strong design features, but also opportunities for social interaction between people and a comfortable dialogue between people and their surroundings (Flemming, 2007). To attract new residents and visitors, many municipalities market their strong sense of place.

Elements of nature play a very important role in establishing one's sense of place, especially within dense urban fabric (Barlett, 2005). Community-based imagery and promotional material is catered to local residents, but more so to perspective residents, new businesses and tourists. Urban centers across Canada rely on tourism as a means of economic

prosperity. As an example, Kelowna British Columbia hosts an estimated 1.2M person visits per year, with each person spending approximately \$425 per day (Central Okanagan Economic Development Commission, 2011) – an impressive number of tourists for a community of only 105,000 residents. Primary tourist destinations include 14 golf courses, active recreation on Lake Okanagan, 13 local wineries and numerous festivals and cultural events. A challenge of having such extreme numbers of tourists and seasonal residents in destination communities like Kelowna is often a lack of social cohesiveness that is a result of people not really knowing each other (Gauthier, 2011). The Town of Grande Cache, Alberta, a community of only 4,200 residents, estimates that over 100,000 tourists pass through its community per year (Dollovoet, 2011). Promoting restorative experiences to tourists by accentuating an abundance of natural environments to enjoy (Scoptellini, 2004) is an important mandate for chamber of commerce groups and local communities.

As a means of promoting local business, tourism and immigration of new residents, communities across western Canada are heavily involved in creating promotional material for their community and surrounding area. Imagery, including on-line photos, marketing brochures and postcards, often include elements of the natural environment within and surrounding the community. The essence of place for many communities is often defined by its natural landscape, and the way in which humans - either directly or intangibly - interact with it. The natural environment is used to establish “place” through imagery in western Canadian municipalities, in order to promote a community for economic vitalization and attracting new residents. Places are promoted by community organizations similar to any other commodity sold

by a business. For this they must be rendered attractive, advertised and marketed in the same way as any other commodity (Aguiar, 2005).

In order to attract business investment, new residents and tourists, communities have been forced to become more entrepreneurial and marketing-oriented (Kotler, 1993). “Place marketing essentially constitutes the means to an end, in that people and organizations reside in/locate to a particular place to realize a variety of experiences and benefits, arising from their use of the configuration of physical and social resources and attractions located therein” (Warnaby, 2009, p. 409). The relationship between humans and nature is a common theme in the marketing of communities, whereas the experiences provided by nature, whether visual or tactile, are key to local identity.

Berger (1997) noted, “Landscapes can be deceptive. Sometimes a landscape seems to be less a setting for the life of its inhabitants than a curtain behind which their struggles, achievements and accidents take place. For those who, with the inhabitants, are behind the curtain, landmarks are no longer only geographic but also biographical and personal” (pp. 12-13). Drenthen (2009) stated that “the narrative of the landscape depends not solely on the material traces in the landscape, but also on the stories people tell about it and the meaning they invest in it . . . many of these histories differ from region to region as well, and add to a specific regional character of certain places” (p. 292). Imagery used to promote place in many western Canadian municipalities often reveal stories of the people in the images, such a person in a jet boat on a lake or the pair of mountain bikers travelling over a hillside. These suggested stories are an important part of establishing a sense of intrigue for non-residents. In identifying the

defining natural characteristics of place in a community, outsiders are provided a sense of the human-nature experience they might find.

Many people seek a tranquil and serene experience to escape the toils of everyday life. Chamber of commerce organizations recognize the attractiveness of potential human-nature connections. Promotional material accentuates the highlights of a community, such as its most exciting public events or activities, and also demonstrates the most beautiful natural features for people to escape within. Promoting a community's attractiveness, including the beauty of its natural environment, is essential. Attractive communities tend to be larger, wealthier, and more civic-minded than other communities (Lekwa, 2007) and using images of nature help bolster these communities as places for escape and relaxation. These are intangible qualities of place that many people seek as places to live and play.

Participatory Landscapes. Over the past decade, community gardens have become much more prevalent in western Canadian municipalities, and are thought to be due to people's desire to reconnect with food, nature and community (Firth, 2011). They are seen as an intervention to aid urban regeneration, social cohesion and related health problems (Kingsley, 2006). Community gardens provide places for children and adults to work and plan and learn about nature, and they are sanctuaries away from the dangers, stresses, and temptations of the street (Schmelzkopf, 1995). Wakefield (2007) suggests that the benefit of community gardens can include:

- restoring a sense of community;
- restoring blighted neighbourhoods; providing improved access to fresh, nutritious, and affordable food;

- building skills among participants;
- improving mental health and well-being; and
- encouraging physical activity.

Studies demonstrate that people often choose settings and activities in the outdoor environment that are part of a shared scheme of order which exists between people of similar racial identities (Gobster, 2002; Lee, 1972). Community gardens help bring together people of various cultures (Shinew, 2004) and age groups (FCFCG, 2010) and are perceived as spaces in which people from different cultures can successfully integrate. These public spaces are often grassroots initiatives that are aimed at providing a valuable source of social interaction, food supply, exercise and sense of community (Landman, 1993; Linn, 1999). Designers have recently gained considerable interest implementing community gardens for these numerous benefits to people within urban areas.

Nature playgrounds are a new phenomenon in western Canada. Learning about the outdoor environment is an important aspect of early childhood development (Cohen, 1994; Sebba, 1991; Wilson, 1995). Play, by definition, implies the opportunity for creative expression and wide latitude in children's choice of activities and use of materials; the equipment on traditional playgrounds does not allow many play options (Wilson, 1995). While nature-based playgrounds have been commonplace throughout Europe for decades, this phenomenon is only now taking root in western Canada.

The movement of implementing playgrounds in urban areas is believed to date back to the mid-1880s in Boston. Playground advocates argued that recreation could improve the mental, moral, and physical well-being of children (Schmidt, 2008). Research findings show

that a healthy, therapeutic effect is experienced by children who are directly exposed to nature (Kuo, 1998; Wells, 2003). There are concerns with nature playgrounds in western Canada, some including perceived safety risks, non-compliance with Canadian Standards Association guidelines for playground equipment and outdoor spaces, “getting dirty”, and contact with other living creatures. Today, there are few nature-based playgrounds within school yards of western Canadian municipalities, while larger municipalities are slowly beginning to implement nature play in urban communities.

Conclusion

Competition exists between humans, between species in nature, and between humans and these other species within nature. Because built environments change much faster than naturally occurring processes, natural areas in urban environments face a significant challenge in adapting to new conditions during urbanization. Understanding the ability of natural ecosystems to be resilient to pressures of surrounding human development is essential in the land planning process. The development of planning strategies that are more sincere to natural systems calls for land planning professionals to improve their understanding of the integrated ecology of cities and nature.

The contemporary design strategies used by land planning professionals that have been described here include biomimicry, placemaking, place promotion, and participatory landscapes. These are only a few of the current approaches that land planning professionals use as it relates to the human-nature connection, while they are the most significant to this research. While these strategies are common in various contexts, there are still challenges in implementing them. Some of these challenges are a result of restrictions in legislative frameworks and governance

structures in different contexts. Case study analyses will examine how land planning professionals use strategies such as placemaking, place promotion, and participatory landscapes in urban design, and the effectiveness of these strategies in facilitating a strong human-nature connection.

Question Four: Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection?

3. INSTITUTIONAL FRAMEWORK

Legislative Framework

To a great extent, human-nature interaction is enabled or curtailed through government policies and regulations. Environmental policy and legislation are contemporary interventions into the ways that we live and do business for the sake of protecting natural resources, the quality of the conditions in which we live, and biodiversity (Calow, 2009). The legislative framework for land use in Canada is complex, in that there are three levels of government that can prescribe Acts, legislation, and bylaws - federal, provincial and municipal. *The Canadian Constitution Act, 1982*, establishes the respective legal authority of the Government of Canada and each of the provincial governments (Government of Canada, 1982). The control that federal, provincial and municipal levels of governments have is known as heads of power, which is a delineation of areas of legislative responsibility and control. As an example, national defense and the postal service is federal, land use and health care are provincial, and zoning regulations are under municipal control - while taxation occurs at all three levels. In an effort to set the institutional foundation upon which much of the human-nature interaction in urban settings occurs this analysis explores land use codes and legislation at the municipal level of government.

Boyd (2003) noted:

“There are systemic weaknesses that cause Canada’s legal system to fail in vitally important areas: Canada is missing many basic environmental laws; existing laws are plagued by excessive discretion; laws and policies fail to reflect contemporary scientific knowledge; implementation and enforcement are undermined by inadequate resources; the public lacks opportunities for meaningful engagement; and governments rely upon an unduly narrow range of legal tools to address environmental problems” (p. 212).

Louv (2011b) claims that “permanent cultural change will not take root without major institutional and legislative commitments to protect, restore, and create natural habitat on a global basis” (p. 45).

Federal Control. Federal responsibilities of natural areas, as it concerns this proposed research, is limited to the protection of fish, migratory birds, endangered species and their habitat. There are five primary federal Acts related to this research, including the *Fisheries Act, 1985*; the *Navigable Waters Act, 1985*; the *Migratory Birds Convention Act, 1994*; the *Species at Risk Act, 2002*; and the *Canadian Environmental Protection Act, 1999*. For example, *The Fisheries Act, 1985*, prohibits any alteration of fish bearing habitat, or habitat that has the potential of being fish bearing, as well as any activity that has or has the potential of adverse affect to fish. This stipulation is directly related to this research given it ensures the protection of particular ecosystems. There is no language within any of these Acts, however, that promotes environmental protection for the purpose of human connection with nature. All Acts recognize the importance of protecting these natural features and species, while they do not suggest the inherent value of these resources to humans for the intended purpose in this research. None of these documents convey the establishment of relationships among people, places and nature.

Provincial Control. In the Province of Alberta, provincial legislation under the jurisdiction of Alberta Environment related to the protection of natural areas in urban environments include the *Environmental Protection and Enhancement Act, 2000*; the *Municipal Government Act, 2000*; the *Water Act, 2000*; the *Wildlife Act, 2000*; and the *Public Lands Act, 2000*. Under each Act are various Standards and Guidelines, Regulations, and Codes of Practice (Alberta Environment, 2011), which are enforced by the various Acts. An example is the *Provincial Wetland Restoration / Compensation Guide* (Alberta Environment, 2007), which is one of the Standards and Guidelines that provides guidance for the procedures related to wetland alteration, enhancement, or removal. None of the above noted Acts, Standards and Guidelines, Regulations or Codes of Practice outline the importance of human interaction with nature, or design strategies for enhancing human-nature contact as sought by this research. None of these documents convey the relationships among people, places and nature. In the absence of describing the importance for these relationships, land planning professionals do not have the backing of legislation to promote strong human-nature connections in the public realm.

The name of the overarching policy document for land use varies from province to province. In western Canada, British Columbia has a *Local Government Act, 1996* (British Columbia, 1996); Alberta entitles their document the *Municipal Government Act, 2000* (Government of Alberta, 2010). Although a bylaw has the effect of an Act, Lidstone (2003) indicated that “a bylaw is different from an Act to the extent a court may set a bylaw aside on a number of grounds arising from the fact that a local government’s authority to enact the bylaw is derived from empowering legislation delegated by a provincial government” (p. 2). This means that provincial legislation will take precedence over any municipal bylaw, if one contradicts the

other. Environmental law related to land use varies from province to province. Some provinces, such as Nova Scotia, have enacted stronger rules, while some such as Alberta have chosen to implement timid regulations (Wood, 2010).

Municipal Powers. Each municipal government is a corporation that is created by the provincial government. A municipality can only carry out the powers delegated to it by the provincial government, therefore has no inherent powers or jurisdiction on its own. In order to refine provincial legislation to each local government, municipalities can create bylaws under the enabling statute to deal with local matters such as land use. It is therefore necessary for the bylaw to contain only matters that fall within the powers and authority delegated to the local government. As an example, designating a parcel of land as “ER - Environmental Reserve” is within the powers of a municipality (Edmonton, 2007), while granting permission to re-route a fish-bearing stream within the ER is not (Government of Canada, 1985).

Current urban development guidelines come with prescribed controls on residents’ daily lives. Louv (2008b) expresses the importance of control over our community such as the ability to play within natural areas or grow their own garden, two activities that are commonly prohibited in new urban residential developments due to development controls. He also states that “the social and cultural obstacles to good community design are closely related to the barriers that keep children from experiencing nature firsthand” (p. 207).

The most prominent legal frameworks for land use, as it pertains to this research, are in the form of municipal bylaws. According to the Oxford English Dictionary, the word “bylaw” originates from its meaning in the 1500s as “local custom” (Albatross, 1992). Provincial legislation stipulates that a local government council may act only by bylaw. Section 180(2) of

the *Municipal Government Act of Alberta, 2010*, provides that where a council or a municipality is required or authorized under any enactment or bylaw to do something by bylaw, it may only be done by bylaw (Government of Alberta, 2010). This is significant, given no municipal council may provide guidance or directives on the way in which we use, alter or protect public land without creating a bylaw. All bylaws are in purely text form. In researching bylaw documents for Albertan municipalities, none convey possible ways to promote relationships among people, places and nature. The potential relationships remain implied and subject to varied interpretations.

All communities with greater than 3500 residents must complete and have in place a *Municipal Development Plan* (MDP) (called an *Official Community Plan*, or OCP, in British Columbia), and those below that population can establish an MDP at their discretion. The purpose of an MDP is to address future land use within a municipality. There are numerous core aspects that every MDP must address, while “environmental matters within the municipality” and “any other matter relating to the physical, social or economic development of the municipality” are two items that the document “may” address (Government of Alberta, 2010). Once approved by Council, an MPD is then enacted as a local bylaw with an assigned number. MDP documents are primarily text-based, with some supporting images such as plan views to demonstrate proposed districts of future development. These plan views are primarily community-wide and do not provide significant resolution such as site-specific ecological features (streams, forests, historic sites, etc.).

Every municipality must also pass a land use bylaw (LUB). A LUB prohibits, regulates and controls the use and development of land and buildings within a municipality (Government

of Alberta, 2010). The requirements stipulated for preparing a LUB do not include the provision of human interaction with nature, or design strategies for enhancing human-nature contact. LUB documents are in primarily text form, with supporting maps and tables. None of these documents found through this assessment convey the relationships among people, places and nature.

Zoning is also a requirement of municipal governments, which designates permissible uses throughout the confines of a city. Zoning practice has always been part of land planning in western Canada, while the various theories of appropriate zoning configurations have evolved significantly. Changing demographics and rapid urban expansion in many other North American cities in the late 19th century led to an increased demand for greater intervention in the structuring of urban space (Haar, 1990). Through zoning, a municipality is able to control the physical design and the type of land uses in a particular area of a city.

Legal Considerations. The primary characteristic of any legal language in the above noted bylaw and Act documents is that each and every word must be clear and concise as to avoid excessive discretion. Boyd (2003) stated that “seemingly insignificant differences in wording, such as using “may” instead of “must,” transform potentially effective laws and regulations into paper tigers” (p. 231). These are legal documents that are scrutinized by courts on a very frequent basis, and as a result have been prepared to only include literal meanings, clear definitions, and direct purpose. Phrases such as “enhance nature contact” or “promoting human-nature connection” are not legalese given they are open to significant interpretation and are not easily measurable. Land use bylaws may include phrases such as “upon subdivision the developer must designate no less than 10% of the entire land parcel as MR – municipal reserve”

(City of Edmonton, 2007), which is a direct statement that can be easily measured. The main goals of land use bylaws are to establish some order in how we configure cities, and to ensure that conflicting uses are not placed side by side or in problematic site locations.

The City of Edmonton Zoning Bylaw, as an example, describes the purpose of natural areas (zoning designation as NA – Natural Areas Protection Zone) as “to conserve, preserve and restore identified natural areas, features and ecological processes” (Edmonton, 2007), with no mention of human interaction within these areas. Mandatory requirements for establishing bylaws include the verbiage to be clear, measurable, and not open to interpretation (Lidstone, 2003). Of the documents described, the only level at which graphics are used is at the local, municipal level of government in the creation of an MDP. Unfortunately the scale at which an MDP prescribes planning strategies is too coarse to support the site-specific scale at which this research operates.

This array of policies and plans for Canadian municipalities is quite comprehensive in outlining the means to protect natural areas, and in many cases outlines the value of the environment to people. For example, City of Edmonton Policy C-531 (Edmonton, 2007b) states, “The City of Edmonton will balance ecological and environmental considerations with economic and social considerations in its decision making and demonstrate that it has done so . . . The purpose of this policy is to enhance and sustain the quality of life for Edmontonians” (p. 1). This language is much more compatible with the desired outcome of this proposed research, given it makes mention of social considerations and enhancement of quality of life. Nature contact is known to have various health benefits (Butterworth, 2000), such as improved mental well-being (Kaplan, 2001), providing restorative experiences involving the renewal of depleted

psychological resources (Hartig, 2001) and Orsega-Smith, 2004; reduction (Wells, 2003).

Policies already in place within the City of Edmonton would be well complemented by interpretations of this research that provide clear definitions and direct purposes as demonstrated in strategies to enhance and sustain the quality of life of its citizens. Doing so would be difficult but not impossible.

Governance

Governance is not only about government (Kjellstrom, 2008) and the enactment of legislation, rather seeking an appropriate combination of health-promoting actions at many different levels – particularly at the local level (Burris, 2007). Implementing the recommendations of this research would be very challenging to place within any federal Act, provincial legislation or municipal bylaw. Legalese consists of very intentional, clear language that does not provide for interpretation or subjective meaning. Elements prescribed within any Act, legislation or bylaw must also be measurable. Nature Canada (2011) has ongoing “quick polls” that assess various aspects of human connection with nature; a recent poll indicates that over 92% of respondents (n=582) are “happier” when in nature (Nature Canada, 2011). This is a very telling quantitative statistic that is based on simplistic research methods. From a legal perspective, the term “happier” would be open to considerable scrutiny and likely discarded due to subjectivity. Municipal policies and plans are the most likely place for the language that this research seeks to establish, given they are by far the most site-specific, considerate of local conditions, and do not require legally binding verbiage. Due to the lack of legalese in the findings of this study, the recommendations would likely be best implemented as non-statutory policy that is referred to by a municipal bylaw as a guiding document.

As a result of the inability to place subjective (non-conclusive) and non-measurable stipulation in Acts, legislation and bylaws, any new code language or recommended strategies from this research would be best implemented at the policy level. In this scenario, a separate policy would be created that focuses on the development guidelines for human-accessible natural areas in urban developments. In addition, its findings could also complement existing municipal policies such as the City of Edmonton Policy C-531 (Edmonton, 2007b). To ensure that it is implemented, the municipal land use bylaw would be altered to indicate that all urban developments, wherein natural areas are to be retained, must be designed in accordance with the noted policy. Because development drawings are scrutinized by municipal administration and not by council, the design standards and policies do not need statutory standing to be valid. The over-arching municipal land use bylaw can enforce the use of the policy in the detailed design and implementation stages of development. The language used, and certainly the supporting images and graphics, would not be limited in the case of policy development. In creating a policy, it would be essential to ensure that any recommendations do not contradict any overarching Act, legislation or bylaw.

Beyond a new form of conveying meaning, this research also seeks to identify alternative mechanisms of governance over natural areas once they are designated. Current trends of environmental governance have changed throughout Canada, with the use of more market friendly policies that include economic incentives, special arrangements with industry, and even the delegation of (typically governmental) responsibilities through industry-initiated codes of conduct (Farber, 1999).

There are many examples of documents provided by municipalities across western Canada that provide more substantive guidance for urban natural areas. The City of Edmonton has released the Draft Management Plan Guidebook, a working document that assists the preparation of management plans for natural areas that are to be conserved (City of Edmonton, 2003). Management plans are required within the City of Edmonton for all new developments wherein natural areas are to be retained. This may include tree stands, wetlands, grasslands or other naturally-occurring ecosystems. Other municipal policies from Edmonton previously described include Policy C-531, entitled Natural Area Systems (Edmonton, 2007b); Envisio – ISO 14001 (Edmonton, 2004); an Environmental Strategic Plan (Edmonton, 2006); a Biodiversity Action Plan (Edmonton, 2009); a Conservation Atlas (Edmonton, 2010); and an updated environmental strategic plan entitled The Way We Green: The City of Edmonton's Environmental Strategic Plan (Edmonton, 2011).

Privileged Landscapes

Certain laws and regulations in western Canada tend to promote the preferential conservation of particular ecosystems thereby limiting the diversity of natural areas and potential human-nature interaction. As an outcome of the application of the environmental laws and regulations in the context of western Canadian urban municipalities, wetlands are frequently retained in new urban development and privileged over other naturally-occurring ecosystems. Local laws and policies can also inadvertently lead to some landscapes being privileged and more likely to be restored or constructed, despite being collectively grounded by protecting the environment.

The federal government generally conceded the leading role in caring for the environment to the provinces during the 1970s and 1980s, with exception to a strong federal presence in the coastal provinces (Nemetz, 1986). While all federal Acts and legislation pertain to all provinces, provincial legislation varies. Mason (2000) noted, “although the division of environmental powers between federal and provincial governments has often been the source of jurisdictional tension within Canada, there has generally tended to be a pragmatic approach adopted in federal–provincial bargaining over environmental matters” (p. 79). Each province in Canada is relatively consistent with the others regarding legislative framework and the authority of respective municipal governments, while provincial legislation and municipal bylaws vary drastically between jurisdictions.

With respect to particular species of wildlife, federal legislation protects all fish, migratory birds and species at risk (Government of Canada, 1985, 1994, 2002) through the *Fisheries Act, 1985*; the *Migratory Birds Convention Act, 1994*; and the *Species at Risk Act, 2002*. The protection of habitat for upland wildlife is also included in the *Canadian Environmental Protection Act, 1999* (Government of Canada, 1999). All other species and their habitat are managed by provincial legislation.

In Alberta, provincial legislation under the jurisdiction of Alberta Environment related to the protection of natural areas in urban environments include the *Environmental Protection and Enhancement Act, 2000* (Government of Alberta, 2000a); the *Municipal Government Act, 2000* (Government of Alberta, 2000b); the *Water Act, 2000* (Government of Alberta, 2000c); the *Wildlife Act, 2000* (Government of Alberta, 2000d); and the *Public Lands Act, 2000* (Government of Alberta, 2000e). Under each Act are various standards and guidelines,

regulations, and codes of practice (Alberta Environment, 2011), which are enforced by the various Acts.

In 1993 in response to the growing loss of wetlands on the landscape and the effect this may have on surface water management in Alberta, Cabinet approved the *Interim Policy for Wetland Management in the Settled Area of Alberta* (Alberta Water Council, 1993). The policy identified as its goal that "the Government of Alberta is to sustain the social, economic and environmental benefits that functioning wetlands provide, now and in the future" (Alberta Water Council, 1993). The intent of the policy is further defined as follows, "in descending order of preference:

- to conserve slough/marsh wetlands in a natural state;
- to mitigate degradation or loss of slough/marsh wetland benefits as near to the site of disturbance as possible; and
- to enhance, restore or create slough/marsh wetlands in areas where wetlands have been depleted or degraded" (Alberta Water Council, 1993).

Generally, all surface water in Alberta is owned by the Province including the bed and shore of lakes, creeks, rivers, wetlands and drainage areas. If wetlands or surface waters are proposed to be altered or removed as part of any development, Public Lands Approval is required and the "no net loss" policy is implemented (Government of Alberta, 2000e). The goal of this policy is to sustain the social, economic, and environmental benefits that functioning wetlands provide, now and in the future. Wetland management will be balanced to recognize that objectives for wetlands may conflict with objectives for other natural resources and all management objectives may not be met for every wetland (Government of Alberta, 2000e).

Landscape Preservation, Restoration and Construction: Privileging Wetlands. As new urban development consumes agricultural land and remnant natural areas, urban fabric must adhere to all federal Acts related to species and habitat protection. This means that all fish bearing water bodies and habitats that include species at risk must be protected, as noted in Section 32 of *the Fisheries Act, 1985* (Government of Canada, 1985). Further, development is restricted at certain times of the year (primarily during nesting) within natural areas that host migratory birds.

As not all water bodies can be avoided through development, there are mechanisms within both federal and provincial legislation to provide compensation for the loss of natural areas. At the federal level, Fisheries and Oceans Canada reviews development proposals and ask for either on-site or off-site compensation, if it is determined that there will be a harmful alteration, destruction or disturbance (HADD) to fish habitat (Government of Canada, 1985). For example, should a fish bearing segment of stream need to be diverted the developer will be required to adequately address the loss of habitat – usually through replacement of the similar habitat elsewhere on site.

At the provincial level, Alberta Environment allows for two means of compensation. The first includes either on-site or off-site compensation of similar habitat. The further off-site the newly constructed ecosystem is established, the larger the size multiplier will be (ie. 3:1 on-site compensation vs. 15:1 for compensation 15km off-site). The second option for compensation in Alberta is a monetary contribution to Ducks Unlimited Canada. Since the inception of the Alberta Environment compensation framework, Ducks Unlimited has been the only non-government organization eligible to receive monetary compensation resulting from development

(Holland, personal interview, April 19, 2011). As a result, restoration and construction of new ecosystems in Alberta is strongly biased toward wetlands by only having a single organization to direct monetary compensation toward.

As part of municipal development requirements in Alberta, protected areas such as wetlands, water bodies and forests can be designated as Environmental Reserve (ER) (Calgary, 2007; Edmonton, 2007) upon subdivision as a means of protecting the ecosystem for all time. Commonly protected natural areas include rivers, streams, and forests. Ecosystems such as grasslands, fens, bogs and rocky outcrops are less often protected as ER given these ecosystems are least likely to host migratory birds as compared to wetlands, watercourses, other types of water bodies and forests (G. Pearsell, personal interview, April 19, 2011).

Of all the ecosystems in Alberta, wetlands are by far the most commonly protected by provincial legislation, of concern amongst NGO's and of interest to private citizens (A. Bates, personal interview, April 18, 2011). In Alberta, the *Public Lands Act, 2000* allows the Minister of the Environment through Alberta Sustainable Resource Development to claim the bed and shore of any water body that is at risk of development (Alberta Environment, 2011), while there is no similar provision for grasslands, forests, steep hillsides, etc. As a result, water bodies are a priority through this over-arching provincial legislation. Policy documents including the *Interim Policy for Wetland Management in the Settled Area of Alberta* demonstrate extremely rigorous protection of wetland ecosystems throughout the Province of Alberta.

Throughout Alberta, it is a municipal requirement for all new developments to provide stormwater management facilities (SWMF) internal to the development (Calgary, 2007; Edmonton, 2007), to control the release of water during precipitation events. Over the past ten

years, municipal and provincial departments have been allowing naturally-occurring wetlands to be converted into a SWMF. The benefits of this approach include: the location of the wetlands (already in low areas); the ability of wetlands to pre-treat water (ie. hydrocarbons, sediment loading, nutrient loading, etc.) prior to dispersal; the assured preservation of habitat and water directed to the ecosystem (due to peripheral development cutting off natural drainage regimes); and retaining natural ecosystems within modern urban fabric. Although these natural features are converted into a functioning public utility lot, no compensation is required for their retrofitting. Given very little construction is required for these types of conversion, opposed to constructing a completely new SWMF, developers are able to save considerable costs for their development.

Having a privileged landscape will obviously lead to that type being more commonly protected and therefore more prevalent in the public realm. Wetlands are currently the most commonly protected ecosystem in western Canadian suburbs, due to the strong support delineated by various Acts, legislation and bylaws. In the creation of cities, there is only a limited amount of open space in and amongst built form. Referring back to theories of human preferences, research on the savanna biome theory demonstrates that our strongest preference is not wetlands, and are rather grasslands with sparse tree and shrub planting. Having a privileged landscape ultimately creates a set of challenges to land planning professionals, such as:

- the inability to incorporate other landscape types in cities that may be more preferred by people, such as savanna-like ecosystems;

- the retention of complex ecosystems such as wetlands, given surrounding development has more impacts (particularly drainage regimes and input of deleterious substances) on wetlands than other ecosystems such as forests or grasslands; and
- the potential that people will associate urban natural area with a landscape type that is not as inherently favoured compared to others, creating a negative association with protecting nature in cities.

Conclusion

In western Canada, there are three levels of government that have jurisdiction over various facets of natural area protection, including federal, provincial and municipal governments. Each level of government has certain powers related to promoting a human-nature connection. This overarching institutional framework requires an interaction between land planning professionals and all three levels of government during the course of designing with natural areas. Because legislation and bylaws at all three levels of government are statutory and must stand the test of legal scrutiny, all language must be very clear and non-subjective. Language that promotes a strong human-nature connection is not necessarily valid within these statutory documents. Case study assessments will explore how effective the overarching framework is in protecting natural areas, which is integral to promoting a strong human-nature connection.

Question Five: Is the current overarching institutional framework effective in promoting a strong human-nature connection, and if not how can this framework be best improved?

Legislation and bylaws have the potential of having a bias toward a particular type of landscape, and this assessment argues that wetlands are in fact a privileged landscape under the protection of three levels of government. In this scenario, it is presumed that wetlands and similar riparian areas would be more prominent in urban areas of western Canadian municipalities. Case study analyses will try to determine if in fact particular preserved landscapes are retained because legislation biases one type of ecosystem over another. This assessment will also identify what information municipalities seek in order to provide for a stronger human-nature connection.

Question Six: What information would each case study municipality seek in order to promote a stronger human-nature connection?

4. SOCIETAL PARADOXES

Various paradoxes exist in contemporary society as it relates to growth patterns of our cities (Portugali, 2008). Human behavior studies suggest we have an inherent affinity to nature yet growing proportions of people live in cities where nature is least apparent (Maller, 2009). Trends toward more sustainable development demand that nature be retained in our cities (Nichols, 2006; Pinderhughes, 2005; Strange, 1997), yet almost no natural landscapes remain intact after development takes place. The discussion of this research will be presented in the form of paradoxes that demonstrate the array of conditions found, and the complexity that exists in resolving the question of this research.

In his classic novel *A Tale of Two Cities*, Charles Dickens aptly describes the paradoxical nature of society through describing the lives and actions and interaction between various

characters during the late 18th Century. The opening words to this novel set the stage for numerous antithetical yet parallel circumstances within the body of his work. Here, Dickens (1859) wrote:

“It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity, it was the season of Light, it was the season of Darkness, it was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us...”

Not only does the doubling technique tell us about various opposing facets of society, but it also helps to reveal parallels. Ultimately, the conflicts drawn by Dickens between urbanites, from peasants to aristocrats, express the belief of a better society to come. In contemporary western society, similar paradoxes exist. This discussion outlines certain paradoxes that have come to light in this research, and the challenges that they present to land planning professionals.

Best of Times vs. The Worst of Times: Contemporary Recreational Trends and the Rise of Technology

Recreational Trends. With modern research in ecology comes a better understanding of various facets of the world around us. Previously unknown complexities of nature are becoming more clear. Over the past decade we have also realized the importance of biodiversity in our cities (Spencer, 2007), and the way in which ecosystems function as a system of entities rather than in singular patches (France, 2006; Lundmark, 2009). We now know so much more about how we can preserve natural features than say 20 years ago. Yet, in conjunction with the increase in knowledge of the natural world there is a dramatic change in recreation, that the environmental effects of which surpass our knowledge on how to integrate them with environmental integrity. Despite the knowledge that we have at hand, land planning

professionals in conjunction with practitioners from scientific professions such as biology and ecology are challenged to deal with the impacts of new forms of human recreation.

We have also accumulated a significant body of literature that demonstrates human preferences as they relate to the outdoor environment, and the health benefits that the human-nature connection has for humans (Berto, 2005; Herzog, 2002; Jacobs, 2008; van den Berg, 2007). There are also numerous studies that show how our exposure to nature has diminished significantly as technology has become more available (Katcher, 1993; Louv, 2011; Orr, 1993). Still, many design practitioners in western Canada have yet to be sufficiently alarmed by our loss of connection with the natural world to lead them to respond more sensitively to how they design our cities (Pearsel, 2011). In response to the influence of global trends such as a demand for all required amenities to be closer to home, urban design strategies are now becoming much more compassionate to multi-modal transportation and a more walkable public realm. In light of this research, a logical next step would be to also provide for routine contact with nature in the public realm of our cities.

The concept of recreation in western Canada was an affordance that became more apparent in the 1960s and 1970s when people began to work less and create more time for relaxation. Traditional family life was changing. With the growth in the number of women in the workplace, there was a dramatic increase in household incomes (Statistics Canada, 2012b), less time in the workplace and more time for personal enjoyment. Within rural areas, motorized recreation, such as boating with personal watercraft and trail access using off-highway vehicles became more common. Some of the more common recreational activities in our cities included formal playground equipment and facilities such as swimming pools and hockey arenas.

Urbanites were becoming more disconnected from nature by recreating in ways that no longer required a direct connection with nature. Chlorination of pool water allowed us to avoid the fears of health risks associated with contacting natural water bodies. Mechanical systems that allowed us to have ice year around in indoor arenas reduced our need to be concerned with seasonal changes. Formal playgrounds with emerging discoveries in child safety eradicated the risks of slivers and bruises from playing in natural areas. While technological advances claim to have improved recreation, we have lost touch with the intricacies of natural systems that satisfied the human race for hundreds of years in western Canada.

Our affinity for nature has been diminished with the rise of technology – technology being primarily responsible for our ability to overcome the forces of nature as to diminish its effect on daily living (Orr, 1993). With our increasing movement away from nature, Orr (1993) argues that over time we will lose interest in the preservation of nature to the extent that it will inevitably diminish our interest in protecting it. Living organisms have demonstrated through their evolution that a key part of survival is to adapt to their surrounding environment, not only in the way they live as an individual but how they interact with other similar species as well as other living things. Humans, however, seem to be the only living species that attempts the opposite by continually inventing tools and methods that allow them to counteract the influences of nature around them while moving away from adapting to it (Benyus, 1997).

The Edmonton suburban development case study provided evidence of an evolution in outdoor recreation over the past 40 years. Upon the emergence of more leisure time in the 1970's, there was a high demand for formal recreation facilities and programmed open space. In recent years, however, activities such as nature hiking and wildlife appreciation are emerging

and becoming more accepted in these new communities. At a time when development and private ownership has reduced the existence and availability of natural areas accommodating large populations of people in relatively small areas of land is demonstrating drastic effects on natural systems. The pressures on already weakened naturally-occurring ecosystems are far too great to stay within carrying capacity of these ecosystems.

Getting Around: Passive Transportation to Recreational Vehicles. Buildings in Hadrian's Villa dating back to the 2nd Century AD were adorned with water circulating beneath the floors to provide cooling, while today we are reliant on mechanical air conditioning. Our ability to inhabit certain places on earth with extreme temperatures has changed with the discovery of new clothing and building materials. Mobility was once limited to unobstructed grasslands and waterways, while today's vehicles allow people to get from place to place despite the terrain before them. With the rise of technology we have removed our personal and immediate involvement with nature in how we live and get from place to place. Modern day mechanical vehicles and multi-modal trends in getting from place to place have inadvertently changed the way that we experience nature and has an impact on our quality of life (Hart, 2008).

The first people to inhabit the western Canadian landscape depended on travel by foot, water, and the use of horses. These passive modes of transport required strategic placement of communities and day to day activities along rivers, clearings and grasslands. Travel routes were predicated by the lay of the land, where people followed alignments that did not pose significant challenges in getting around. Mechanical modes of transport that first arrived to western Canada came in the form of rail, steamship and eventually the automobile. The emerging land-based forms of transportation in western Canada included passing through mountains, grading hills,

filling in of low lying wetlands, and crossing of major obstacles such as rivers and streams. Many water-based modes required deepening of streams and rivers to accommodate vessels. All of these alterations to the natural landscape had significant ecological impacts that were not fully understood in their time. Development of many of these emerging transportation networks saw earlier settlers challenged by natural features that required significant means to overcome the obstacles of nature. Railroad alignments needed to be relatively flat, waterways sufficiently deep, and roadways relatively straight.

Today, the public's exploration of nature is most common with off highway vehicles, bicycles and passenger vehicles. The challenge of naturally undulating terrain has now become part of the thrill of exploring nature. On the other hand, mechanical transport allows people to go further faster and demands greater areas of land to satisfy the human craving for exploring. Despite being exposed to greater areas of land, people arguably have a far less intimate contact with nature given that the interface between them and the natural environment is through mechanical means.

Television and Computers. Grinde (2008) notes that, "there seems to be a current trend towards a love for TV and computer screens rather than for nature" (p. 2339). More and more of our time is being pulled indoors away from nature by work, video and computer screens, parental anxiety about crime, and the dangers of automobile traffic (Jago, 2005). With a growing attachment to products of recent technology our society is becoming much less dependent on nature as a means of relaxation and escape from daily routine. With technology such as television as part of daily routine for children, Katcher (1993) argues that our current generation would greatly benefit by more nature contact by, for example, going on more nature hikes. More

intimate contact with nature would help children relate better with wildlife on a personal basis which would inadvertently increase their respect for nature and promote stronger tendencies to better care for it. Louv (2008) describes “nature deficit disorder” (NDD), which he claims is an emerging phenomenon among children across North America. His book further identifies the necessity of nature contact, while claiming that our society makes a deliberate effort to segregate children from the natural world. His work often criticizes television and other types of technology for causing this separation from nature. Louv (2011) states that NDD is “an atrophied awareness, a diminished ability to mind meaning in the life that surrounds us, whatever form it takes. This shrinkage of our lives has a direct impact on our physical, mental, and societal health” (p. 11).

Damage to Ecosystems. New technologies are becoming more detrimental to natural ecosystems through direct and indirect impacts. Speed is one factor; experiencing the intricacies of nature – the smells, sounds, etc. – is often not possible moving so quickly. In many western Canadian municipalities such as Fort McMurray, off highway vehicles are still permitted. This is especially common in the peripheral suburban area of cities where natural areas are common and readily accessible. This study has identified some of the detrimental impacts that these motorized vehicles have on natural areas, and has also commented on some the effects that more passive modes such as cycling can have on nature. Accommodating human demands for multi-modal access to nature has been demonstrated in all case study examples discussed. This demonstrates that our passion for recreational vehicles is widespread, leading to direct impacts to natural areas.

New Technologies in Play. Playground equipment manufacturers make claims to immeasurable play value in conventional playground equipment and the ability to evoke a range of sensory experiences, motor skills challenges, and imaginative play opportunities. On the other hand, literature supports the benefits of nature-based play for children as opposed to the traditional playground equipment that currently dominates children's play areas, school yards and public parks (Moore, 2008).

Nature-based playgrounds are not common in western Canada, as they challenge current standards for child safety and socially acceptable means of play in our cities. Very compelling research that demonstrates the value of nature-based play for children (Keeler, 2008; Staempfli, 2009; Wilson, 1995; Wilson, 1996) is further supported by a considerable number of successful precedents throughout many European countries (Fjortoft , 2001; Nyhus, 1998). With this information in hand, municipalities have yet to challenge current safety standards and work with its residents to convey the value of returning to nature-based play activities.

Conclusion. Technology has affected the human-nature connection. Recreational trends are moving the public toward more mechanical means of experiencing nature such as power boats, all-terrain vehicles, and active modes such as cycling. These mobility types can have detrimental effects on natural areas, and also lead to people travelling at a faster pace and thus unable to intimately experience nature. With the rise of other technology such as television and computers, more of our free time is being spent indoors and not in contact with natural areas. The way in which we recreate has a direct impact on the amount of time we have available for contact with nature. Each case study will be assessed for evidence of technological advances,

such as how residents travel from place to place and how they recreate, and the impact that these activities have on ecological integrity as compared to methods prior to newer technology.

Question Seven: What impact has the rise of technology had on the human-nature connection, and on the integrity of these natural environments?

Age of Wisdom vs. Foolishness: Role of Land Planning Professionals and the Individual in Governance

Role of Land Planning Professionals. For years, land planning professionals have been deemed essential in the building of our cities. The development of cities in western Canada has relied on these practitioners to guide the best possible scenarios for community growth and maintenance. Land planning professionals and other related experts tend, too often, to sketch utopian visions unrelated to the problems of city living, while others argue that they have served simply to justify the wishes of powerful political and economic entities (Bocking, 2006). While the public often trusts that professionals are acting in the greater good of all people, individual practitioners are ultimately responsible to their clients, who may have differing values from those of the public or contrary to the best approach to natural area protection. Case study examples included as part of this research have demonstrated the loyalty of land planning professionals to their clients, and in many cases the support of approaches that are not in the best interest of the natural environment.

When operating at a regional design scale, wherein large numbers of people experience the spaces created, an incremental change in a participant's attitude toward nature can have profound effects in the broader context. One Canadian national park itself can host well over

two million visitors on an annual basis, and the way in which a design professional introduces nature to them can have an incredible influence. The methods of connecting people with nature can have an immeasurable impact on how future generations will care and respect for their landscape.

Our cities have been shaped under the guidance of individuals representing such land planning professions as engineering, architecture, landscape architecture, urban planning, and urban design. Planning for the natural environment often comes with a peculiarly profound and intimate bond between the designer and the particular landscape (Jordan, 2003). For many land planning professionals, the act of designing for natural systems is in itself fulfilling because of the human-nature bond that exists (Clewell, 2006; Higgs, 1997; Leigh, 2005; Light, 2000).

The case study example for the City of Edmonton will outline the requirement for natural area management plans for all naturally-occurring ecosystems that are to be retained within urban development. Most other large cities in western Canada have adopted similar approaches. These management plans are being prepared with the best information possible, yet based on a review of a sample of these plans it is not clear that land planning professionals have a strong understanding of the actual impacts, nor do they include evaluations of factors such as cultural influences and attitudes that link natural areas with people. These management plans explore only a few variables that affect these ecosystems, such as drainage patterns, volume of water leading into a system, perimeter activities and permitted uses within the natural area. These management plans do not address impacts such as nighttime lighting, noise, biodiversity, or the social implications of humans related to nature. Improved understanding of cultural responses will contribute to greater success when we attempt to integrate wetlands with the built-up

environment (Manuel, 2003). Without such information, inferior decisions resulting in reduced overall benefits to society and nature may result (Boyer, 2004).

Design professionals within western Canada are not in tune with individual need for nature contact and the health benefits to humans afforded by this contact. In case studies described in this research, human health benefits of nature contact were not part of the repertoire of studies investigated. Studies were also completed by singular perspectives, in that interdisciplinary points of view were not evident. This research has outlined the various known and documented benefits of human contact with nature, while these theories are not being applied to practice. Land planning professionals can be generally categorized into two groups. The sciences, which include scientifically based disciplines such as engineering, biology and clinical health, that study how things really are and tend to use quantitative measures when assessing the landscape and determining design strategies. The second group is the humanities, represented by professions such as landscape architecture and community planning. More qualitative and subjective measures are used to evaluate landscapes and to impose design strategies. The challenge to designers in this group is to work within a design environment that demands subjectivity to create “good design”, while meeting ecological best practices and being scrutinized by legislation and guidelines - both of which are laden with more quantitative measures.

Role of the Individual in Land Planning Processes. Case study examples showed that municipally-based initiatives have included public involvement as an integral part of the planning process, while no public involvement was included in privately-based design. As an example, the City of Edmonton General Plan (1972) outlined a robust public involvement

strategy used to create, scrutinize and endorse the plan. In case study examples of suburban development in Edmonton, public input was not part of the process led by design consultants, from the acquisition of the land to the completion of new homes and residents moving in. For years, public consultation has been a municipal requirement for all publically funded projects throughout western Canadian municipalities. This is not the case for the design of other public amenities driven by private land development companies.

Factors in Land Planning Decision-Making. Land planning decisions are driven more by economic considerations than a more balanced approach of ecology and human wants, wishes, and values (Talvitie, 2009). One of the challenges of implementing public consultation is the time delays built into design processes, and the financial cost of incorporating this effort into work programs. Within the current markets in the development industry throughout western Canada, two of the most prominent measures of efficiency are approval time and cost of implementing plans (Schroeder, 2012). Consultation takes time and costs money, therefore is more often than not considered to be an asset to these processes.

Increasingly we have entrusted the creation and care of our cities to various professionals in the land planning field. A primary motivation for the engineering field is to establish best case scenarios based on rational calculations. As an example, creating the most efficient design of urban transportation networks, or taking “disorderly nature” such as a flood prone river and redefining a naturally-occurring process as an engineering challenge to resolve (Bocking, 2006). Many design disciplines have well established criteria that delineate efficient designs that are not at all compatible with natural area protection and preservation.

Conclusion. Since the inception of cities in western Canada, land planning professionals have been entrusted by residents to properly plan our communities. In light of various challenges that these professionals now face and with a more educated general public on planning matters, there is a higher level of public scrutiny on planning processes. As land planning becomes a more complex profession, more and more perspectives from other disciplines are becoming necessary to successfully shape our communities with nature as an integral part of the urban fabric.

The land planning process is informed and influenced by various factors, such as the overarching institutional framework, input from public consultation, and direction given by either the municipality or by clients of each land parcel. Land planning professionals must balance the demands by each interest group with an array of legislation and bylaws, and with the best science available to them. Through investigating case study examples, this research will identify potential strategies to help balance the competing interest of various stakeholders that promote a stronger human-nature connection.

Question Eight: What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection in western Canadian municipalities?

Epoch of Belief vs. Incredulity: Influence of Changing Global Trends

Over the past decade, the emergence of several global trends has changed long-standing climatic and hydraulic patterns in western Canada. The changes have direct relevance to land planning in western Canadian cities. Concerns of peak oil has led to people rethinking their means of getting place to place using transportation modes reliant on fossil fuels. Growing

health concerns such as obesity, heart disease and attention deficit disorder (ADD) are now encouraging a healthier lifestyle, such as eating better and increasing physical activity (Frank, 2005; Lee, 2008). Water scarcity has led many communities to evaluate water use and implement new ways of improving water quality or implementing water re-use strategies. While there is considerable evidence to support these trends, there are still many skeptics that oppose these findings.

Environmental Movements. In the years after World War II, open space preservation took center stage as both an object and method of local planning practice (Schmidt, 2008) in many North American cities. The environmental movement of this era was a response to rapid industrialization and urbanization following this war – a reaction to changes both in the mode of production (the chemical revolution, development of atomic energy, and proliferation of synthetic material) and consumption (massive-scale housing construction) (Gottlieb, 1993). The post-war era was also a time when reliance on land planning professionals to guide the strategic growth of our communities became a legislated requirement. Bocking (2006) claimed that from the 1940s through to 1970 was a period where the authority of land planning professionals in Canada was the least challenged (p. 52). Citizens entrusted professionals to do the right thing, whereas today it is evident that the professionals of the past, based on the challenges of today in natural area preservation, may not have directed us in the right course.

Growing concerns for the environment and both urban and social impacts of surging growth introduced an ecosystem-based rationale for preserving natural areas. At this point, land planning professionals began to realize that natural areas need to be preserved and used because they served specific ecosystem functions considered vital to the earth (Schmidt, 2008). It was no

longer a question of where to build our cities, but an evolution toward deciding where not to build our cities (Rome, 2001). A critical impact of the first environmental movement of the mid-20th century was the transformation of a mindset from an anthropocentric to an ecocentric view of the relationship between society and nature (Harvey, 1997).

There was another significant environmental movement that affected western Canada at the turn of the 21st century. The majority of the modern world understands the potential impacts of the spontaneous and unregulated advance of technology available to us. The well-known idea that culture, if it develops spontaneously and is not consciously guided, will leave a desert behind it has never been as thoroughly understood by people as it is today (Gusev, 2010). With global warming becoming front and centre as a global concern, many nations now point at the western Canadian oil and gas resource industry for its contribution to significant greenhouse gas emissions and carbon output, on top of the surface harm that this industry has on various ecosystems. Western Canadians recognize that industrial development poses challenges in protecting the environment, while a considerable proportion of their jobs are directly or indirectly linked to this industry. How the oil and gas industry affects the livelihood of families typically dictates their perceptions and world view (Piotr, 2011). Because their livelihoods are directly linked with the oil and gas industry, many western Canadians are hesitant to endorse any action to mitigate for global warming such as slowing resource exploitation.

Climate Change. Climate change can be viewed as human-induced change to climate and depletion of natural systems, and may be the greatest global health threat of this century. It is predicted to have wide-ranging impacts upon human mental health and well-being (Costelloe, 2009), through changes and challenges to people's environment, socioeconomic structures and

physical security (Nurse, 2010). Today, concerns exist about climate change, the urban heat island effect, changes to hydrology through increased surface run-off of rainwater and pressures on many existing green places within urban areas due to an increased demand for housing (James, 2009). Coupled with these concerns is the observation that brownfield sites tend to be havens for many species of plants and animals within urban environments. Because these sites can have a high ecological value, the tasks of maintaining ecological integrity and meeting conservation objectives regarding biodiversity become more difficult. New approaches and innovative techniques must be adopted (Grant, 2003).

While the validity of global warming as a theory is questioned, given our earth has seen mean temperatures rise and fall over tens of thousands of years, it is very difficult to dismiss the rate at which mean temperatures are currently rising. A considerable body of research is now available that measures the impacts that a rise in temperature will have on our earth. While ecosystems are able to adapt to incremental changes in conditions, many argue that the changes are happening much faster than the resilience of ecosystems (Power, 2007). Tree ranges of the boreal forest are expected to shift northward, and seed dispersal may not be adequate to maintain current diversity (Johnson, 1989). With rising ocean levels from melting icecaps, coastal freshwater wetlands are expected to be converted into salt-laden ecosystems (Peters, 1985). While research on these trends are quite common and readily available, very little information is available on the impacts on prairie wetlands of the Canadian prairie region (Poiani, 1991). These inland wetlands are by far the most important breeding grounds for waterfowl in North America (Hubbard, 1988), producing up to 80% of the continent's total duck population (Batt, 1989).

That said, a very common waterfowl species is at significant risk as climate change continues to affect natural systems.

Peak Oil. Throughout western Canada, trends of urbanization demonstrate a rapid movement towards dispersion (Filion, 1996; Filion, 1999), whereas development is less compact and urban sprawl occurs. The arrival of the automobile dramatically influenced on the way in which cities were planned. People are now able to travel greater distances by automobile than on foot. Personal vehicles also provide more direct access to remote locations than most methods of public transportation. Access to nature was also improved with the automobile, being able to drive further distances for getaways. Due to various growing global trends, such as peak oil and obesity, more and more urban residents will rely on closer-in natural settings to satisfy their need for recreation in natural settings (Barton, 2009).

With peak oil comes the potential for fuel costs to increase as the supply of fossil fuels becomes more depleted. This may force individuals to drive shorter distances, if at all, to satisfy their recreational needs. With an increase of fuel costs there will also become an increase of reclamation costs, given most of these efforts take advantage of fuel powered equipment.

Obesity. Obesity has become a major concern throughout North America, and western Canada comes with no exception to this concern. There have been notable shifts toward healthier lifestyles in recreation in western Canadian municipalities. Bird (2004) notes that more greenspace and biodiversity in cities increases people's physical activity. In neighbourhood-scale research conducted by Bell (2008), children who lived in greener neighbourhoods experienced less excess weight gain than did children in neighbourhoods with less green space. Greener neighbourhoods are also found to lower the prevalence of numerous other medical

conditions that are related to obesity (Ellaway, 2005), such as diabetes and heart disease (Maas, 2009).

Water Scarcity. The first people of western Canada developed their communities around water given it was an essential element for survival. For many generations, western Canadian municipalities have been developing strategies to get rid of surface water in order to increase usable land for agriculture and development (Bos, 2001). Today, we are now aware of the impacts on groundwater systems that surface alterations of watersheds can have. Advancements in the fields of biology and ecology have demonstrated that alteration of natural areas and watersheds has a direct impact on the availability of freshwater that humans rely on. The case studies here documented many of the changes to this mindset over time as new technologies were developed. Today, we are attempting to correct the damage done over the past few generations.

Conclusion. Various global changes are occurring that affect the land planning process, some affecting human social mindsets and others affecting natural systems. With the rise of these trends comes a change in human world view, that has a direct impact on the human-nature relationship. This includes the way people participate in the landscape, daily lifestyle choices, and the way we plan our communities. Case study assessments will determine if there is a noticeable change in either the form or function of urban fabric in light of these global trends taking place.

Case Study Question Nine: How have emerging global trends affected the land planning process, observed planning strategies and overarching legislative frameworks in each case study municipality?

Season of Light vs. Darkness: Minimizing Ecosystem Degradation

Human Patterns in the Landscape. During the era of the western frontier in the late 19th century, there were obvious differences in mindset between established cities of eastern Canada versus the newly emerging communities of the west. Describing this phenomenon for development across east and west United States, Schuyler (1986) states that “settlers on the frontier employed the rectangular street plan to convey at least the appearance of urban civilization, while residents of cities on the eastern seaboard attempted, through the creation of public parks and suburbs, to restore aspects of the countryside” (p. 45). This paradigm was also true for cities just north of the border that began developing near the Canada and United States border. Like many other human activities, urban development has direct impacts on the long-term function of natural ecosystems with an increased rate of species invasion and species extinctions (Wardle, 2005). Following a grid pattern in both rural and urban development has demonstrated impacts on natural areas given the temptation to not deviate development alignments. The case study examples in this research identified how each community imposed a grid pattern for many generations of development, and only in recent years are more flexible patterns common. New patterns allowed for the preservation of existing natural features to keep watersheds the same size, or surface features such as water bodies or clusters of trees. This ultimately reflected people’s desire to attempt to retain nature and to retain these natural elements as part of their communities.

Katcher (1993) outlines how patterns of natural species can have varying effects on human response toward comfort. For example, the movements of a swimming shark in comparison to a swimming tropical fish conjure two distinct human responses, primarily based on preconceived notion of human safety in the context of each of the two species. This perception of comfort based on prior knowledge is directly related to an individual's sense of safety in relation to the animal. Correlating patterns that lead humans to feel unsafe with the design process will help encourage higher perceived safety. Increased perceived safety of the public realm and natural areas will increase public acceptance for these landscapes and ultimately promote preservation.

Ecological Function. Ecological function can be defined as a natural ecosystem that maintains a suite of functional traits, such as species abundance, richness and composition (Chapin, 2000). Ecological function includes the interactions between organisms and the physical environment, such as nutrient cycling, soil development, etc. (Biology On-Line, 2005). C.S. Holling, a Canadian ecologist, coined the term “resiliency” in the context of ecological systems. Resilience is the way in which a particular ecosystem responds to some type of disturbance (Holling, 1973). In light of increasing pressures that society has on ecosystems (Walker, 2001) this term has become commonplace, with numerous studies related to the way in which ecosystems have adapted to various pressures put upon them. A key consideration when assessing resilience is to consider multiple scales - rather than exploring resilience only at the site scale, it should also be assessed on a more regional basis to determine contextual influences and adaptations (G. Pearsell, personal interview, April 19, 2011).

Ensuring long-term ecosystem function is essential to maintain natural areas in urban settings. Resilience, the way in which an ecosystem responds to a disturbance, is essential to monitor over the course of overseeing the performance of an urban natural area as an indicator of ecological health. While a natural ecosystem will never retain its original complexities after development surrounds it, it may be able to adapt in such a way that it still functions and accommodates its current species composition.

Protecting Biodiversity. Over the past decade, it has been determined that biodiversity is an important aspect of ecosystem function (France, 2006; Loreau, 2001; Lundmark, 2009). Ecological theory and evidence obtained from experiments on a variety of ecosystems suggest that communities made up of many interacting species should be more stable (i.e., less temporally variable in terms of overall biomass or productivity) than simple communities made up of few interacting species (Smith, 2006). While Acts and legislation protect individual ecosystems, such as fish bearing streams and wetland areas, they do not include mechanisms to protect biodiversity. Considering how one ecosystem (and the species that it hosts) compliments adjacent ones, it is important to protect a system of ecosystem types all at one time (Chapin, 2000; Wardle, 2005).

Current Acts, laws and legislation in Canada and the Province of Alberta do not address the importance of biodiversity. As a result, there are limited legal means of ensuring long-term ecosystem health. At the municipal level of government, communities are able to address the importance of biodiversity through local bylaws and policies. As seen in the example for the City of Edmonton, a very comprehensive strategy has been put into place to ensure biodiversity is promoted in the land development process. Promoting biodiversity would be bolstered by

providing new language within statutory Acts, laws and legislation that is now only found in non-statutory municipal policy and guidelines.

Plant community diversity is positively correlated with ecosystem functioning (Kinzig, 2002), and as a result to retain only those plants in an ecosystem that have direct benefits to humans is a threat to biodiversity. Alike the designation of undesirable plants as weeds, human preference for particular landscapes can possibly be a result of the intrinsic value of these ecosystems to the individual. By communicating the value of natural ecosystems to humans, designers may be able to remedy the phenomenon of human dislike for particular landscapes and be able to better protect them.

Conclusion. Over time, patterns of urban development have changed. At the onset of developing cities in western Canada patterns were based on the efficiency of implementing civic infrastructure, and less concerned about protecting natural systems. In recent years we have learned much more about ecological function of ecosystems, and the importance of protecting biodiversity. In their current state, provincial and federal acts and legislation do not address concepts such as biodiversity, and there is now pressure on municipal governments to ensure there is adequate legal protection to ensure ecosystem protection. Case studies will be assessed for local strategies that are in place to minimize ecosystem degradation and to ensure a higher level of ecological protection.

Question Ten: What strategies are prevalent in the case study municipalities to help minimize ecosystem degradation?

Spring of Hope vs. Winter of Despair: Varying Perception of Nature

Schmidt (2008) states that:

“we tend to objectify nature and society as separate realities . . . nature was, for the most part, interpreted through an urban lens. It is only through urban eyes that the romanticized image of nature could be constructed. This set up a contradiction. While nature was touted as ontologically distinct – the opposite of society – it was not nature per se that was of interest but rather its relationship with society and cities” (p. 96).

Therefore, nature was susceptible to various interpretations which reflected the values of those doing the conceptualizing or revealed changes in the political economy rather than any sort of objective reality of nature itself (Castree, 2001). Over successive generations, we have radically altered our associations, from savage and wild to settlement and cultivation, to the idea of a rural retreat (Williams, 1973).

World View and Value Systems. Case study analysis explored the shift in world view of the First Nation people, and the effects that conflicting world views between them and European settlers had on their physical health, spirituality and way of life. With a purely ecocentric value system respect for nature and embedding it in daily life was not optional, but necessary to survive. During the late 1800s and early 1900s this culture was forced to take on a new lifestyle that diminished their value system. The new settlers brought the hope of technology and new ways of life, yet their arrival only led to despair and hardship amongst these first people.

We have seen that the environmental movements of the mid-20th century and that of the past decade have resulted in new values for the natural environment, and a shift from anthropocentric to ecocentric values amongst western Canadians. For First Nation people, it was a time to celebrate the opportunity to return to their original way of life that allowed them to flourish as a community. This movement has been a paradigm shift of nature being dominated

or controlled by humans, to a more integrated systems-based view of the relationship between society and nature (Harvey, 1997).

Humans have differing values for natural areas. Manuel (2003) states that:

“Our acceptance of wetlands, especially of wetlands in rapidly developing areas, is key to timely and successful protection and management. Acceptance grows with understanding. We now have a well-developed science of the ecological functions of wetlands. We are seeing the benefits of translating this scientific knowledge into education about wetlands. We have federal and provincial legislation supporting wetland protection and many projects based on direct citizen participation. Our understanding of the culturally derived value of wetlands is, on the other hand, less developed. How and why we respond to wetlands – and hence value the – underlies our willingness to accept and advocate wetland protection” (p.922).

Defining “Nature” and Nature Contact. There are varying interpretations of what nature really is in the minds of the general public (Buijs, 2009, Van Den Born, 2000), and what is considered nature contact. Landscape Architect Ian McHarg interprets nature not by social function, rather by its ability to sustain all life. He states that “clearly the problem of man and nature is not one of providing a decorative background for the human play, or even ameliorating the grim city: it is the necessity of sustaining nature as a source of life” (McHarg, 1994, p. 19).

For some, nature can be as small as a patch of weeds growing alongside a city boulevard. To others, nature exists far outside the city boundary and is the land untouched by humans. Nature contact occurs at many scales within the built environment such as certain elements of biomimicry of building features to large amenities such as parks (Frumkin, 2011). Nature can also include naturally-occurring ecosystems that have been retained in and amongst the built environment. Natural views from within buildings are also considered nature contact (Ulrich, 1984, Velarde, 2007).

Landscape Architect Michael Hough, distinguishes between designed and natural landscapes as:

“these two contrasting landscapes, the formalistic and the natural, the pedigreed and the vernacular, symbolize an inherent conflict of environmental values. The first has little connection with the dynamics of natural processes. Yet it has traditionally been held in high public value as an expression of care, aesthetic value and civic spirit. The second represents the vitality of altered but nonetheless functioning natural and social processes at work in the city. Yet it is regarded as derelict wasteland in need of urban renewal” (Hough, 1995, p. 8).

Despite the shifting emphasis in society’s relation to nature, the use of open space either to address social concerns or to protect ecological processes required the externalization of nature as distinct from society and independent of social processes (Schmidt, 2008).

The field of weed ecology stems from the science of agrology, exploring invasive plant species in a variety of contexts. A challenge for many land planning professionals is determining a common baseline of what exactly “weeds” are, and how a varying definition amongst the public will affect the ability to provide acceptable design recommendations. Radosevich (1997) noted that,

“weeds exist as a category of vegetation because of the human ability to select for desirable traits among the various members of the plant kingdom. Just as some plants are valued for their utility or beauty, others are reviled for their apparent lack of those traits . . . the value of any plan is unquestionably determined by the perceptions of its viewers” (p. 3).

Safety in Nature. Crime Prevention in Environmental Design (CPTED) is an approach used by various design professions to promote human safety in the built environment, retrofitting natural areas with human access, and strengthening sense of community to promote public safety (Byrne, 2010). This approach was established by C. Ray Jeffery in the 1970s, and explores how elements of a place can support or deter crime through direct influences on the decision making

of offenders (Michael, 2002). Some of the CPTED principles are quite consistent with Prospect-Refuge Theory, regarding established sightlines over long distances. CPTED is Darwinian in the sense that the approach is similar to studies in animal behavior by exploring how to eliminate opportunities for predators to stalk their prey (Appleton, 1996). CPTED principles are not successful in the protection of various natural ecosystems in urban areas, primarily due to the abundance of hiding places and limited sightlines in many ecosystems, such as forests. As many municipalities insist on the use of CPTED principles for all public open space, designers are challenged to balance CPTED principles for enhancing public safety and retaining ecosystems in their natural state. As an example, a winding trail through an urban forest presents significant risk through a CPTED audit, and also creates perceived risks (Herzog 1998, 2005). CPTED principles may suggest removing understory vegetation and straightening the trail to improve sightlines, which would have direct impacts to the local ecological condition such as vegetation removal and encouraging abnormal movements for large game.

Conclusion. It is important that humans have some sense of value of nature – either anthropocentric- or ecocentric-based, in order to assure protection of these natural areas. There are varying views related to what defines nature, and there are also varying levels of comfort associated with exposure to nature. These perspectives can be correlated with world view of individuals or cultural background. Case study analysis will explore any variation in definitions of nature through reviewing past and current policy documents, and will also identify personal perception of safety and comfort related to nature contact.

Case Study Question Eleven: What are the varying views and values of nature that can be seen in each case study, and do these perspectives result in an attitude that supports natural area protection?

We Had Everything vs. Nothing: Our Reliance on Nature

The Inception of Our Cities. Cities were developed around resource and nature availability – without water and other natural resources, humans did not survive (Brown, 2009). Today modern technology allows us to live without such a direct contact with nature (Coccossis, 2002). As settlements within western Canada began to develop, so did the rise of industrial capitalism and an effort to think of resource and goods production for the masses. Industrial capitalism was rapidly altering the relationship between nature and society. Schmidt (2008) notes:

City dwellers were becoming increasingly detached from contact with nature, as modes of production became mechanized and wage labour became prevalent. Furthermore, it became clear that the assumed agrarian stability and self-sustaining (farmer) was giving way to a market economy, agricultural commercialization, and an increasingly mobile rural population, as home-steaders moved west in search of new lands” (p. 94).

In his work entitled *The Country and the City*, Raymond Williams discusses the changing perception of both country and city throughout centuries of people (Williams, 1973).

Commenting on changing perceptions of the city and nature, he notes:

We have to notice the regular sixteenth-and seventeenth-century association of ideas of the city with money and law, the eighteenth-century association with wealth and luxury; the persistent association, reaching a climax in the late eighteenth and nineteenth century, with the mod and the masses; the nineteenth-and twentieth-century association with mobility and isolation” (p. 290).

Contemporary Efforts to Return to Nature. Movements and activities to strengthen the human-nature connection are becoming more prevalent in western Canadian cities. An array of groups related to natural resources and a reliance on nature – such as farmers’ markets, watershed alliances and slow food movements – are examples of grassroots efforts to reestablish the human-nature connection (Bartlett, 2005). People are now beginning to understand the value in returning to nature for daily survival, as seen in the previous case study examples.

The benefits of nature to humans are numerous and very diverse. These benefits range from health improvement to creating sense of place. The array of benefits outlined in this research can be supported by various disciplines. Unfortunately the planning of our cities is not done with a diversity of disciplines and points of view represented on a single design team. While there is a strong effort on the part of the public and the consulting industry to allow humans to return to nature, these efforts are not done in collaboration with numerous disciplines.

Conclusion. Cities around the world were once developed around the availability of resources for survival. With increased technology in how we move essential elements of human needs from place to place, cities are less reliant on close proximity to elements such as water. In more recent years, there are demonstrated trends toward a returned connection with nature and once again relying on nature that is close to home. Each case study will be assessed for how the respective community’s reliance on nature has changed over time, and how this changing mindset has affected the protection of natural systems and the human-nature connection.

Case Study Question Twelve: How has human reliance on nature changed over time within each municipality, and what has any change had on the human-nature connection?

CHAPTER THREE: RESEARCH PROCESS AND METHODOLOGY

1. INTERRELATED PROCESSES

Within this study there are three interrelated conceptual processes at play. They include human value systems, design processes and the institutional frameworks in effect within various contexts. The dynamic tensions of this interrelationship will be used to assess case studies of three municipalities, in ways that it either promote or inhibit the human-nature relationship.

Value Systems

The literature review discussed various theories concerning the human-nature relationship (Bourassa, 1990; Hartig & Staats, 2005; Home, 2009; Hunziker, 1995; Hunziker, 1999; Kaplan, 1989; Lamb, 1990; Misgav, 2000; Ulrich, 1983), such as biophilia (Besthorn, 2003; Hansen-Ketchum, 2009; Kahn, 1997; Kellert, 1993; Orians, 2008; Orsega-Smith, 2004; Pliska, 2006; Van Den Born, 2000; Wells, 2003), savannah biome theory / prospect and refuge (Appleton, 2006; Blobaum, 2005; Botkin, 1995; Clamp, 1982; Falk, 2009; Hagerhall, 2000; Mealey, 1995), and place attachment (Aguilar, 2005; Barlett, 2005; Kotler, 1993; Scoptellini, 2004; Warnaby, 2009). Some of these theories are competing with one another, and some have been refuted by researchers (Orr, 1993; Perrin, 2009; Smardon, 1988; van den Berg, 2003). None of them argue that a human-nature relationship is a bad thing. Personal values are often difficult to assess as they are intangible (Catton, 1954; Lyons, 2007). Value systems, otherwise known as world view, influence the types of landscapes that western Canadians favour, and ultimately prefer to retain (Kellert, 1996). There are two generalized types of world view. Ecocentric valuation believes that mankind lives in harmony with nature, and that humanity is an integral part of the natural world around us (Donnelly, 2006; Steverson, 1994). Anthropocentric

valuation supports the idea that humans dominate all aspects of the world around us (Grey, 1998; Katz, 1999). This research will show how ecocentric valuation by far contributes to a stronger human-nature connection through case study assessment.

Numerous players are involved in the creation of our cities that bring forward personal values (Westworth, 2001). Some of the players include local residents, municipal representatives, design practitioners, land owners, developers and elected officials. Each interest group is influenced by a set of values that range on the spectrum from ecocentrism to anthropocentrism (Nisbet, 2009).

Design Processes

Various professions in western Canadian municipalities are involved in land planning, with these professions coming from two fairly distinct mindsets – the sciences and the humanities (Bhabha, 1994). The scientific mindset includes disciplines such as engineering, biology, urban ecology, law, and agrology. Through the lens of these practitioners, sites are commonly assessed using empirical methods that employ quantitative measures, and design strategies are based on measurable targets. The second mindset can be categorized as the humanities and include such disciplines as landscape architecture, urban planning, and rural planning. For these practitioners, sites are assessed using more subjective means using qualitative measures, and design strategies are based on more intangible measures.

Over the past decade, there has been a shift in mindset amongst various disciplines whereas there is becoming less of a distinction between professions (Bhabha, 1994). The emergence of new professions such as environmental planning (a combination of traditional planning profession and ecology) is creating strategic bridges between disciplines (Fabian,

2008). Many engineering practitioners are now developing a stronger appreciation of qualitative approaches as academic curriculums are beginning to encourage more humanities-based courses in core program content (Van Kasteren, 1996). Consulting firms are also populating design teams with varying perspectives, and this interdisciplinary approach is becoming more commonplace.

Many design processes include public consultation, wherein local preferences for landscapes affect ultimate design decisions (Garin, 2002, MacLean, 2010). Feedback from the public is often solicited near the end of design processes to validate findings and to potentially steer the final result (Urban Systems, 2012). Consultation is common for public projects such as community parks, however is far less common for the development of privately owned lands such as suburban developments that are going through subdivision. Land planning professionals and other designers also apply personal biases and judgment to their work (Peeters, 2008) while having to keep within professional ethics and consistent with best management practices in their field. Based on their educational upbringing and experience, these professionals apply their own values in the design decisions made and can also be influenced by their past mentors and peers (Granitz, 2009). At the same time, professionals are forced to work within an institutional framework that guides their work, which allows for some creativity but oftentimes delineates clear direction for design processes. For example, while a designer may want to create a naturalized environment within an urban park, municipal policy may require that all new public parks be programmed sports fields. Clients and land owners also bring forward their own mindsets that have an impact on design processes, and designers are often subject to meeting their client's needs and designing accordingly.

Institutional Framework

There are various policies, guidelines and legislation at the municipal, provincial and federal levels of government that guide planning processes (Boardman, 2002, Harrison, 1996). Federal legislation related to natural area protection prohibits certain activities, while also providing a mechanism to alter or destroy ecosystems. Provincial legislation is much the same, whereas particular types of natural systems are protected differently. At the municipal level, policies and bylaws are much more site specific (Government of Alberta, 2010) and provide a more detailed framework for designers to conduct their work. Each design discipline also operates within a code of practice that is endorsed by their professional association (Martin, 1989), and uses established best management practices that are established by their regional industry or general field (Jones, 2007). While a design process may lead to a particular solution to a problem, the institutional frameworks of both governments and the professional disciplines will delineate parameters within which land planning professionals must work.

2. METHODOLOGY

This study involved three phases to respond to the main research question, including a literature review (included in Chapter Two), case study assessment (included in Chapter Four), and a discussion of findings (included in Chapter Five).

Literature Review

A literature review was completed that used predominantly peer reviewed journal articles, as well as published books. Various themes that were included in this literature review were based on the three interrelated processes coming out of the main research question, as well

as other supporting topics. Through the literature, nine themes were introduced that address the main research question, and in doing so gave rise to 12 questions that will be applied to each case study assessment.

Case Study Assessment

Three case study municipalities located in western Canada were selected: the city centre of Fort McMurray, Alberta, suburban developments in Edmonton, Alberta, and suburban developments in Strathcona County, Alberta. The criteria used to select these sites included a diversity of scale (i.e. population, density), history (i.e. settlement period, traditional peoples) and economic drivers (i.e. resource extraction, agriculture). Consistent variables for all three sites included the overarching Provincial and Federal legislative framework, the availability of equally qualified land planning professionals and period of time investigated. The 12 literature review driven questions related to these sites were answered through a range of methods, including historical and archival research, desktop studies, reference to project files, personal professional experience working in these municipalities, site visits, and personal conversations with professional colleagues.

For approximately 15 years I have been actively working as a professional environmental planner and landscape architect throughout western Canada. This work is primarily focused on recreational planning, site reclamation and naturalization, as well as the preservation of natural areas within communities of varying size. Much of the information included in case study assessments was a result of professional experience working these municipalities. All information gathered was based on project files, recorded conversations with clients, colleagues and municipal representatives, as well as archival research in municipal libraries and historical

societies. As noted in the limitations section in Chapter One: Introduction, there was a significant amount of information that was not available to this research due to confidentiality. At the same time, having access to many years of current data was invaluable in understanding the dynamics of site conditions, and having access to several key practitioners and municipal representatives provided insightful information to support this research.

Background information for these three case studies was compiled through desktop studies of various categories of literature, legislation and other written sources. Using historical archival research for each case study site, this research documents:

- the evolution of local populations' reliance on nature, and their inherent need for a connection with the natural environment;
- development patterns of urban areas, such as population, density, configuration, recreational amenities and the inclusion of naturally-occurring ecosystems;
- planning practices related to urban development and the inclusion of natural ecosystems; and
- policies related to the protection of natural areas and the extent to which they do/do not succeed.

Through research of historical information, site visits and personal professional experience working in these three municipalities, this study then responds to each of the twelve questions introduced in Chapter Two: Literature Review, and these questions include:

1. What public reactions to different ecosystem types or characteristics of natural areas can be observed in case study assessments?

2. Is there a correlation between the human values observed in case studies and the protection of natural areas in urban environments?
3. What are the historic trends of natural area preservation and uses within the case study area?
4. Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection?
5. Is the current overarching institutional framework effective in promoting a strong human-nature connection?
6. What information would each case study municipality seek in order to promote a stronger human-nature connection?
7. What impact has the rise of technology had on the human-nature connection, and on the integrity of these natural environments?
8. What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection in western Canadian municipalities?
9. How have emerging global trends affected the land planning process or the observed planning strategies in each case study municipality?
10. What strategies are prevalent in these case study municipalities to help minimize ecosystem degradation?
11. What are the varying views and values of nature that can be seen in each case study, and do these perspectives result in an attitude that supports natural area protection?
12. How has human reliance on nature changed over time within each municipality, and what has any change had on the human-nature connection?

The three case studies include:

- Fort McMurray city centre in the Regional Municipality of Wood Buffalo, Alberta (see Figure 1) – an investigation of the evolution of this urban fabric from the time of inhabitation by First Nation tribes to today;
- suburban developments in Edmonton, Alberta (see Figure 2) – an overview of the suburban mindset in Edmonton since the 1970s and an in-depth assessment of three specific suburban neighbourhoods since their inception; and
- residential developments in Strathcona County, Alberta (see Figure 3) – investigating a suburban development within newly emerging municipality with considerably less history than other western Canadian municipalities.



Figure 1 – Aerial photo of the city centre in Fort McMurray, Alberta. Athabasca River in foreground, Snare River on the right, Clearwater River top of image. Photo reproduced with permission by Regional Municipality of Wood Buffalo.



Figure 2 – Aerial photo of a typical subdivision in the greater Edmonton area.



Figure 3 – aerial photo of portions of Heritage Wetlands during the construction of adjacent neighbourhoods located in Strathcona County, AB.

Analysis of Findings

This research reflects on the literature review findings related to the benefits of nature, theories of human attachment to nature, the evolving paradigm of nature as a means of human survival, and the current strategies and philosophies now endorsed by land planning professionals. The discussion section in Chapter Five of this dissertation compares the human-nature connection literature with observations in the three case studies, and makes a series of recommendations, based on the twelve case study questions. Using site examples from the three western Canadian case study municipalities, this research demonstrates that design processes lead to varying results as it relates to opportunities for a human-nature connection, spanning from opportunities for intimate contact to no natural areas even present. Results of these interactions can, in some cases, positively contribute to human-nature connection, and in others diminish this relationship.

The following matrix shown in Table 1 provides a general snapshot of the current directions of western Canadian urban development. This information summarizes some of the findings from the three case study assessments, including world view, historical development patterns, limitations, contributions to the human-nature connection, and recommendations. A more comprehensive analysis is included in Chapter Five: Discussion.

	World View and Human Values	Development Patterns	Limitations	Contributions to Human-Nature Interaction	Recommendations
Fort McMurray	ecocentric values amongst First Nation people prior to arrival of European descendants; today anthropocentric values are most prevalent, First Nation values have also changed due to external influences	evolved from nomadic and ecologically sincere habitation on the land to permanent patterns that are very destructive to nature; urban area is still a temporal landscape given the community is dependent on resource industry which may not persist long-term	unable to verify human affinity for nature – was only assumed based on very recent inclusion of policies to protect the environment in municipal policies, as a result of public consultation indicating a need to protect nature; several key draft reports with relevant information were confidential	historically very significant need for nature contact for survival; today little to no interaction and there are numerous social problems in the community; lack of social cohesion and minimal sense of place inhibits nature protection; recreational vehicles taking away from intimate human-nature contact	promoting a stronger sense of place may increase care for nature protection; need for more municipal policy, in the absence of any statutory bylaws that protect natural areas; a more interdisciplinary approach is needed to ensure this complex challenge is addressed with all available perspectives, including health impacts of the built environment which is currently not included
Edmonton	anthropocentric values are most prevalent; value of nature to development industry is economic, whereas residents demonstrate a balance of economic and intrinsic value of nature	sprawl patterns with limited inclusion of natural areas in urban fabric; strong reliance on vehicular transportation with a road network that has led to the most significant loss of natural areas	several key files with very telling information on relationship between interest groups were confidential, such as directives given by land developers to consulting teams on how to approach planning; directives from developers often overshadow public interests	replicated natural areas are more common than naturally occurring ones within suburban developments, while constructed naturalized areas still provide nature contact; common strategies used such as CPTED are not ecologically sincere and need to be revisited	there is a need to work with private landowners to protect natural areas, given most current policy / legislation does not apply to individuals; stronger public consultation required, earlier on in process of land development; develop strong place attachment that is true to the context and not 'manufactured'; municipal standards needed for natural areas as overarching ones are not sincere to ecological integrity; need a better understanding of human preferences for particular landscapes
Strathcona County	a mix of ecocentric and anthropocentric values are observed	sprawl patterns with significant inclusion of natural areas in urban fabric; surrounding agricultural lands demonstrate a strong ethic toward natural area preservation	several key files with very telling information on relationship between interest groups were confidential; relatively new municipality, difficult to see trends over time	abundance of both naturally occurring and constructed naturalized areas; urban development has ample opportunities for human-nature interaction, rural areas also have many preserved areas that accommodate human use for passive activities and connection	continue building on the success that the relationship between land owners and NGOs has on natural area protection; better educate residents on the need to respect natural areas in their existing state; need a more consistent understanding of what "nature" means to help minimize challenges to land planning professionals; public education to reduce misconceptions of nature being unsafe

Table 1 – General findings of case studies

CHAPTER FOUR: CASE STUDIES

1. FORT MCMURRAY CITY CENTRE, REGIONAL MUNICIPALITY OF WOOD BUFFALO, ALBERTA

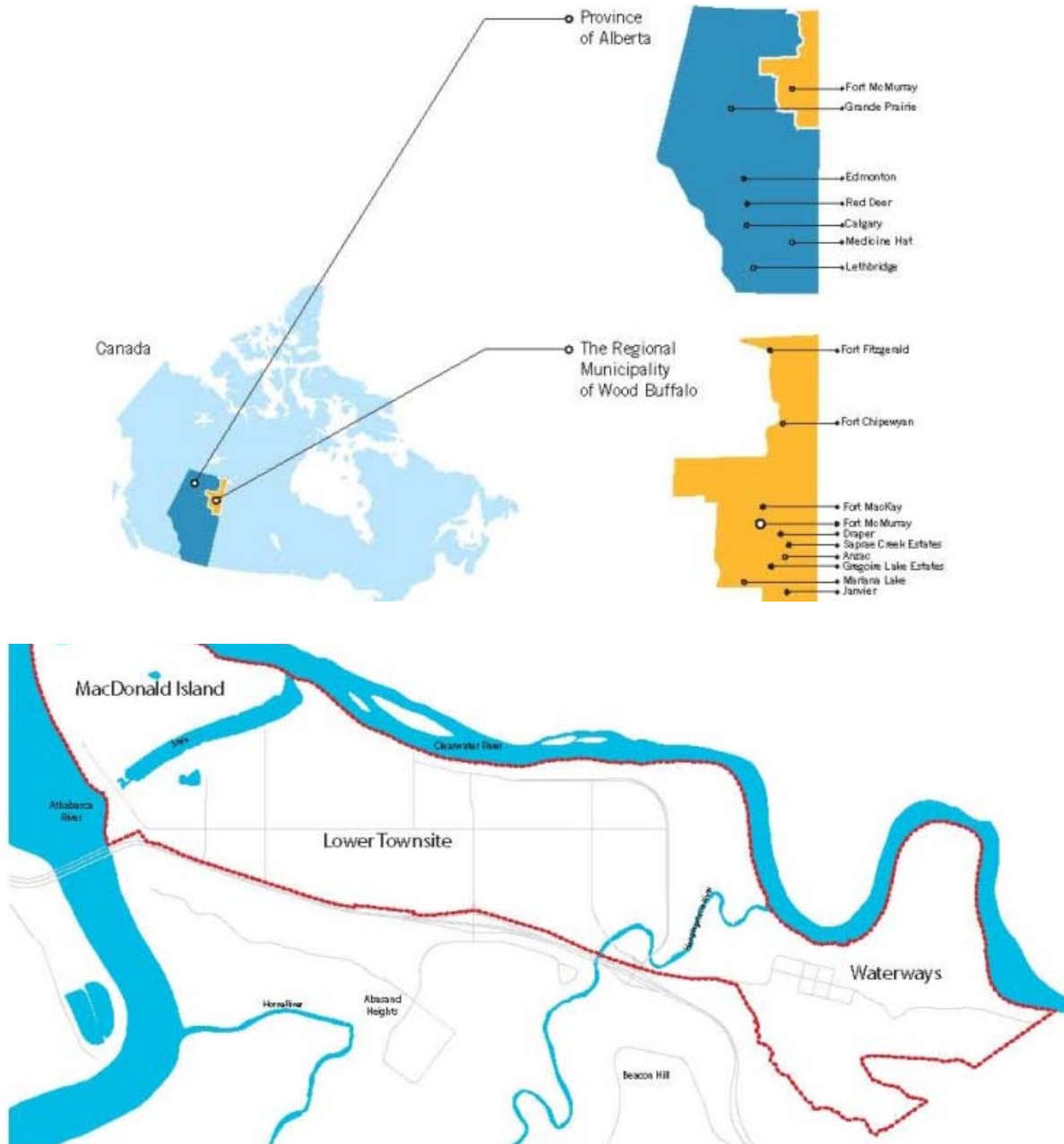


Figure 4 – regional context (top) of the Regional Municipality of Wood Buffalo; image of the city centre within Fort McMurray (bottom). Image reference: Urban Systems Ltd. (2012).

General Description

By land area, the Regional Municipality of Wood Buffalo (RMWB) is currently one of the largest municipalities in all of North America, extending from central Alberta to the borders of Saskatchewan to the east, and the Northwest Territories to the north. The Municipality is nearly 70,000 square kilometers, and contains predominantly pristine boreal forest wilderness as well as some of the world's most plentiful deposits of oil and gas. Figure 4 shows RMWB in the context of all Alberta. In past years, this region is most well known for oil and gas exploration and exploitation, and most recently the controversial oil sand developments. Dating back to the early 1900s, this region has provided both renewable and non-renewable resources to its settlers. Within the Municipality are clusters of human development, such as Fort Chipewyan at the far north of the province on the shores of Lake Athabasca to the dense urban centre known as Fort McMurray. Within Fort McMurray is the area referred to as the city centre (and in some context the city centre), which extends approximately four kilometers from MacDonald Island to the north-west to Waterways in the south-east. Figure 4 demonstrates these boundaries.

The geomorphology of much of western Canada is a result of the recession of glacial Lake Agassiz that once covered most of the modern day prairie provinces. As this large lake receded, considerable changes to the lake bottom occurred as water moved through watersheds in new and flowing patterns (Fisher, 2009). The landscape throughout areas of northern Alberta, including the city centre of Fort McMurray, is drastically different than the surrounding prairie and boreal forest ecosystems that are generally flat. The most notable characteristic of the city centre of Fort McMurray is the very high and steep slopes of the river valley that leave the city centre near the river water level, and between 20m and 50m lower than the surrounding

landscape. The valley in which the city centre is set was carved by the movement of water within the Clearwater and Athabasca River valley, leading from south to north toward Lake Athabasca.



Figure 5 – 2010. Aerial view of the western half of the city centre of Fort McMurray. The Snyc and MacDonald Island in the foreground. Image reproduced with permission from Regional Municipality of Wood Buffalo.

The landscape of the city centre area is dominated by the influence of the surrounding rivers. Figure 5 includes an image that depicts the general character of this urban area. Remnants of the boreal landscape remain along the river, consisting of mixed deciduous and coniferous forest stands. The shoreline along the city centre edge is variable, as some areas are low-lying fluvial flats and sand bars created by deposits from sharp turns in the river, and in-flow from adjoining smaller rivers and creeks. As seen in Figure 6, a number of sections of the shoreline are subject to erosion, specifically where steeper edges are exposed to funnels of more rapid river current and ice-flows in the spring. There are other sections of the sloping banks that are not experiencing erosion problems. These are typically located in calmer areas away from

strong currents, downstream from older wharves and landings along the shore, and where there is a heavily vegetated riparian zone (Westworth, 2008). Any remaining forested areas that have been untouched by development are along the water's edge.



Figure 6 – 2012. Shoreline condition along the Clearwater River near the city centre with ongoing natural erosion.

The Snye River is a major feature of the city centre area, and was originally an open water connection between the Athabasca and Clearwater Rivers. Figure 4 demonstrates the locations of each of these rivers. With the construction of the causeway to MacDonald Island, the Snye became an enclosed body of water, open only to the Clearwater. The removal of the natural flow through the Snye has led to significant siltation and accumulation of aquatic vegetation in the water body. However, this has also led to the Snye becoming a spring time

spawning area for northern pike that is now protected by Fisheries and Oceans Canada (Westworth, 2008). For many years, the Snye has been used for access by float plane, given its calm water and close proximity to the community. Today, this River remains a strategic landing surface and docking facility for float planes. During winter months, the rivers surrounding the community are popular retreats for ice fishing, snowmobiling and playing on outdoor hockey rinks.



Figure 7 – 2011. Outdoor hockey on the Snye.

Two other water bodies within the city centre area include the Hangingstone River and Saline Creek, two watercourses that are located at the far south end of the city centre area. These water bodies bisect the city centre and the Waterways neighbourhood, and the riparian areas of these two watercourses are still somewhat vegetated and intact. The Towns of Fort McMurray



Figure 8 – 1939. Float planes on the Snye. Photo reproduced with permission from Fort McMurray Historical Society.

and Waterways were incorporated in 1948 (Cohos, 1974). Both of these communities have repealed their status as individual entities, and are now part of RMWB without delineated boundaries that define their extents.

To the north of the city centre area is MacDonald Island, which was created as a segregated land area as waters of the Athabasca and Clearwater carved the landscape. The Island was segregated from the city centre until the mid-1990s when a land bridge was created to

provide access. This alteration of the Snye, basically cutting off water between the Clearwater and Athabasca as shown on Figure 9, led to significant changes to the character of the Snye with eventual problems with sedimentation buildup.



Figure 9 – 1972. Image of land bridge constructed across the Snye River, near its confluence with the Athabasca River (left). Reproduced with permission from Fort McMurray Historical Society.

First Peoples and Early Settlement: Cultural Shifts

Prior to the arrival of European settlers the Fort McMurray region was inhabited primarily by Cree, Chipewyan and Metis nations. The fur trade introduced First Nation and Metis people to the Athabasca region, with the first recorded fur trade activity in 1719 when the Hudson's Bay Company had a Cree man by the name of Wa-pa-su initiate trade in the area (McKillop, 2002). Many descendants of these First Nation and Metis groups still live in RMWB

today, with Metis and Chipewyan people being the most prevalent. These groups were highly dependent on nature, for both spiritual meaning as well as day-to-day survival.

Both Cree and Chipewyan traditional values hold that all forms of life are interconnected, and that life is sacred. Beliefs of these people are ecocentric, whereas humans are only one of many beings that live in harmony with Mother Earth. To the First Nation people, Mother Earth includes the land, plants, animals, rocks and their interconnectedness with humans. The elements of earth are not seen as commodities, rather are regarded as relatives to humans and are treated with utmost respect. Cree and Chipewyan also value the power of observation, and understanding the dynamics and changes of nature is engrained into their culture. From an early age, First Nation children are taught the art of listening and remembering – oral tradition and memory development helped people to become self-reliant in a land where one mistake could cost them their lives (Alberta Education, 2009).

Community settlement patterns of the area's First nation and Metis people have been well recorded. Fort Chipewyan is located at the hub of the Athabasca, Peace and Slave Rivers, and is the oldest continuously occupied settlement in all of Alberta (FMA, 2006). While Fort Chipewyan hosted a permanent settlement of people, other areas within the region hosted more nomadic people that followed wildlife as a means of their survival. In the 1870s the Hudson's Bay Company established a post and designated it as Fort McMurray (Krim, 2003), located in what we know of today as the city centre area. Rather than being a fur trading post like many of the other posts across western Canada, Fort McMurray was primarily a transshipment station, being alongside the confluence of two very significant rivers. Fort Chipewyan, located near the northern end of the Municipality on Lake Athabasca, was still the primary fur trading post in the

region. Another First Nation community settlement area is Fort McKay, located part way between Fort McMurray and Fort Chipewyan.



Figure 10 – 1929. Image of Hudson’s Bay Company development along the Athabasca River, at the far north-west end of the city centre. Photo reproduced with permission from Fort McMurray Historical Society

Contact by First Nation people with the world beyond the Athabasca region was a result of European descendants travelling by barge and steamboat, in the late 19th and 20th centuries. The Klondike gold rush that began in 1887 led to thousands of people passing through from the south. Furnoleau (2004) stated that these Klondikers brought with them “drunkenness, immorality, and every other accompanying vice peculiar to modern civilization” (p. 39). During the Klondike gold rush and a surge in people passing through the Fort McMurray region, furbearing animal populations declined, which resulted in significant hardship and hunger for the First Nation and Metis people.

In 1899, the First Nation people of the Athabasca region signed Treaty 8 (Dempsey, 1997). A condition of these people signing this treaty was for Canada to guarantee protection of rights to their traditional way of life, including their traditional economy that requires access to and use of the land (Furnoleau, 2004). Local First Nation and Metis people continued to live on the land in a semi-nomadic pattern, however they were confined to a semi-sedentary residency pattern (FMTA, 1983) with the introduction of mandatory education for children that required permanent housing for women and children. This change in lifestyle led to the transition from an ecocentric value system to more anthropocentric values that were imposed onto First Nation people by European descendants. The transition led to a reduction in human-nature interaction.

The railway led from Edmonton to the Fort McMurray region, reaching the rural development of Sapræ Creek in the early 1920s, then extended to the lower townsite area (then known as Waterways) in 1925. The waterfront, shown on Figure 9, became the venue for various shipping companies, such as McInnes Fish Products Company that processed 165 tons of fish annually to markets in the south (Regional Municipality of Wood Buffalo, 2010). The beginning of this fish industry marked the start of the commoditization of nature opposed to the harvesting of resources and wildlife for subsistence.



Figure 11 – 1942. End of the rail line from south leading into the Waterways community, transshipment yard that transferred goods from the rail line onto steam ships. McMurray community at top of image, downstream.

In the 1930s the Province of Alberta established a trapline registry system which led to many First Nation people being unable to continue trapping in the traditional use areas of their descendents (FMES, 1997). It wasn't until 1968 when the Department of Indian Affairs again allowed First Nation people to trap without paying trapline fees. In the 1980s, the market for fur collapsed, and it was no longer possible for most people to make a living off the land (FMA, 2006). Although most First Nation people no longer make their living solely off the land, FMES (1996) notes that traditional land use still occurs and is integral to "their history, their culture and their present existence" (p. 6).

Through investigating historical accounts there is evidence of a change from ecocentric values to more anthropocentric values of people in the Fort McMurray region, including:

- the radical transition of First Nation people into the public school system, wherein education did not include cultural preservation or oral history that included teachings of the sensitive balance between humans and nature;
- a change in settlement patterns, from nomadic living to minimize human impacts on the environment to permanent settlement that led to direct impacts on nature; and
- the commoditization of resource and wildlife harvesting demonstrating the time wherein these resources began to have a monetary value;

Economic and Population Growth: The Discovery of Oil

Oil Extraction. Oil sand development, which is by far the region's most well known economic driver, began in the 1950s within the traditional lands of First Nation and Metis people of the region. In the late 1980s the Alberta Pacific pulp mill was opened, which sources its timber from along the Athabasca River. The oil sands and pulp mill brought an increase in population and a market economy with its related goods (FMES, 1997).

The native inhabitants of the region were the first to discover oil sands in the region, with the oily material being useful for things such as waterproofing canoes and softening leather. Significant exploration for oil deposits by European settlers began in 1914, with some of the first experimental tar sands sites alongside the Clearwater River just across the river to today's city centre. The byproducts of crude oil found in such large volumes became strategic to the nation-wide boom in industrialization, and to fuel the sudden rise in automobile use across North America. As corporate entities began to take over the use of landscapes for large scale resource exploitation, access to nature became much more limited. Industrial activities affected wildlife populations, and included development that was unsafe for people to travel through. On a more

intrinsic level, viewsheds began to change drastically, particularly within the city centre, as large tracts of land were cleared, graded and developed on.

Affect of Oil Discovery on Populations. The growth of Fort McMurray was never static, and has always been predicated by economic conditions of the oil and gas industry. From 1950 to 1963, the population slowly increased at a rate of approximately 2.5% per year, to a population of only about 1,300 people. When significant oil deposits were discovered in the 1960s, a surge of industrial growth led to annual population increases of 22%, resulting in a population of approximately 10,000 people in 1974 (Cohos, 1974).

Significant immigration has been required to meet the employment needs of a booming oil and gas industry and supporting services. Today, human culture in Fort McMurray is extremely diverse, with approximately ten recognized cultures (S. Alatorre, personal communication, September 14, 2011) now living within the city. Between the years 2000 and 2010 the Municipality grew at a rate of approximately 8.5% per year, making it the fastest growing Municipality in Canada over that decade; with a regional population of approximately 100,000 people in 2010, the majority of which live within the city centre of Fort McMurray with approximately 74,000 residents (Urban Systems, 2012). Along with significant population growth, the city has one of the strongest economies in all of Canada with an average household income of \$178,000, which is nearly double the national average (Blake, 2011). Fort McMurray is situated within the valley of the Clearwater River, and is bound on three sides by water – to the east and north by the Clearwater River, and to the west by the Athabasca River. The fourth side of the city is bordered by Highway 63. Being land locked on all four sides, any new growth must look upward rather than in typical sprawling patterns, with infill and densification.

Population projections, as a result of a surge in industrial resource extraction, delineate the population of the city centre to grow by over three times over the next 18 years, to an estimated population of 230,000 people by 2030 (Price Waterhouse Cooper, 2012) as seen in Figure 12. In order to deal with a sudden and dramatic surge in population growth, the city centre will be redeveloped at a density that surpasses any other Canadian city.

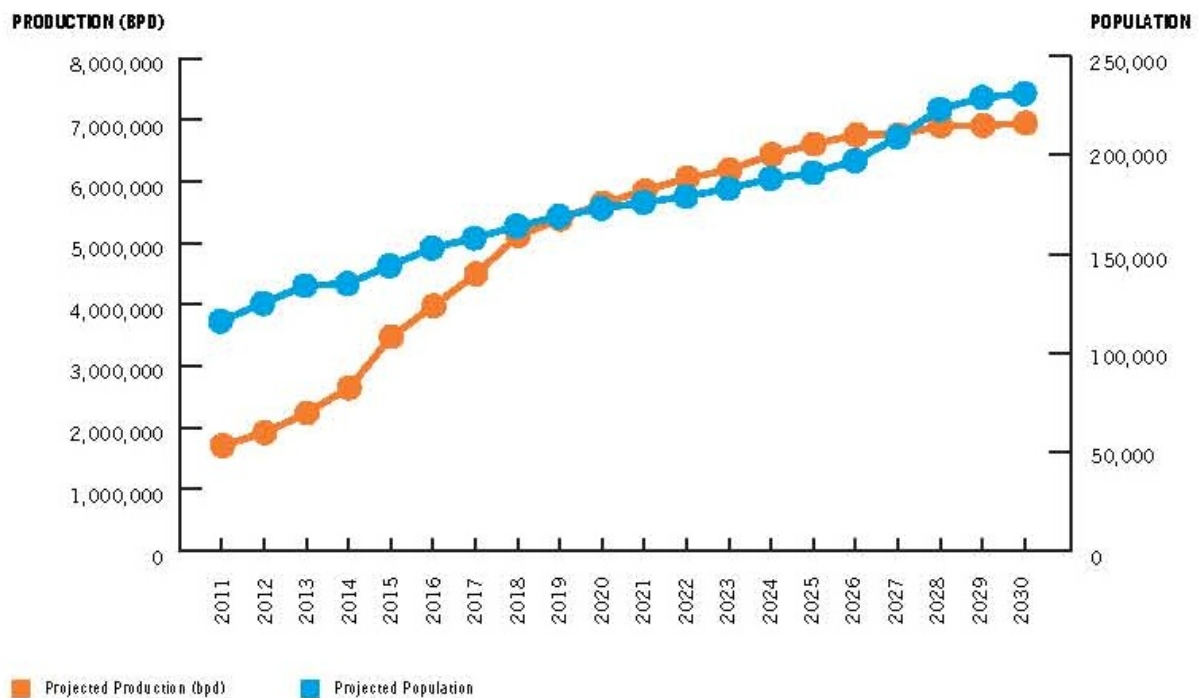


Figure 12 – Population projections for the city centre, correlated with production of oil (barrels per day). Source: Urban Systems Ltd. (2012).

A community's size and typical settlement pattern is closely related to the question of centralization versus decentralization at the national level (Holden, 2004). From an ecological perspective, there are some benefits to high density of development. Decentralized concentration, such as relatively small cities such as Fort McMurray with high density and short distances between the houses and public / private services, is a primary principle of sustainable urban development (Holden, 2004). The increased population that comes with high density will

have dramatic impacts on the remaining natural areas within this community. This is especially true given the current populations already detrimental effect on ecological integrity. Trends across Canada are now demonstrating a preference for infill and densification, which became most prevalent in the mid-2000's (R. Schroeder, personal communication, August 15, 2011) with people looking for a more walkable city and the ability to live, work and play within walking distance. Facilitating people's access to nature will become a detail design issue that must be supported at the municipal, provincial, and federal levels.

Infrastructure Development. The Clearwater and the Athabasca Rivers played a very important role in the development of the city centre of Fort McMurray. In 1925, the Alberta & Great Waterways Railway was completed, which provided a strategic link between Edmonton and Fort McMurray. With steamboats travelling on the two large rivers travelling north from Fort McMurray to Fort Chipewyan and beyond, a significant transshipment development was created in the area now known as the city centre. Crude oil production took advantage of the transshipment facilities in Fort McMurray by allowing exports to be loaded on trains that ran to processing plants to the south. With the installation of pipelines across the Province that leads directly from exploration sites to processing refineries near Edmonton, Fort McMurray is no longer a transshipment site for oil products. Further, the development of Highway 63 leading from Fort McMurray to Edmonton in the 1940s led to the discontinuation of passenger and freight transport using rail. Today, the Waterways district of the city centre still has remnants of the historic transshipment facilities, while the majority of shipping infrastructure has now been since over-built and the rail bed has been since removed. (Urban Systems, 2012). All of this development is in effect allowing unbroken human-nature interactions to be subdivided. This

disconnect is seen both in the continuity of ecological systems as well as people's access to nature.



Figure 13 – Historic transshipment facility along the Clearwater River, at the end of the rail line and at the shipping yard to load steam ships. Photo reproduced with permission from Fort McMurray Historical Society.

Preservation of Natural Areas in the City Centre

Since the arrival of the rail line in the 1930s and its connection with the waterfront to load and off-load steam ships (as seen in Figure 13), much of the waterfront within the modern-day city centre region was cleared and graded to suit this industrial activity. Further, the rivers that surround the community, to this day, are actively dredged to maintain sufficient depths for shipping, recreation and aesthetics. The work of Oliver (2006) provides strong rationale to explain how natural features have been altered to best suit development patterns of cities. Focusing on the Thames River in London, he discusses how the engineering discipline justified “improving” the river by channelizing it to flow faster. Irregular shallow water pools were eliminated to create more regular river depths that improved not only its aesthetic appearance but also its function as a navigable waterway. The author cites a number of early writings from

previous centuries that discuss the original condition of the river – pleasant and gentle, and in harmony with its surroundings – and demonstrates how over time technology has resulted in the elimination of most all of its natural character. The dredging of the rivers along the banks in the city centre has led to unnatural erosion, and in many ways has changed the character of the riparian areas for “human benefit”, shown in Figure 14.



Figure 14 - 2011. Summer time image off the boat launch on the Snýe where regular dredging takes place.

While the waterfront areas in Fort McMurray were originally dredged in order to accommodate shipping, this is now a necessary practice due to the land bridge across the Snýe that causes significant siltation along its interface with the city centre area. The rivers adjacent to Fort McMurray are of the few inland fish-bearing water systems in Canada to be actively dredged (A. Brown, personal interview, August 3, 2009), with a precedent set far before we really understood the dramatic ecological effects of altering the substrate and riparian areas of water systems. While dredging was essential to allow large shipping vessels into the city centre until the mid-1900s, dredging is now done to keep emergent vegetation from overcoming many areas of the river for purely aesthetic and recreational purposes, and for limited use of float planes that still frequent the city centre area. Planes have been using the Snýe and Clearwater Rivers for year-round take off and landing for approximately 100 years, as seen on Figure 15.



Figure 15 – various modes of transportation on the Clearwater and Snye, including dogsled, boat and plane. Dogs and sleds were loaded into planes, boats strapped to the bottom of planes for long distance travel. Photo reproduced with permission from Fort McMurray Historical Society.

Today, the water's edge is dominated by a series of recreational amenities, such as parks, boat launches and all-terrain vehicle (ATV) staging areas. Other areas of the waterfront that were once shipping facilities now include roadways, commercial and residential developments. Very little natural vegetation remains alongside the Clearwater and Athabasca River riparian areas, due to previous development along the rivers and also as a result of constant erosion that scours the river edge. Remaining clusters of vegetation along the water's edge are typically those that are highly susceptible to erosion. At the same time, there are several patches of natural areas that have always remained undeveloped. Many residents feel unsafe accessing these areas as they are heavily overgrown, strewn with garbage, and frequently occupied by

homeless people (Urban Systems, 2012). The Municipality owns considerable land along the rivers that is currently undeveloped, and with the significant growth pressure in the downtown this land has become extremely valuable and most likely subjected to new development.

The city centre has a long history of flooding, which typically results from ice-jams on the Athabasca River during spring ice break-up. Flood waters from the Athabasca back up into the Clearwater, and in combination with high flows in the Clearwater, result in rapid rise in water level in and around the city centre. For many years, flooding has impaired development along the Clearwater and the Snyc, and is often credited for causing any current natural area to still be intact. Today, development is still restricted by flood levels, while efforts are now being made to make the lands more developable by suggesting landfilling low lying areas, and creating perimeter dykes along the entire riverfront interface with the city centre. Figure 16 depicts the flood of 1977 which resulted in flooding of more than half of the city centre. A 1:100 year flood event today would have similar impacts on the community, given city-wide flood protection measures have yet to be completed.



Figure 16 – flood of 1977 that extended far into the city centre area. Photo reproduced with permission from Fort McMurray Historic Society.

To mitigate for flooding concerns, RMWB is currently developing Prairie Loop Boulevard along the river at a height of 648.5m to provide basic flood protection for the 1:40 year flood level (Urban Systems, 2012). This dike presents several challenges, and some include:

- a physical disconnection for pedestrians from the city centre to the waterfront, having a four lane roadway ;
- a physical barrier that segregates existing ecosystems and any wildlife movement;
- a roadway alignment that passes through many of the remaining natural areas and eliminates many of these natural ecosystems;
- the introduction of vehicles along the water's edge that brings noise and contaminant pollution; and
- lost opportunities for passive recreation within remaining natural areas with land being used for a dyke and transportation system.

The development of highways throughout western Canada allowed non-industrial traffic to get access to various communities. Travel by train or by boat was commercial means of transportation, while roads allowed the individual to experience travel at their own convenience and on their own schedule. While the implementation and long-term operation of highways had significant impacts on nature, highways allow people to see vast extents of natural areas. There are known benefits of even viewing nature through a window (Ulrich, 1984), while other amenities such as roadside pull-offs and trail heads for random hiking allow road travelers to explore the natural environment first-hand. Without these roadside amenities, being inside a

vehicle would present a barrier to experiencing nature, similar to how contemporary off-highway vehicle use can detract from the human-nature experience.

Historical Enabling Policies

The New Town Plan of Fort McMurray (1974). This plan (Cohos, 1974) begins with:

“The purpose of (the plan) must be to satisfy the human needs of the present and future residents of the community. The anticipated growth and development of the Town must be accommodated. The basic requirements for housing, education, recreation and shopping must be assimilated into a singular corporate aim – to encourage the creation of a lively human environment. In Fort McMurray there is a particular need to unify old and new, to take advantage of the unique physical and landscape features of the location, to meet the challenge presented by the numerous obstacles to development, and to program the construction so that at each stage of evolution there is a satisfactory basis for human experience” (p. 8).

The 1974 plan was focused on balancing growth, efficiency and organization with community good, the conservation of amenity and the pursuit of an improved quality of life for people (p. 8). As one of its many conclusions, the document calls for “long-term government policy . . . at all levels to produce a stable political climate within which the substantial capital resources can be expended for future profits and benefits to the people of the Town, the Province, and Canada generally” (p. 20). For the most part, this document provided a very clear indication of the mindset of modern-day Fort McMurray as it existed in 1974. In general, discussions on the open space related to their ability to be developed, or the constraints that they present including steep slopes, flooding, or poor soil condition. “Recent development in the Town has been restrained only by the practical limitations of construction. Conservation of natural resources for their own sake, and as the features most important to the aesthetic quality of the Town, has been considered secondary to the need for rapid economic growth, the provision

of housing, industry, etc.” (p. 114). Noteworthy conclusions related to the natural environment included the following statements:

“Natural areas can and should remain within the Town limits as a contact, both visually and in terms of recreational opportunities, with the structured portions of the community. The (monetary) value of these, while possibly unclear in present circumstances, will increase as the population and corresponding built-up area extend into the countryside” (p. 124).

“As a general rule . . . trees which naturally grow in dense groups must be conserved in substantial stands, or eliminated and replaced. Pre-grading of development sites is similarly not compatible with retention of existing trees” (p. 145).

“Streamways, particularly the lower reaches of the Hangingstone River and Saline Creek, are to be protected by an undeveloped margin along each bank. This will be wide enough to allow for sheltering, stabilizing vegetation and for trails” (p. 146).

“ . . . there are lands lying below the 808’ contour which, unless filled, have severely-limited potential for recreation use. It is proposed that landfill of these areas occurs to a standard which permits their reclamation for basic parks and recreation purposes” (p. 151).

Based on these conclusions, there is a directive to retain tree stands, only if in large clusters (without a defined size or parameters). This demonstrates the limited knowledge in the ability to sustain smaller clusters or lineal bands of trees. In terms of plant communities, retaining only large tree stands would limit species richness and diversity. In terms of biodiversity, it would work against current knowledge that supports the need for a system of natural areas rather than simply large and singular ecosystems. From the above quoted statements, a highly anthropocentric perspective is clear with a focus on monetary value of trees, the need to fill lower lying lands to make them useful, and the imposition of recreational uses such as trails in even the most sensitive riparian ecosystems within the creek areas.

While there is some intent to preserve these remaining natural areas, protection is driven by direct human benefits and development, even when population of the city centre did not

warrant the exploitation of the entire land area. The direct human benefits can include personal privacy from homes and yards, or retaining mature trees near a development to create an amenity lot that has more monetary value. There is no obvious effort to retain these natural areas in their intact state through preservation, and no discussion on any aspect of wildlife habitat conservation.

2004 Parks and Outdoor Recreation Master Plan. In 2004, RMWB completed a *Parks and Outdoor Recreation Master Plan* to help identify contemporary demands for recreation and to delineate permitted uses throughout all undeveloped lands. This plan covered all of the land within the city centre. Today's recreational activities within urban natural environments include trail walking, cross country skiing, snowmobiling and boating. Through extensive public survey, key recreation recommendations were made. These include:

- allowing commercial enterprises in parks;
- identifying a festival site with a 10,000 person capacity;
- implementing an off-site development levy to create new park or recreational space; and
- improving and maintaining existing parks rather than acquiring and developing new ones (HarGroup, 2004).

The 2004 plan does not address strategies for the preservation of any remnant natural areas, while it does designate areas that are undeveloped as potential recreation areas for passive uses such as walking trails.

Local Bylaw 00-05. This municipal bylaw has direct relevance to the protection of existing natural areas along the shores of the rivers, as these areas are prone to frequent flooding. This bylaw was an update to the Municipality's previous land use bylaw and outlines the

restrictions of development as a result of ongoing flooding that takes place through a large area of the city centre. Development within the downtown that is below the 248m level (40 year flood level) is prohibited, and development between the 248m and 250m level (100 year flood level) is subject to floodplain building restrictions (RMWB, 1999). The majority of remaining natural areas along the edge of the rivers are within the 40 year flood level. While much of the riparian area and naturally-occurring ecosystems are within the 40 year flood plain, development is still permitted if finished floor elevations are elevated above 248m, or if perimeter dykes are implemented to keep flood water away from the structures. Elevating buildings through grade alterations and the implementation of dykes have direct impacts on natural areas with surface vegetation being removed and covered with fill material.

Current Enabling Policies, Guidelines and Initiatives

2011 Municipal Development Plan – Bylaw 11-027. The *2011 Municipal Development Plan* (MDP) provides a comprehensive summary of Municipality-wide initiatives and direction for upcoming growth. This document was released in the beginning of 2012, and took advantage of the current growth projections and directives of the 2012 LTSARP that will transform the city centre. In essence, the bar was set high when the current Mayor made a recent public statement that Fort McMurray would soon be Canada’s most sustainable municipality. Recognizing the amount of negative publicity that this municipality receives due to oilsand development, this initiative could not come at a better time.

The MDP speaks to the importance of balancing year-round recreation with environmental conservation. Recognizing the importance of the natural environment, the plan suggests that the Municipality will “work with the Province to support integrated resource

management and planning practices, to identify and establish conservation areas where development would be restricted” (p. 56). The plan then states that “where it has jurisdictional authority, the Municipality will limit development along lakes, rivers, and streams, as well as where it would negatively impact wildlife corridors and migratory routes” (p. 56). The plan does not speak to prohibiting development or complete preservation of natural areas, rather the intention to balance human use with environmental protection and to limit use of these natural areas. This approach will not prohibit disturbance of riparian and other sensitive naturally-occurring ecosystems.

The MDP recognizes that the city centre area does in fact contain a system of built up areas, parks and natural areas, and encourages a “green network” that will accommodate a variety of active transportation options including walking, cycling, cross-country skiing and in-line skating (p. 68). The document indicated the need for a continuous river trail system that extends across the entire waterfront of the city centre. The MDP explains the importance of environmental stewardship, defining this practice as “developing exemplary practices in how the natural environment is managed and protected to minimize the adverse effects of development . . . the goal is to respect natural systems and their limits, minimizing the region’s ecological footprint as growth is thoughtfully and sensitively accommodated” (p. 99). These statements within the MDP ultimately signify a change in world view, as for the first time a planning document from RMWB identifies the need to protect nature for a non-human benefit. Unfortunately, with the extent of damage already done within the city centre, this commitment comes too late.

Biodiversity is highlighted as a critical element to consider as the Municipality grows, and articulates this by saying:

“healthy and well-functioning ecosystems support the region’s high biodiversity, its economic development, an outdoor lifestyle, and the overall well-being of residents. As the population and economy grows, associated development is placing increased pressure on the natural environment. Protecting and managing the natural environment, as well as minimizing the impact of development, is fundamental to achieving a sustainable future for our region. Action on the environment often requires a multi-jurisdictional approach, with the cooperation and collaboration of different levels of government” (p. 102).

Under direction 2.1 of this document, entitled *Healthy Ecosystems that Support Biodiversity*, areas that are highlighted include respecting natural habitats and ecological corridors, protecting and restoring riparian areas and wetlands, and adhering to environmentally responsible practices. Overall, the MDP provides very clear and robust statements toward supporting the protection of natural areas throughout the Municipality.

2012 Lower Townsite Area Redevelopment Plan. In 2011 and leading through 2012, the Regional Municipality of Wood Buffalo commissioned Urban Systems Ltd. to complete the *Lower Townsite Area Redevelopment Plan* (LTSARP), which is a comprehensive document to outline urban development requirements for the city centre area that accommodate future growth forecasts. Only draft notes from this study were available for use in this research, as the final report was not yet approved by Council.

Overall, the city centre is now being re-designed from scratch and the majority of the city centre buildings will be demolished and rebuilt (R. Taylor, personal interview, January 7, 2012). This rebuild is a factor of sudden and imminent population growth, and the need for a much different development density and configuration of urban fabric. With little to no natural areas within the core of the city centre, this would be an ideal opportunity to instill a new ethic of

environmental protection and explore ways to incorporate replicated nature in the city. This type of intervention would support an initiative by the Municipality that strives to provide outstanding public open space for its current and future residents. Mayor Blake has stated publically that RMWB will soon become Canada's most sustainable municipality, in addition to the following excerpt:

“there’s a growing trend in Canada for younger people to live in urban environments that offer convenience and meet their lifestyle needs. For example, many people choose to live in urban environments that have vibrant arts and cultural scenes, great public spaces, a diversity of shops and services, schools and parks, places to socialize, and that are pedestrian or cycle oriented. We must strive to meet those needs in Fort McMurray — and I’m confident that we can. Of course, there are other challenges and we are equally committed to addressing them as well. For example, while the development of the oilsands has generated considerable prosperity in our region, we know the risks of relying on a single industry, which is why we are also looking at ways to diversify our economy and make it more resilient” (Blake, 2011).

Ultimately, the LTSARP makes provisions to accommodate growth of a tripling of the city centre's population over the next 18 years. As it relates to natural areas, the LTSARP makes recommendations for improved recreational access to the waterfront to accommodate the recreational needs of all city dwellers. These improvements include filling in of lower lying riparian areas for the purpose of public plazas and formalized public open space, the construction of continuous walls along the water's edge, where the shores are most vulnerable to erosion, and the enhancement of natural areas with walking trails and other passive recreational activities. The plan area includes the entire city centre, and includes a development density for some areas that is more than two times the density of any other Canadian city (measured by floor area ratio). More detailed design elements related to public use of any remaining natural area in the city centre will be resolved in an upcoming design initiative for the entire Clearwater and Snye waterfront. This project was only beginning at the time of this research.

The LTSARP centers around creating a world class and densely populated downtown that provides an array of place-based urban amenities. For years, RMWB has claimed that the natural environment helps to define sense of place, and the LTSARP provides a significant opportunity to include any remaining natural areas as an integral part of the city centre. The brand of having nature define sense of place has been used for the entire Municipality and is less specific to the city centre. From site visits to the city centre, the evoking image of naturalness is not at all found on the ground, only seen visually by looking at the surroundings beyond the city centre. Using nature to define sense of place is not applicable to the city centre.

2012 Waterfront Animation Plan. In March 2012, RMWB retained Urban Systems Ltd. to complete a new waterfront masterplan for the entire Snyc and Clearwater interface with the city centre. The word “animation” is particularly important, as there has been strong direction from RMWB that this plan will bring many people to the waterfront districts for active use of this public amenity, and animation of the public realm. The LTSARP suggested that the waterfront will become a unifying element of the city centre that will help create a strong sense of place, and accommodate a ranging program of activities. The Waterfront Animation Plan was only at its very inception during the time of this research. Objectives of this current study include:

- an inventory of existing uses and development within the recreation zone, which includes all remaining natural areas;
- overall design guidelines, design briefs, and program options for the recreation zone (including actions and phasing) - this will outline how each park relates, connects, and interfaces with one another and surrounding development; and

- detailed design guidelines, design briefs, and program options for each park identified in the 2012 LTSARP (including actions and phasing, with priority given to the Snye park area) - these will be uniquely developed for each park – adding to the character and quality of the environment.

Ultimately, the fate of all remaining natural areas in the city centre will be delineated by this plan as it determines future programmed uses, preservation strategies and ways in which these areas connect with urban fabric. Given this plan was only in its inception and not approved by RMWB Council for public consumption, its findings were not available for use in this research. From discussing details at the inception of this plan, indications suggest strong direction from the Municipality to maximize development, with only retaining natural areas in the city centre as required by regulatory agencies. This will result in conserving natural areas within the riparian areas of the Hangingstone River, and a limited buffer of approximately 10 to 30m along the shoreline of the Clearwater River.

Supporting Provincial Policy. Provincial Acts related to the protection of natural areas in urban environments include the *Environmental Protection and Enhancement Act, 2000*; the *Municipal Government Act, 2000*; the *Water Act, 2000*; the *Wildlife Act, 2000*; and the *Public Lands Act, 2000*. The most rigorous of these Acts related to the preservation of natural areas would likely be the *Public Lands Act, 2000*, which stipulates that any land that is the bed and/or the shore of a surface water body may be claimed as public land, giving the Province the ability to take title to this land and prohibit any alteration or disturbance to the land. Within the city centre boundaries, bed and shore would be limited to the named rivers, creeks and wetlands, as well as their shorelines that typically includes the extents of any flooding. Protection of these

lands is at the discretion of the Province, and on occasion it may not exercise its right to claim shoreline areas. The *Water Act, 2000*, is arguably as pertinent as the *Public Lands Act, 2000*. The *Water Act, 2000* states that the Province has jurisdiction over any water body, regardless of its permanence including any wetland, drainage channel, river, creek, stream, etc. No alterations can be done without approvals under this Act.

In relation to the anticipated alterations of the natural areas that will be prescribed by the 2012 Waterfront Animation Plan, supporting provincial policy will delineate required forms of compensation for any disturbed natural areas. Due to the active alteration of the shorelines through dredging and historical active use of the shoreline for industrial activities such as shipping, provincial agencies will likely permit any proposed alteration to pre-disturbed land. In order for provincial agencies to require protection for natural areas, they must demonstrate that these ecosystems are intact and have not been disturbed in the past and simply re-established. Riparian and aquatic areas will certainly require compensation for any disturbed areas or improvements, such as shoreline re-grading, removal of riparian vegetation, installation of piers and concrete shore walls, or new boat launches. All of these noted improvements are anticipated for the city centre natural areas. Compensation will likely take place through monetary payments by RMWB, or through offsite reclamation that will not directly benefit the city centre.

Supporting Federal Policy. Federal laws and Acts that pertain to the protection of natural areas within the city centre area include the *Fisheries Act, 1985*; the *Migratory Birds Convention Act, 1994*; the *Species at Risk Act, 2002*; *Navigable Waters Act, 1985*; and the *Canadian Environmental Protection Act, 1999*.

Any development that affects fish and their habitat must be scrutinized under the *Fisheries Act, 1985*. Any in-stream activity that creates any harmful alteration, disturbance or destruction (HADD) to riparian areas and water bodies, must obtain an approval and while a HADD may in fact be authorized, developers must demonstrate prescribed compensation to offset the harm done to fish and fish habitat. Ultimately, reclamation of previously disturbed habitat areas is permitted for compensation areas, meaning that areas that are slated for disturbance (that have already been previously disturbed in some way) may result in the availability of reclamation resources for other areas within the confines of the city centre. *Navigable Waters Act, 1985* approval would be required for any in-water or on the bank infrastructure. A review would be done to determine if there would be any impact on navigation of the water body.

Other federal Acts noted would also be triggered for any further development within the city centre. Today, there are no recorded or observed species at risk within the boundaries of the city centre (EDS Group, 2009). There are, however, occasional migratory birds that pass through this site throughout the year, while development is only restricted for those durations where active nesting is taking place. This means that natural area preservation is not strictly enforced by any federal Act for lands within the city centre boundaries, as there are means of disturbing habitat areas and offsetting this disturbance by compensation (either monetary of direct reclamation anywhere in Canada).

Current Development Conditions: Plan View

Community Description. The modern day city centre contains predominantly low lying structures and development in a gridiron pattern. With exception of the two municipal buildings

along Franklin Avenue that extend to seven storeys and nearby apartment buildings that range from five to twelve storeys, all other development is no higher than approximately three storeys. Commercial development is predominantly located along Franklin Avenue, which extends from east to west across the city centre area. Industrial development is focused along the shores of the Clearwater River, strategically located to have direct access to the water's edge. Residential development is intermixed within the community, but predominantly lies between commercial and industrial development areas. Public open space includes several pocket parks along Franklin Avenue and within residential areas, with natural areas including riparian areas, low lying flats, and pockets of treed areas along the water's edge.

For the most part, industrial development has eradicated the majority of natural character of the waterfront, and any intact natural area has been preserved by the nature of flooding that has kept these lands undevelopable without significant re-grading. Recreational amenities are concentrated on MacDonald Island, including one of Canada's largest multi-purpose recreational centers that houses a swimming pool, hockey arena, library, play spaces and outdoor play areas. The Island also has a golf course that covers much of its upland area. MacDonald Island is only accessible to the city centre via a single vehicular bridge at the far west end of the city centre.

Development density has been extremely low, and in character with many emerging towns across western Canada. At its current density, the city centre has reached capacity at approximately 80,000 people, with few remaining parcels of land available for new growth. The 1974 General Plan suggested that the city centre area could contain up to 60,000 residents before a shift in development approaches would be required. Over the past ten years, densities have been increasing to accommodate yet another surge in population increase.



Figure 17 - 2011. Remaining natural areas are located along the water's edge. This large tree stand is zoned as residential development and will be land filled to bring it to a suitable building elevation. Current zoning does not protect any of this treed area as natural preservation.

Growth patterns were based on traditional town planning principles, with a main street spine running through the community, civic functions and commercial amenities within a core area, residential areas surrounding the civic and commercial area and industrial development near water. The community has been elongated as a result of being land locked by water on three sides, and limiting terrain on the fourth. By the mid-1970s the entire city centre had been developed in some way, with exception of small clusters of natural areas that were impaired by environmental limitations. It was acknowledged by Cohos (1974) that “the need to enrich man’s living environment by the preservation of natural vegetation and by the quality of that which is created by man can be more fully realized by concerned and carefully planned development than

can be by the traditional development prevalent today” (p. 61). Obviously it was recognized that the development mentality of this community, even back in the mid-1970s, was seen to disregard the importance of natural area preservation.

Influencing Factors of Growth Patterns. Fort McMurray was first developed around a transshipment facility where the rail line met the waterfront, providing a strategic transportation hub between Edmonton to the south and abundant resources to the north. This resulted in industrial development along the waterfront, which is arguably the use that is least sincere to natural area preservation because of the large areas of land that were flattened. It has been previously noted that the community is land locked on all four sides by steep terrain and water.

At its inception, the transient nature of this community - being a town that was built to serve a resource extraction process only until it was exhausted - led to more temporal developments with many people only living here for short periods of time. Ultimately, there was low investment made in any traditional development within the community, in the fear that markets for local resources could collapse, or the resources could run out (Urban Systems, 2012). Today’s conditions are much different, whereas there is considerably more certainty that the local economy will thrive, at least until the global reliance on oil comes to an end. On the other hand, many “locals” are still only living in Fort McMurray for short periods of time. According to the 2010 census, 25% of the population of Fort McMurray is fly-in-fly-out, meaning they are only in the city for a short period of time for work, while calling distant communities their home.

Modern urban planning principles use a ten-minute walking distance as a means of determining maximum distances between daily amenities such as a home, shopping store, school, park and other basic amenities. This trend, however, has only recently emerged and was

not a consideration in the past planning decision-making for Fort McMurray. Due to the large distance between many essential amenities, residents are reliant on passenger vehicle transportation. As more people move to the community, there are more cars. More cars result in the need for larger parking lots and more significant roadway networks. Figure 18 shows the cross section of Prairie Loop Boulevard that is now being constructed, which includes four wide lanes of traffic. The imposition of car-friendly development has a direct impact on available public open space for natural areas and passive parks. As the new city centre plan is implemented for this community, a more substantial public transportation system is being implemented. This will inadvertently reduce parking lots, allowing for more buildings. Roadways will narrow somewhat, allowing for bicycle lanes and wider sidewalks that are more pedestrian-oriented. In all, while the public realm will become more pedestrian friendly in the conversion to a new urban pattern, available natural areas or even human constructed naturalized areas are not part of the emerging mindset.

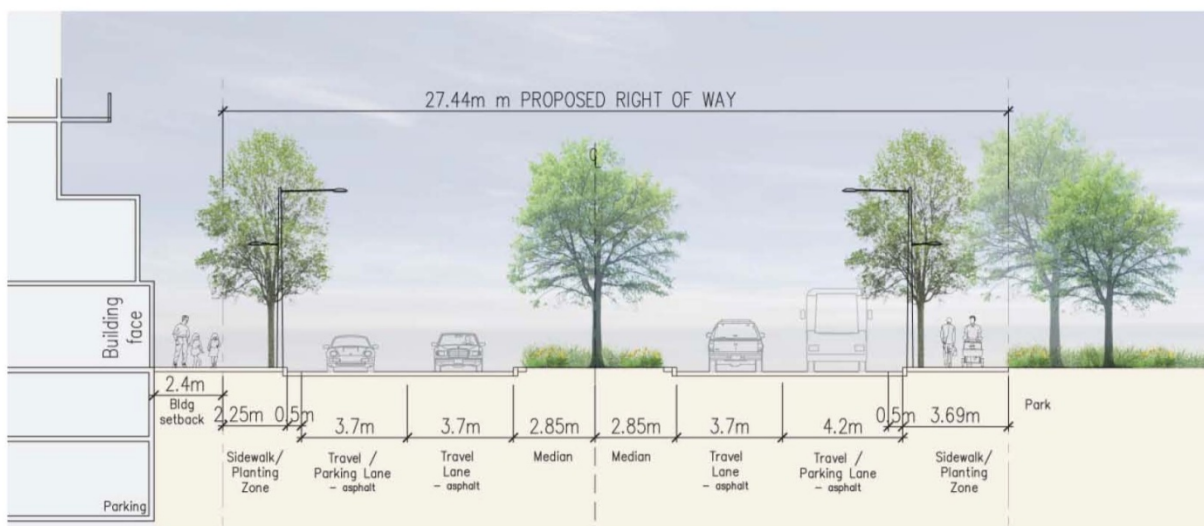


Figure 18 – cross section of Prairie Loop Boulevard including ornamental tree plantings. Image credit: Urban Systems Ltd. (2012).

Integrating Natural Areas into Urban Form. With respect to site development in past generations, there has been little to no effort made to integrate natural areas into the urban form. There is also poor connectivity from the developed areas of the downtown and the waterfront, with most users travelling to the water's edge by passenger vehicle. Subdivisions were developed without consideration for local topography and vegetation, and street patterns are in either rectangular or looped grid (Cohos, 1974). Maintaining this street grid did not allow for any development to work with natural site grades, or to avoid removing sensitive natural areas. Based on site visits and air photo analysis, treed areas within the city centre are predominantly formal plantings on disturbed lands that are typically not native species. Along the shores of the rivers, vegetation was removed to accommodate commercial and industrial use of the shoreline. As a result, these natural areas were not preserved given they would impede access for uses that drove the local economy.



Figure 19 – 1951. Air photo of the city centre. Source: Urban Systems Ltd. (2012).

Current Development Conditions: Perspective View

Community Culture, Identity and Sense of Place. A core component of First Nation cultures and practices include the passing of oral tradition and stories of their past. Over successive generations, these people have passed on their history and cultural values through storytelling. Even today, elders hold this responsibility. As a means of understanding the history of the land, land planning professionals work with local First Nation communities and their elders to collect stories to depict the history of the land around us. For most Euro-Canadians, culture and identity of our communities is typically captured through writings and published work.

Culture can be defined as “a way of life that characterizes a particular group, and includes the ideas and behaviours that its members share, as well as the objects, or ‘material culture’ that they produce” (Cox, 1989, p. 29). There are substantial variations between the cultures of the First Nation, Metis, and Euro-Canadians. In particular, First Nation world view stresses the universal interdependence of creation (Sioui, 1989), conceptualizing all components of the world as interlinked in a sacred circle of life (FMA, 2006). Balance, reciprocity and respect are fundamental tenets of the First Nation worldview and underlie human relationship with the land (Coutu, 1999). Within the First Nation culture there is a value system that defines both individual and community level responsibilities to protect the land, whereas this has not been the case of the European descendents that have since called the Athabasca region and the Fort McMurray city centre home.

For years, RMWB has touted its identity as a group of communities that are surrounded by the beauty of the natural environment. Land-based activities continue to be integral to the

cultural identity of the people of the Fort McMurray region, and also to the First Nation and Metis inhabitants of the area. According to Athabasca Chipewyan First Nation (2003), “although the history of the land use of our people includes many changes, the core of their identity and culture comes from the relationship with the land” (p. 2). According to the Fort McKay First Nation (1994), trap lines have become the land base on which the traditional lifestyle is still possible (p. 2). Sense of place for the First Nation and Metis to this day remains based on the natural landscape.

For people that traditionally lived off the land, a change of diet and declining use of the traditional foods of the area represents a loss in culture and cultural identity that negatively affects not only physical health, and also mental-emotional, social and spiritual health (FMA, 2006). “We eat not only to nourish our bodies but also to nourish our souls. Food helps to express who we are and who our ancestors are” (Canadian Journal of Physiological Pharmacology, 1995, p. 785). While this study focused on First Nation health, its findings demonstrate health effects that would be consistent with all humans. Local food production is not common in Fort McMurray, with its food and goods shipped in from other larger centers. There is no farmers’ market or community gardens in this community, which are great venues to make available local and healthy foods, stimulate a localized economy, demonstrate self-reliance of the community, and bring people together.

The city centre lacks a sense of place. Development to date has been put into place with a boom-or-bust mentality, where there is a lack of permanence. Since the late 1800s, the study area was home to predominantly transient residents. Typically the man of the household would be off working on distant sites, leaving women and children back at home in Fort McMurray.

The 1974 General Plan (Cohos, 1974) indicates the problems associated with the town having a much younger than normal demographic, and also a high proportion of women and children living day to day in the community (pp. 59-60). Today, with the rise of technology and much more effective and accessible transportation, working men and women commute to the community from outside cities and provinces on a regular basis, predominantly by air travel, leaving families back in distant communities. The temporality of many of those who live in the community is a significant problem when trying to establish a sense of place centered on families who call this home.

Community Pride. Based on several visits to the community, a lack of local pride by individuals on private property is very evident. Many of the homes (see Figure 20), and even commercial buildings, lack façade and exterior upgrades, and even interiors of buildings are minimally renovated. Private yards are rarely adorned with enhanced plantings, whereas they commonly store vehicles and other equipment to serve homeowner's occupations and collection of relics. It appears that homes are more places for people to rest in between work schedules, and a more lucrative investment without having to input renovation or upkeep costs. With extremely high demands in housing and commercial property in the city centre, values are still considerably high regardless of the condition of the building structure (Urban Systems, 2012).

The streets and community parks, on the other hand, are generally maintained, litter free and complemented with current furniture. Park furnishings such as benches, waste receptacles, washroom buildings, and fencing must all be made of non-flammable materials, due to ongoing problems with arson and other reckless acts of vandalism. Entrances to parks and trails are typically lined with large boulders to prevent unwanted access and subsequent damages.



Figure 20 – 2011. Typical residential district of the Waterways neighbourhood.

Numerous playgrounds are placed within community parks, including traditional play equipment, skateboard parks and formal outdoor hockey rinks and multi-use pads. Community parks are of the few community areas available for gatherings and promoting socialization between residents, in the absence of a public square or other urban-based gathering area.

Throughout the community are numerous dump sites on public land that accumulate large debris and household waste. The Municipality has considerable challenges in controlling unauthorized dumping, particularly in the remnant natural areas (A. Brown, personal interview, May 27, 2010). These dump sites demonstrate a complete lack of respect for the community, and hinder personal experiences in the few natural areas that are remaining in the city centre and surrounding natural areas. An example is shown on Figure 21.



Figure 21 – 2011. One of numerous dumping sites within nearby natural areas.

Daily Life. This research began with a literature review of documented theories of the human-nature relationship and human preference for nature, as well as the health benefits of human contact with nature. Studying the historic connection that First Nation people had with nature and the sudden separation from the natural world due to European influences is a testament to the effects to human health when physical and spiritual contact with nature is degraded.

For First Nation people, there is strong evidence to support that their departure from traditional practices has resulted in significant health and social problems amongst their communities. Today, First Nations have of the highest rates of obesity, type-2 diabetes, lung cancer, alcoholism and heart disease by race amongst all other Canadians (Health Council of Canada, 2005). Royal Commission of Aboriginal Peoples (1996) stated that:

“Skeletal remains of unquestionably pre-Columbian date . . .are, barring a few exceptions, remarkably free from disease. Whole important scourges (affecting Europeans during the colonial period) were wholly unknown . . . There was no

plague, cholera, typhus, smallpox or measles . . . Cancer was rare, and even fractures were infrequent . . . There were, apparently, no nevi (skin tumours). There were no troubles with the feet, such as fallen arches. And judging from later acquired knowledge, there was a much greater scarcity than in the white population of . . . most mental disorders, and of other serious conditions” (p. 100).

Other events over the past 100 years have also affected First Nation and Metis populations across Canada, and were also prevalent in the Athabasca region. Most notable was the residential school dilemma, which over the past century saw First Nation and Metis children forcibly taken from their homes and placed in public schools; approximately 35% of adults over the age of 45 were also forced into this education systems, some remaining in these institutions for an average of six years (Health Council of Canada, 2005). Many of those who attended are of the opinion that their health and well-being was drastically affected by this experience (National Aboriginal Health Organization, 2004).

Today’s First Nation and Metis people living in reserves and settlements within the Municipality live in very poor and impoverished conditions, and arguably no better than people in most developing countries. This is not the case within the city centre, where social conditions, access to health care, education, services and other support amenities are readily available. At the same time, Fort McMurray has always been challenged with providing modernized social conditions, with struggles associated with transient populations. As noted earlier, Klondikers passing through the community in the late 1800s brought with them reckless behavior. Today, Fort McMurray is infamous for problems with drugs, sex and alcohol (Tetley, 2005), along with other infrastructure-based challenges. This on-line news article states:

“The local authorities are struggling to cope. They cannot approve any more buildings in the town centre, (the deputy Mayor) says, because the sewerage system is overflowing. Doctors at the hospital complain of being overwhelmed; housing costs deter new recruits. The sole road connecting Fort McMurray with the rest of the

province is crowded and deadly. The only way for the town to raise revenue to tackle these problems is to increase property taxes. But locals complain that they already suffer from exorbitant local prices, and want the oil companies to foot the bill. Crime is another problem. Many of the thousands of workers who live in barrack-like accommodation at nearby mines and construction sites come to town at weekends, to drink a beer or ten, brawl, and buy sex and drugs. "This town is awash in cocaine," says one long-time resident. Marijuana, crack and crystal meth are also widely used. Drug abuse in the northern oil patch is more than four times the provincial average" (Tetley, 2005).

The climatic conditions of Fort McMurray are unique amongst most other western Canadian cities. Seasonal variation in light, temperatures and rainfall form the basis of major shifts in behaviour and psychological states (Heerwagen, 2008). In northern communities across the world, there are significantly reduced daylight periods during winter months, and also significant seasonal variation of temperatures. Reduced daylight in winter months is associated with increased levels of Seasonal Affective Disorder (SAD), which can be described as a yearning for more daylight. Some of the strategies to relieve symptoms include bright light therapy, better access to indoor daylight, and increased time outdoors (Heerwagen, 1990). Fort McMurray has extreme variations in seasonal temperatures – ranging from -50C in winters to +35C in summer – and variable daylight with only as little as 64 hours per month during the winter vs. 286 hours during the summer (Environment Canada, 2012). The community has recognized the significance of SAD in Fort McMurray, and as a result has encouraged current studies on implementing innovative lighting throughout the downtown in particular areas of the public realm to offset the impacts of extended darkness.

Contact with Nature. Studies on the health concerns of First Nation communities throughout Canada often refer to the change in the People's way of life causing many of today's concerns (Health Council of Canada, 2005; National Aboriginal Health Organization, 2004).

Counteracting the lifestyles imposed on First Nation people by European descendents in the early 20th century, many First Nation communities are now seeking more legislative authority over their people and the ability to return to traditional ways of life.

From the city centre there are three prominent locations where people gather at the waterfront. The first is at the confluence of the Snye and Clearwater, where vehicles park on top of a sandbar or can drive right up to the water's edge. This area is almost exclusively accessed by vehicle, with people parking on the sand bar and predominantly remaining in their vehicles. The second significant waterfront development is a wood boardwalk placed along the river's edge with benches to provide a view of the river. The third waterfront development within the



Figure 22 – 2011. Snye side recreational area including a wood boardwalk and benches, boat launch and area for vehicles to drive directly in the water.

city centre is an off-highway vehicle staging area that allows people to load and unload quads, skidoos and other recreational vehicles. There is also a boat launch at this location, seen on Figure 22. All of these access points to the water and riparian areas are highly disturbed landscapes that are most commonly accessed by vehicle.

A visit to Fort McMurray will quickly demonstrate a local love for large trucks and recreational vehicles. Off highway vehicle use is extremely popular, with an array of quad and snowmobile trails leading from the city centre into the surrounding forested area. Many of the trails are also frequented by large trucks. Over the past decade the municipality has been working to install barricades and traffic control devices such as large boulders, steep grade drop-



Figure 23 – 2011. Informal off-highway vehicle river crossing near the city centre, causing significant shoreline and in-stream damage

offs, and steel fences to prevent access into many natural areas by off highway vehicles and trucks (EDS Group Inc., 2009). Fences are commonly pulled out, boulders are winched out of place, and other means of controlling access are commonly removed. The damages to the surrounding environment as those shown on Figure 23 are substantial, including soil erosion and rutting, over-compaction of adjacent tree roots, disturbance to wildlife, contamination of river water and destruction of public property.

In early 2012, the RMWB initiated a request for proposals to implement a nature-based playground in the Timberlea neighbourhood, which is part of Fort McMurray yet a suburban development to the city centre. Working with the public and Catholic school boards, the Municipality envisioned the conversion a traditional school yard into a nature-based playground that would be the first of its kind for the Municipality. Nature playgrounds have existed in Europe for many years, while they are only now emerging here in western Canada as a new trend in play. The request for proposal document (Regional Municipality of Wood Buffalo, 2012) began its introduction by indicating:

“Children to longer have the freedom to roam or explore their neighbourhoods, walk to school, or even climb a tree as previous generations have. School grounds have become flattened, paved and sterilized landscapes with modular playgrounds. The obesity rates, diabetes, asthma and ADHD continue to increase in our children and youth. The average screen time for kids in North America now exceeds 52 hours per week. Potentially the children of today will have a shorter lifespan than their parents” (p. 11).

The main intent of the project was to reconnect children with nature, with defined spaces to “engage gross motor skills, cognitive skills development and the senses . . . create an environment that promotes increased attention spans, reduced absenteeism, creativity and collaborative play and learning . . . [to promote] open-ended play, allowing quiet, individual,

group, multi-generational and sensory play” (Regional Municipality of Wood Buffalo, 2012, p. 11). Upon receipt of proposals from the industry, the project was cancelled due to a lack of financial support by RMWB.

There are various degrees of naturalness that humans are exposed to within the city centre. Along some sections of the Clearwater River shoreline and within the Hangingstone River riparian area, there are patches of pristine wilderness that have yet to be human altered. These areas, however, have been frequented by hikers as seen by the number of informal trails strewn over these landscape patches. Pristine natural areas are very few and relatively small, thus not providing a significant ecosystem for people to enjoy. The surroundings of Fort McMurray offer more natural landscapes, so residents that seek this type of experience must leave their community. For the most part, physical connection to the natural landscape is limited to disturbed patches of land that have avoided development only because they exist within active flooding areas and have had little to no development potential.

Site Specific Example

Longboat Landing. This new urban development is located at the far east end of the city centre, and includes a multi-family home development. To date, this area of land was never developed, as its native ground elevation is within the 40-year flood plain and is susceptible to frequent flooding. Until the past few years, this area was predominantly covered with native trees and grassed meadows. Upon submission of a detailed development plan, the Municipality approved the submitted plans to permit development. Over the past few years RMWB has created Prairie Loop Boulevard, a continuous ring road that travels near the periphery of the community, at an elevation of 0.5m above the 40 year flood level. This road provides some



Figure 24 – 2009 air photo. Longboat Landing development north of the Hangingstone and west of the Clearwater River.
Source: Urban Systems Ltd. (2012).

protection against annual flooding for most of the city centre. Longboat Landing is located outside the confines of this flood protection dike.

As seen through air photo review (see Figure 24) and site visits, the entire parcel of land was stripped of all surface vegetation. In order for development to be approved, the entire area required land filling to ensure all development of inhabitable structures is above the 1:40 flood levels. Approximately 3m of fill was required over the entire area, and this material was hauled in from other construction projects in the area. Figure 25 demonstrates this filling activity. Upon review of the development boundaries for this site, property lines in some areas are immediately against riparian areas of the Hangingstone River, leaving no buffer of natural areas between the top of the river bank and developed areas. This demonstrates that there was no effort made on the part of the developer to consider the ecological effects of this development on



Figure 25 – 2012. Land filling natural areas to create a suitable elevation for the construction of residential units adjacent to the Hangingstone, in Longboat Landing. Fill material is being placed beside the edge of the riparian area with no buffer.

the sensitive natural ecosystem. This research process was not successful in determining if any environmental approvals were completed prior to initiating any of this work.

Today, there are no trails, parks or natural trees found within the Longboat Landing development, and the developer has obviously chosen to maximize housing yields on this land. Fill material allows for much of the community to be somewhat elevated from its surroundings, offering a more strategic view of the surrounding natural environment. Unfortunately, the current layout of this community has the backs of the homes facing the Clearwater River. This configuration of homes will prohibit views of the river from the public realm. Views will only be available to private land owners, from their rear yard decks and back yards. Views of water are highly marketable, and as a result the less of a treed buffer between homes and the rivers, the higher the value there will be assigned to these lots.

Case Study Assessment: Questions and Findings

1. *What public reactions to different ecosystem types or characteristics of natural areas can be observed in Fort McMurray's city centre?* Because of the limited amount of natural areas within the city centre, it is very difficult to assess which characteristics of urban natural areas people are most compelled to. Also, restoration efforts have not taken place within the city centre, therefore it is not possible to determine which landscapes or characteristics of urban natural areas people are most compelled by. Development patterns demonstrate the removal of trees to provide an unobstructed view from urban development to the rivers, however the rationale for this cannot necessarily be attributed to public preference for views of water over retaining forested areas.

2. *Is there a correlation between the human values observed in case studies and the protection of natural areas in urban environments?* First Nation and Metis communities were semi-nomadic, and they moved from place to place following seasonal food sources to best assure their survival. Access to clean water, strategic transportation and to the surrounding environment could allow communities to remain in one place, while many day-to-day survival activities such as hunting and gathering necessitated communities to follow these renewable resources. As populations increased, pressures on the renewable resources such as fruit, fish, meat and furs increased. Co-existence required humans look to new areas for harvesting these supplies while others recovered. This world view accommodated the protection of natural areas within the places where these people developed their communities and within the area that is now the city centre of Fort McMurray.

European values instilled into the region led to more permanent developments and inhabitation. With the construction of amenities such as rail lines, shipping yards, hotels and stores the community now known as Fort McMurray was solidified. The view that basic essentials could now be traded for, shipped over long distances, or preserved using new technologies changed the way in which we planned our lives and our communities.

Communities no longer needed to provide for all of the required services and amenities for its people, with the rise in mobility. At the same time, many resource based communities are not guaranteed to prosper over a long term, and the collapse of the resource often means the complete closure of the community. The mindset of a temporal community, wherein the community may become a ghost town upon depletion of its primary economic driver, may be a factor in many of the social problems and lack of respect for the natural environment as seen in Fort McMurray. There are over 100 recorded ghost towns in Alberta (Ghost Towns Canada, 2012). Most of these communities were abandoned after the depletion of resources, pulling railway tracks, or re-routing of a highway.

While past plans and policies for the city centre recognized the natural environment in practice it has been ignored and not considered a priority to protect. Today's planning efforts now need to accommodate a surge of population growth. Practices such as landfilling riparian areas and creating new wall-lined riverbanks adorned with an array of urban amenities are prevalent. From the time of purely First Nation inhabitation to today, there has been a significant shift from an ecocentric value system to being purely anthropocentric. Resource exploitation and a strong economy is still front of mind.

Decisions seem to be made based on purely an economic basis. With surreal demands for new housing in this community to accommodate the surge in population, development is in high demand by consumers to ensure the booming oil sand industry can accommodate its required work force. Developers are maximizing densities in order to place as many housing units as possible into small areas. Land parcels that were not economically feasible to develop in the past were the reason for most of the preservation of natural areas in this community. Today, this land is now being drastically altered to suit new growth as housing prices have reached the point where practices such as land filling are now cost effective options.

3. *What are the historic trends of natural area preservation and uses within the Fort McMurray city centre?* Since the formation of the community, the protection of natural areas was not a clear objective to land planning professionals, industrial developers and local residents. This is evident by the pattern of continually eradicating natural areas within the city centre area. While past plans include verbiage related to the need to protect natural areas, this was not the case in practice given early on elimination of most natural areas within the city fabric. Eradication of nature still occurs today, despite the vast array of legislation and policy overarching planning initiatives in RMWB. At its inception and for the subsequent decades, the community was very much a temporal landscape, acting as a transshipment facility and a temporary home for fur traders, Klondike miners, and other resource-based workers.

Planning documents from approximately 40 years ago recognize the value of protecting natural areas, while the deeper meaning in the statements made resulted from an anthropocentric value system. In the 1970s there was still available land for development, considering the population at this time. There was no apparent pressure to begin costly development schemes

such as filling in lower lying lands for development purposes. Any remaining natural areas, such as the ravine systems, were to be made available for passive recreation such as aesthetic appreciation and walking trails. These natural areas have degraded significantly due to human use by evidence of air photo interpretation, as a result of the pressures from adjacent development. Even the developments being approved today permit the complete annihilation of natural areas and not protecting any natural ecosystems within the new urban fabric.

The reviewed community development plans have been reactionary and based on sudden needs for immediate intervention and alteration of the city centre area. For the most part, these reactions have been the result of population surges, and the Municipality not being ahead of forecasting growth and the challenges that the community needs to overcome. Since officially becoming a formal city about 50 years ago, there has been a significant lack of innovation, application of current best management practices, or planning to improve the social conditions. Obvious byproducts of this include a lack of local identity, community culture and sense of place, all of which are well publicized and experienced by residents and visitors to Fort McMurray.

Today, there is considerable pressure for new development. With little to no vacant land remaining, growth must be accommodated through rebuilding of currently developed areas, and increasing density. Rather than following the current low density pattern and a layout that is most conducive to automobile travel, the new development strategy outlined in the CCARP is to create a new urban form that surpasses the density of any other Canadian city and to bring a new type of urban recreation to the city centre. These densities will have tremendous pressures on any remaining natural areas, while in the process of finalizing the new city centre plan there has

been no effort at all to explore the ecological impacts of this growth or strategies for protecting the remaining ecosystems. On the other hand, current policy encourages the protection of natural systems with developed areas, and potentially these high level planning documents have enough rigor to ensure more site specific policy for protecting any remaining natural areas. Access to nature will also be provided by the community's surrounding region, which given the history of human-nature interactions does not bode well for the surrounding region.

The most common nature-based recreational activities for local residents today include off-highway vehicle use. With an abundance of regional trails and immediate access from the city centre, skidoos, quads, motor bikes and trucks dominate the trails and waterfront areas. These types of uses are not compatible with wildlife protection and also cause significant damage to vegetation. Abandoned rail lines and areas that once accommodated transshipment yards are now dominated by recreational vehicles.

4. Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection? Historic planning in Fort McMurray was in fact guided by land planning professionals, and historical documents include verbiage that supports an interest to preserve natural areas. On the other hand, current site conditions demonstrate an inability to facilitate a strong human-nature connection, by evidence of the lack of retained natural areas in the community and the absence of recreational options that accommodate passive recreation such as trail walking, wildlife appreciation or nature interpretation. While there was overarching legislation and local policy that suggested an interest in preserving natural areas, preservation is not evident today due to the way in which the city grew over the past 100 years. While an interest to retain natural areas was suggested in past policy documents, strategies to achieve this

were not included. This suggests that there was an interest in retaining natural areas, while land planning professionals did not have sufficient knowledge in preservation strategies for implementation.

By example of the Longboat Landing development, land planning professionals are still not demonstrating an ability to effectively connect humans with the natural environment. In this example, the entire parcel was not only stripped of all natural ecosystems, but it was also land filled to allow this land to become developable and above the 1:40 year flood elevation. There was not attempt to apply innovative thinking toward ways to include natural features within this new urban fabric. On the other hand, this research did not determine if this was a result of client direction to strip all natural areas, or the inability of land planners to make natural area preservation work.

5. *Is the current overarching institutional framework effective in promoting a strong human-nature connection?* Historic developments on the waterfronts of Fort McMurray demonstrate that overarching Acts, legislation, policies and bylaws were not effective in promoting a strong human-nature connection. These past developments included the removal of all vegetation, and complete re-grading of most of the waterfront. In-stream alterations, including dredging, was common practice and still takes place today. All of these activities are now restricted by provincial and federal legislation, unless grandfathered as in Fort McMurray. This community was developed with a mindset of a working landscape that was developed in such a way to facilitate industrial and commercial uses. Not only did this overarching framework fail to preserve natural areas, but it also did not help foster a strong human-nature connection that First Nation people once had in this region. At the municipal level, historically

there has not been supporting policies to retain natural areas, which has a direct effect on the potential for a strong human-nature connection.

Today, federal and provincial policies have yet to become more robust as it relates to promoting a strong human-nature connection. Local policies and bylaws have also yet to be developed that would support this connection.

6. *What information would RMWB seek in order to promote a stronger human-nature connection?* While there is still support to preserve remaining natural areas, these remnant ecosystems are being considered for new urban development that will lead to considerable alteration of these environments. One of the most evident challenges presented in preserving natural areas is the extreme density of development that must be accommodated in the city centre over the next generation. There also seems to be a nonchalant attitude that, because the city centre is surrounded by nature across the rivers, preserving nature within the city centre is less imperative. RMWB would benefit from knowledge on incorporating high densities of people and urban development, while being able to preserve in-tact ecosystems. Its residents would benefit from education on the range of values that the natural environment has to humans, from both an anthropocentric and ecocentric perspective.

Through densification of the city centre, the community is now crafting one of Canada's first form-based codes as a bylaw to direct all future development within the city centre. The form-based code has the advantage over the bylaws of other cities in Canada given it begins to prescribe uses, materiality and overall aesthetic of the public realm as new development on privately owned lands occurs. This means that as private land is developed, a complimentary aesthetic is prescribed for the adjacent streetscape. The current draft code, slated to be

completed and approved by Council after the completion of this dissertation, provides clear direction for all aspects of the city centre area with exception to the waterfront and remnant natural areas. These outstanding areas will be subject to the recommendations of the upcoming 2012 Waterfront Animation Plan, which will delineate the way in which urban fabric incorporates any remaining natural areas. As these two local bylaw documents are being developed, RMWB would benefit from suggested strategies to include natural features as part of the public realm in both the upland urban fabric (as delineated by the form-based code) and waterfront (as delineated by the Waterfront Animation Plan).

With the amount of proposed development within the city centre in the next few years, public access to the waterfront will become more challenging. A review of previous land planning practices indicates that new development has the potential of restricting access to the waterfront where the only remaining natural areas exist. Through the process of densification and urban regeneration, there will need to be a concerted effort to ensure suitable development of the public realm, to provide residents with access to natural features. To support this, the land use bylaw and site development guidelines must value the benefits of nature for both environmentally- and human-based reasons. Land planning practitioners have a professional and moral obligation to ensure that provisions are made to accommodate nature contact as this community transforms to meet the surge in population. The city centre of Fort McMurray now seems to have a robust collection of municipal policies that support the preservation of natural areas, while there are many conflicting interests in the few remaining ecosystems such as recreational use and the pressure for new development. These policies, as previously suggested in question five, are not effective in promoting a strong human-nature connection. While there

are policies to support the protection of natural areas, there are ways for developers to opt out of this approach to maximize their development yields and therefore economic profitability of the development.

The health benefits associated with contact with nature are not known to RMWB, and are not evident in any currently approved land planning documents, reports and practice. The cancellation of the nature-based playground project this year demonstrates the lack of support for new and creative initiatives and perhaps knowledge in health benefits of the human nature connection.

With the creation of the 2012 Waterfront Animation Plan, bringing the knowledge accumulated in this research will be imperative to help provide opportunities for residents to access nature within the urban fabric for years to come. Establishing a vision for the need to protect natural areas as an integral part of the urban fabric will be to the success of the waterfront development strategy.

7. What impact has the rise of technology had on the human-nature connection, and on the integrity of natural environments in Fort McMurray city centre? Today, with the rise of technology humans are no longer required to have resources for daily needs in close proximity to where they live. People are now able to trade products, resources and other daily requirements on a global scale. The primary resources that the local economy is now reliant on are entirely different, including subterranean oil and gas deposits rather than natural resources on the surface. Today, the natural environment is often perceived as an impediment to the lucrative resource extraction process of the oil sand industry. Perhaps the extreme importance of the oil and gas industry to this community is the cause of disconnect between humans and nature within the

urban environment. It seems that an exploitive mindset in the grand scale of natural resource extraction clouds people's judgment with respect to protecting nature in their own back yards.

The rise of new technologies in the way we move bulk goods changed the human-nature connection. With the arrival of the rail line, followed by the regional highway system to Fort McMurray, water-based shipping became less cost effective and this industry soon collapsed. With the demise of the water-based shipping industry, all of the industrial and commercial waterfront development was abandoned, leaving almost the entire waterfront of the lower townsite highly disturbed as a result of re-grading, compaction, the removal of all vegetation and the abandonment of building foundations. To date there have not been any efforts to reclaim this shoreline (as seen on Figure 26), leaving the site very vulnerable to erosion and the presence of nuisance and noxious weeds. After being abandoned for over 60 years, the waterfront is not a welcoming landscape for people and a positive human-nature connection is not provided.



Figure 26 – typical shoreline condition along the Clearwater River. After years of remaining abandoned, much of the city centre's shoreline is left in this state. Source: Urban Systems (2012).

8. What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection in RMWB? A human-nature connection cannot be possible in the absence of natural areas. Because most natural areas have already been disturbed within the city centre and there is also a concurrent demand for more open space to support a population surge, restoration is essential. Restoration efforts will allow many of the previously disturbed landscapes to return to a more naturalized state, particularly along the waterfront where erosion is very prevalent with a lack of surface vegetation. Restoration efforts may also involve local residents through creating stewardship organizations that allow people to meaningfully contribute to bringing nature back to their city.

During the development process, land planning professionals can be more diligent in working with land developers to try and preserve any remaining natural areas as part of municipal reserve dedications. Stronger arguments need to be made to rationalize the importance of having natural areas embedded within or in close proximity to residential and commercial areas, rather than developing entire parcels and paying cash in lieu of open space provisions. By understanding public demands for natural areas through consultation, land planning professionals can better demonstrate to developers that the inclusion of nature in our cities is preferred and therefore economically strategic. Implementing more public and stakeholder consultation in the development of privately-owned lands to demonstrate the current demands for nature would help land planning professionals be more successful in promoting the human-nature connection.

9. How have emerging global trends affected the land planning process or the observed planning strategies in Fort McMurray city centre? There were two observed trends

through this case study analysis. The first was the demand from residents for recreational amenities closer to their homes to facilitate healthier lifestyles, and the second included a desire to reduce reliance on automobiles. These trends were evident through consultation notes that suggest residents are now demanding recreational options within walking distance of where they live, rather than having to rely on vehicular transportation to access these amenities. There was a clear demand for improved public transit and the minimization of street widths as noted in recent planning documents. These initiatives are meant to make streets more walkable and welcoming to multi-modal transportation, rather than having people relying on fuel-powered personal passenger vehicles. With rising costs of fuel products, RMWB is experiencing a demand from its residents to provide better mobility options within the Fort McMurray city centre, and the ability to use the public realm close to home as a venue for improving personal wellness. These public demands have affected the planning process by delineating a new mentality of streets and the provision of a more safe and comfortable public realm.

10. What strategies are prevalent in these case study municipalities to help minimize ecosystem degradation? There were no observed strategies in place within RMWB to minimize ecosystem degradation within urban development. Municipal policies such as the current MDP highlight the importance of protecting the natural environment; however it does not include strategies to do so. With the current policies in place, there is a suggestion that protecting ecosystems is important while the current developments do not follow suit.

11. What are the varying views and values of nature that can be seen in Fort McMurray city centre, and do these perspectives result in an attitude that supports natural area protection? Based on this case study analysis, natural processes and ecosystems seem to be

perceived as an impediment to development of this city. As an example, any remnant natural areas within the city centre are within floodplain areas which cannot be developed due to the potential for frequent flooding. Rather than exploring ways to use these areas for recreation, RMWB is exploring ways to alter the landscape as to make these lands developable. Privately owned lands that have remnant natural areas, such as Longboat Landing, are now being developed given housing prices are now high enough to allow for significant land re-grading. The attitude of land being simply a commodity for human development and associating value to this land with only economic considerations results in an attitude that does not support natural area protection.

12. *How has human reliance on nature changed over time within RMWB, and what has any change had on the human-nature connection?* The first people in this region were highly dependent on natural resources as a means of survival. Positive ecological health ensured that sufficient food and trading materials were abundant, and there was a high degree of spiritual harmony between humans and nature. Having immediate access to nature within reasonable distances from settlement areas was essential. These people were most compelled by the elements of nature that provided daily survival – food, water and shelter. By far the most essential element to the first people was water, for both a source of life but also transportation. Today, First Nation people experience less dependence on nature, given they no longer forage for food, homes are built from manufactured products, and these people get around using planes, trains and automobiles. While there is a significantly less reliance on nature for day to day living, First Nation culture still centers its spiritual values on nature. Daily living, however, does

not demonstrate the same human-nature connection that this culture once expressed over 100 years ago.

The city centre area of Fort McMurray was first developed as a community to support industrial and commercial activities of the resource sector. Key features such as the river system for transportation and renewable and non-renewable resources for economic benefit made this community strategically located. Since the arrival of European settlers the community had always had a mindset of nature as an economic resource, and this attitude has remained the same until very recently. Only in the last couple of years have there been more robust policies that respect nature for non-monetary values. Protecting nature and encouraging a stronger human-nature connection has yet to occur on the ground, therefore the effects that this recent change has on the human-nature connection cannot be assessed.

2. SUBURBAN DEVELOPMENT: GREATER EDMONTON AREA, EDMONTON ALBERTA

General Description

Natural areas are an essential part of Edmonton's heritage and have helped define the city. For decades, sense of place for the City of Edmonton has been centered on its crown jewel – the North Saskatchewan River Valley – with an array of trails, festival spaces, public parks and other non-programmed open spaces spread alongside the river's edge. At 7,400 hectares, Edmonton's river valley is the largest stretch of urban parkland in North America (City of Edmonton, 2006). This enormous ecosystem dominates Edmonton's landscape, but there are numerous other natural areas beyond the river valley (City of Edmonton, 1992) such as ravine

systems, forests, wetlands and grasslands that are either protected (publically owned) or unprotected (privately owned).

For years, Edmonton has celebrated the considerable feat of preserving the integrity of most of the river valley and ravine system throughout the confines of the city. Figure 27 demonstrates the location of the river and ravine system in Edmonton. There have been alarming losses of natural areas of land to new subdivisions as the city has grown into peripheral areas. Like many other North American cities, Edmonton has seen its share of urban sprawl to resolve demands for new housing and an idealized standard of living that the automobile afforded us. A mixture of social, economic, environmental, and political factors influence the construction of any subdivision, and it is no simple matter to produce a policy or site design that satisfies all of these influences (Hostetler, 2009). While Edmonton boasts a comprehensive collection of environmentally focused strategies, plans and visions, the natural areas they seek to protect have been severely fragmented, degraded, or altogether lost in recent years. The City has grown to the point where it is no longer possible to separate environmental issues, quality of life and economic necessity. All these interrelated, and pressure-laden issues, require the City to balance environmental protection with economic growth and the social fabric of society (Spencer, 2007).

Until the 19th century, natural areas such as forests, meadows and wetlands were seldom looked upon as a resource worth conserving within cities; in the late 20th century, the interest in using existing nature as part of the future green infrastructure in cities increased, even with regard to small remnants very close to houses, roads and other developed areas (Florgard, 2007).

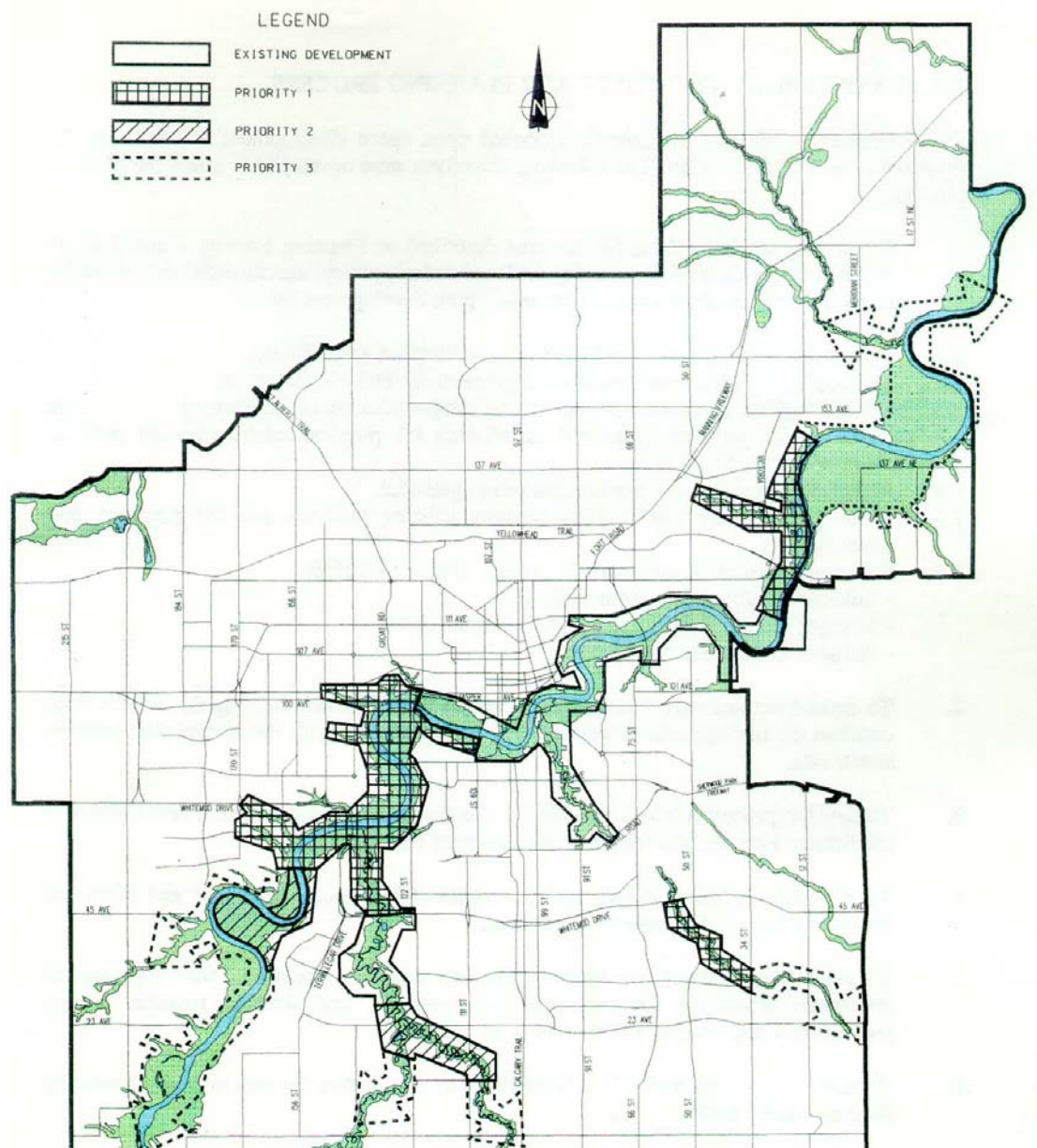


Figure 27 – Extents of the North Saskatchewan River Valley and Ravine System within the City of Edmonton. Source: City of Edmonton (1994), p. 5.

On paper, there is strong interest in Edmonton to retain natural areas as part of public open space that is consistent with the claims of Florgard (2007). However in practice, large naturally-occurring areas were consumed by traditional urban development, while only remnant portions of these areas are actually retained (Geowest, 1993). This pattern continues today.

As of 2008, Edmonton had nearly 3,500 hectares of protected natural areas outside the confines of the North Saskatchewan River Valley (Edmonton, 2010), while a significantly greater number of natural areas are unprotected and owned by private individuals (as seen on Figure 28). It is obvious that privately owned lands are not subject to protection from any municipal policy, whereas they are still obligated to conform to provincial and federal legislation. As an example, it is entirely at the landowner's discretion to clear all of the trees off their private property to convert the land from a native tree stand to agricultural cultivation. At the same time, the landowner may not affect active nesting of migratory birds, while that window is only preventing tree clearing from approximately April 15th to June 30th, as per the federal *Migratory Birds Convention Act, 1994*. Although natural areas provide important ecosystem and societal services, these services typically are not sold nor do they have a market price. Therefore, landowners do not, in most circumstances, receive a return on preserving these natural areas (Boyer, 2004).

Conservationists usually seek to protect landscapes and their conservation values through land purchase or obtaining conservation easements on land (Milder, 2007). Edmonton (2012) notes that:

“in the last several decades, Edmonton has lost many natural areas as land has been converted for development. However, as the incredible value of natural areas became clear, the City made it a priority to protect as many natural areas as possible. The surest form of protection is to purchase natural areas for conservation, and in 2009 the City borrowed \$20M to do this . . . “.

The purchase of land parcels helps to protect remnant patches. From what we now know about biodiversity and the importance of connectivity between a network of ecosystems, there

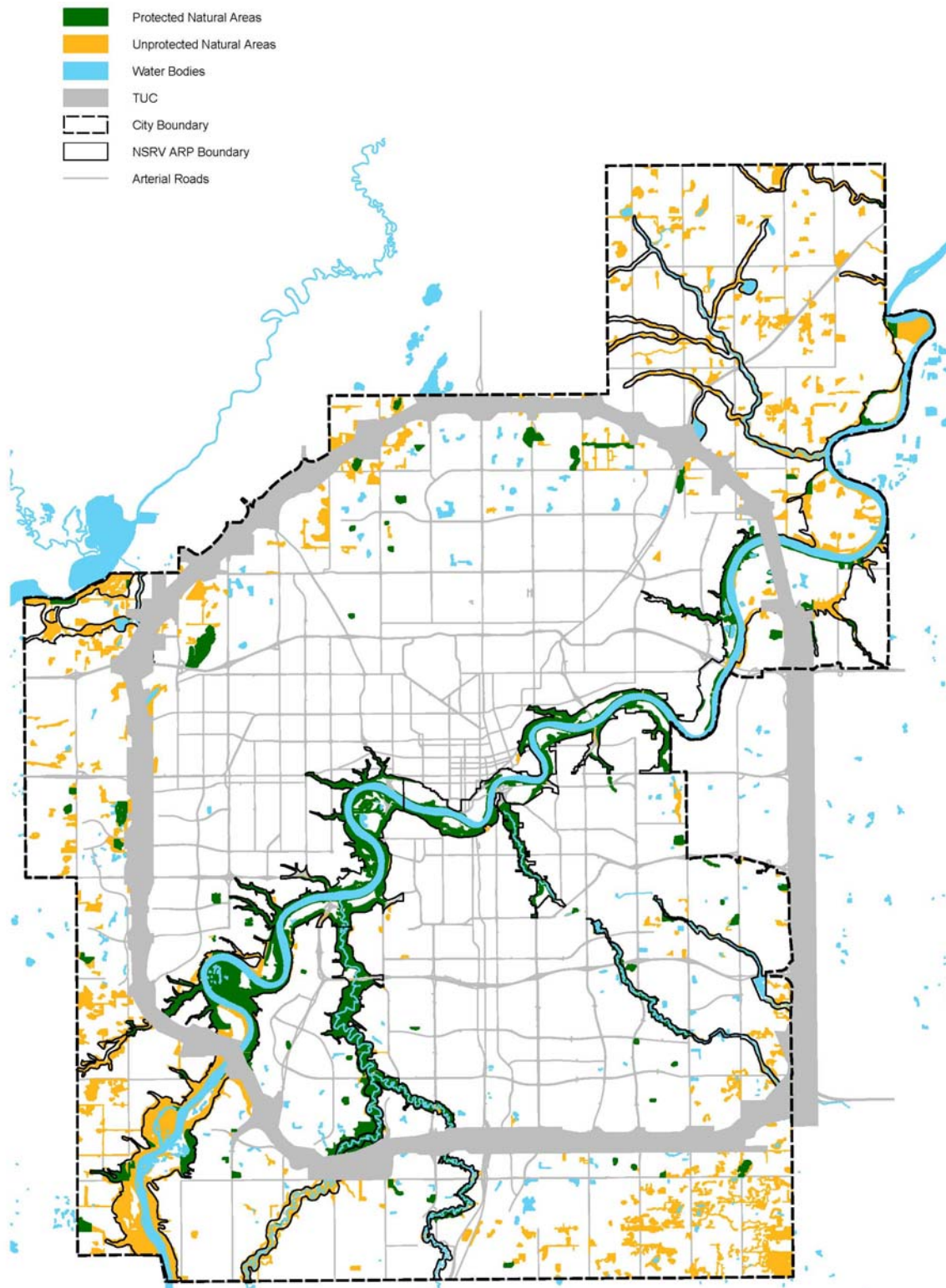


Figure 28 – Protected and non-protected natural areas in the City of Edmonton. Source: City of Edmonton (2012).

are obvious challenges with the pressures of urban development and an urgency to explore protection at a more regional basis.

Population Growth. Alike the cultural composition of the Athabasca region prior to the arrival of European settlers, the Edmonton area was populated with semi-nomadic tribes of First Nation and Metis people. The first European descendants began arriving in this area in 1795, with the initiation of Fort Edmonton. The Fort was predominantly a fur trading business, with a strategic location along a significant river system. In 1894, the Town of Edmonton was incorporated as a community. In 1904, Edmonton became a city, with only about 5,000

CITY OF EDMONTON POPULATION, HISTORICAL

YEAR	POPULATION		YEAR	POPULATION		YEAR	POPULATION
1878	148		1935	82,634		1971 *	436,264
1881	263		1936	85,470		1972 *	441,530
1887 (e)	350		1937	87,034		1973 *	442,365
1892	700		1938	88,887		1974 **	445,691
1895	1,165		1939	90,419		1975 **	451,635
1897	1,638		1940	91,723		1976 **	461,559
1899	2,212		1941	93,924		1977 **	471,474
1901	2,626		1942	96,725		1978 **	478,066
1903	6,995		1943	105,536		1979 **	491,359
1904	8,350		1944	108,416		1980 **	505,773
1906	14,088		1945	111,745		1981 **	521,205
1908	18,500		1946	114,976		1982 **	551,314
1909 (e)	23,000		1947	118,541		1983 **	560,085
1911	24,900		1948	126,609		1984 (e)	563,900
1912	53,611		1949	137,469		1985 (e)	567,700
1913	67,243		1950	148,861		1986 **	571,506
1914	72,516		1951	158,012		1987 **	576,249
1915	59,339		1952	169,196		1988 (e)	580,000
1916	53,846		1953	183,411		1989 **	583,872
1917 (e)	56,000		1954	197,836		1990 **	605,538
1918 (e)	57,000		1955	209,353		1991 **	614,665
1919 (e)	59,000		1956	223,549		1992 **	618,195
1920	61,045		1957	238,353		1993 **	626,999
1921	58,821		1958	252,131		1994 (e)	623,400
1922 (e)	60,000		1959	260,733		1995 (e)	620,000
1923 (e)	61,500		1960	269,314		1996 **	616,306
1924	63,160		1961	276,018		1997 (e)	626,500
1925	65,378		1962	294,967		1998 (e)	636,100
1926	65,163		1963	303,756		1999 **	648,284
1927	67,083		1964	311,804		2000 (e)	658,400
1928	69,744		1964 *	357,696		2001 **	666,104
1929	74,298		1965 *	371,265		2002 (e)	677,430
1930	77,557		1966 *	381,230		2003 (e)	688,940
1931	79,059		1967 *	393,593		2004 (e)	700,660
1932	78,387		1968 *	410,105		2005 **	712,391
1933	79,231		1969 *	422,418		2006 **	730,372
1934	79,773		1970 *	429,750		2008 **	752,412

Figure 29 – Historical population of City of Edmonton. Source: City of Edmonton (2012b).

residents. Population increased steadily over the next few decades, with 72,500 people living in Edmonton just before World War I. The most significant growth occurred upon the discovery of oil in the mid-1940s. During the 1950's, Edmonton's population exploded with the emergence of the oil and gas industries in the region, growing from approximately 150,000 to 270,000 people over this decade. In 2008, the City reached a population of 750,000 people (Edmonton, 2012). Figure 29 includes the historic populations of the City of Edmonton.

Today, there are approximately 40 different suburban housing developments currently being developed around the periphery of Edmonton, each with a full build-out range of 1000 to 7500 residential units (UDI Edmonton, 2012). Despite a recent global economic recession in 2010 through the present day 2012, northern Alberta, given its strong oil and gas industries, is still experiencing an economic boom and continue to prosper. As a result, the growth of suburban development has not receded and will continue to consume peripheral land for development. During the periods of 2001 to 2006 and 2006 through to 2011, Edmonton was the second fastest growing municipality in Canada (Statistics Canada, 2011c).

The Rise of the Subdivision

Edmonton's Growth Patterns. In the Western world, the growth of urban and suburban areas has been the dominant demographic characteristic of the twentieth century (Ehrenfeld, 2000). Urban sprawl is certainly not unique to the Edmonton region. Over the past fifty years, the City of Edmonton has grown in all directions. Servicing limitations have not been a notable concern in any direction of growth, while most of the growth has been seen in southerly and westerly directions. To some extent, the North Saskatchewan River posed some challenges for development in the southwest corner of the City, with limited bridge crossings in this quadrant



Figure 30 – new suburban development in Edmonton, Alberta. Parkland subdivision, located at the west end of the City, incorporates patches of naturally-occurring trees with newly constructed stormwater management facilities in wetland configurations. Source: Google Earth, accessed January 3, 2012.

and difficulty accessing new neighbourhoods that emerged in this region. Figure 31 shows the North Saskatchewan River at an area where a bridge is much needed to make land beyond the river more feasible to develop. As development exploded in this quadrant in the 2000s, additional bridges were installed, along with the first segments of a new city-wide ring road to alleviate transportation pressures and to provide access to these new neighbourhoods.



Figure 31 – 2009. Shoreline of the North Saskatchewan River within the City of Edmonton.

Challenges with Sprawl: Local Mindset. Urban sprawl comes with a number of challenges as new clusters of development are added to the urban fabric of a city. Some of the challenges associated with sprawl in the Edmonton context include:

- loss of natural habitat and agricultural land as new suburban areas are built out;
- while there are a range of residential, commercial and business development within many of these suburbs, the majority of children do not attend school within walking distance of home, and the majority of adults work in far reaching areas such as downtown – people are reliant on vehicular traffic, predominantly being passenger vehicle;
- depletion of the downtown, with added pressures to develop amenities closer to emerging population centers on the periphery of the city;
- public transit options for these subdivisions are limited to surface busses, as other means such as the light rail transit line does not service suburbs;

- continuous construction activities are occurring year round in many of these emerging communities, causing an abundance of construction traffic with large equipment and delivery vehicles in residential areas;
- costly infrastructure, given the long distances to install public utilities to reach these communities including storm, sanitary, water, gas and cable / telephone lines; and
- large volumes of traffic require larger roadways to accommodate an adequate level of service.

The Public Realm. Urban subdivisions convert raw land parcels into a series of partitioned lots. Lots are designated specific uses, and can be either privately owned on a fee simple basis or be designated to transfer to municipal ownership once constructed. Zoning bylaws establish the permitted uses and configurations of land. As it relates to those lands not sold for uses such as residential, commercial and industrial uses, municipalities will indicate within a development agreement those conditions that the developer must meet in order to accommodate the privately owned land parcels. This can include conditions such as providing utilities to service these lots, roadways in a variety of configurations to provide access through the development, the development of parks and open space, or simply transferring over natural areas with little to no alteration.

In the City of Edmonton, all subdivisions must provide ten percent of the total land area to be subdivided as municipal reserve (MR), or cash in lieu of park space based on fair market value of the land. Obviously the latter option presents some concern, wherein a neighbourhood may have a lack of green space for area residents. The *Municipal Government Act of Alberta, 2000* also empowers the municipality to take environmental reserve (ER), which is elaborated on

later in this discussion. Both MR and ER areas of land compliment other areas of the public realm such as streetscapes.

Stormwater Management. It is a municipal requirement in the City of Edmonton that all developments provide for a stormwater management plan. Since the beginnings of sprawl patterns in Edmonton, conventional stormwater management facilities must be provided in all developments. In essence, these facilities resemble a pond basin, wherein the water levels fluctuate as precipitation events occur. When storm events take place, water from surface flow, catch basins and direct rainfall lead into these basins. An outlet structure leading out from the basin allows a controlled rate of water to be released to downstream locations, such as rivers and streams. Given the dramatic increase of impervious surfaces that come with urban development, precipitation is much less likely to infiltrate into the ground, leading to larger volumes accumulating into the public utility network. The overall intent of stormwater management systems is to ensure that stored water is released at a controlled rate, to protect downstream systems.

Stormwater management facilities within Edmonton have evolved considerably over the past 50 years. At their inception and until approximately 1980, these basins were developed as dry ponds, whereas the flat bottomed basins could be used for a number of recreational uses during dry periods. Activities ranged from active sports fields to passive and non-programmed parks. Challenges with traditional dry ponds (shown in Figure 32) included sediment accumulation in and amongst grass that was usually mowed for active use, unexpected flooding that caused delays to any programmed activity, challenges with saturated pond bottoms having a relatively flat profile, and the lack of species diversity that the area would support. As a means

of creating more aesthetically pleasing public open space, wet ponds became more prevalent in new Edmonton developments. Ponds were adorned with fountains and night lighting to create more visual interest, and residents began to use these amenities for paddle boating in summer, and ice skating in the winter. An example image of a wet pond is shown on Figure 33.



Figure 32 – 2011. Typical dry pond used as a stormwater management facility. The basin is only flooded during precipitation events, and dries out as water leaves the system through outlets, see on left side.

In light of these scenarios, human-nature interactions are reduced as a result of:

- a widespread vehicular transportation network that includes roads and other supporting infrastructure that creates barriers and has direct disturbance to natural areas;



Figure 33 – 2011. Typical wet pond found in the City of Edmonton, used for stormwater management.

- the development of private lots, wherein the individual has the right to alter lot features at their discretion;
- changes in regional and local drainage regimes to meet stormwater management requirements, which affects the integrity of naturally-occurring ecosystems;
- demands from consumers of suburban lots for more formal public open space such as formalized parks, play fields, ponds, etc.;
- increased impervious surfaces associated with urban development; and
- the introduction of deleterious substances and other pollution such as hydrocarbons, sediment from erosion processes, light and noise – all of which impact natural areas both physically and visually.

In the early 2000s the City of Edmonton began to fully understand many of the safety risks associated with stormwater management facility and human contact with the water. Stormwater contains many deleterious substances that pose health risks to humans and wildlife, such as hydrocarbons off of roadways and other vehicular surfaces and nutrient loads from excessive use of fertilizers and other chemicals. In addition, with water flowing into these ponds, even during winter months, ice formation was very irregular and in many areas very thin ice or no ice at all forms. As a result of these many public health and safety risks, new regulations led to prohibiting any human use of these ponds. An example of a regulatory sign that is required by municipal standard for all stormwater management facilities is shown on Figure 34. No contact with the water is permitted.



Figure 34 – 2011. Standard City of Edmonton regulatory sign for stormwater management facilities (non-permitted uses).

Beginning in the early 2000s, a new approach to constructed stormwater management facilities emerged, with the implementation of constructed wetlands. A typical cross section is shown on Figure 35. These systems provided numerous benefits, including:

- pre-treatment of stormwater such as phytoremediation (contaminant and nutrient uptake by emergent plants);
- accumulation of sediment in and amongst emergent vegetation;
- a perimeter of emergent vegetation that provides a buffer to prevent human access to the open water area;
- health benefits for humans as a result of direct contact with these natural systems (Horwitz, 2011);
- increased biodiversity and habitat for wildlife; and
- the ability to be eligible for compensation under Alberta Environment, if designed in accordance with best management practices.

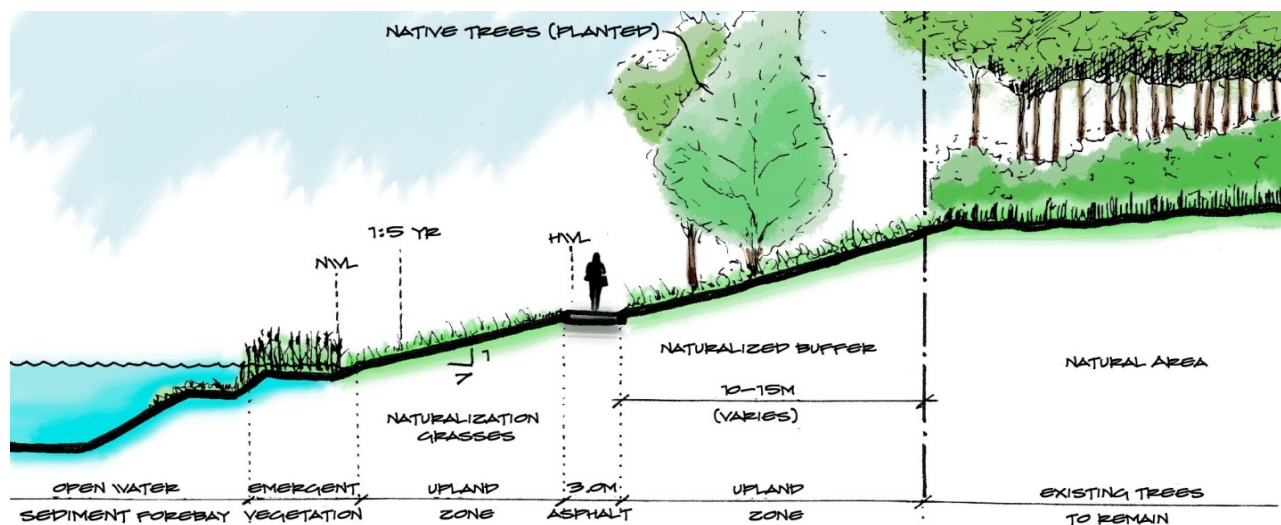


Figure 35 – Typical cross section of a constructed wetland. Source: EDS Group Inc. (2006).

Because of ongoing public concerns related to emergent vegetation detracting from the appeal of wetlands, every SWMF in Edmonton must have a boat launch installed, which allows City of Edmonton maintenance crews to regularly remove emergent vegetation.

In some cases, naturally-occurring ecosystems such as wetlands, creeks and ravines that pass through residential neighbourhoods are used as part of the network of stormwater management facilities to accommodate the controlled release of surface runoff during precipitation events. In this instance, a qualified professional must provide a detailed report that demonstrates pre-development conditions, such as water input, are going to be maintained in order to keep the system intact. These systems are usually designated as environmental reserve, and still allowed to be used as public utility in managing stormwater.

Views As Related to Nature

Economic Value of Nature: The Rise of Agriculture. From an agricultural perspective, the Edmonton region has a mix of cultivated fields for annual crops, and pasture land used for grazing. Aerial photographs of the greater Edmonton region of today demonstrates a patchwork of land surrounding the City that is almost entirely privately owned, and segregated in standard mile-based quarter section configurations (see Figure 36). There is active use of much of the land surrounding land for agriculture and rural subdivisions, while there are still a number of patches of surface water and forested areas that have yet to be eradicated.

Conventional agricultural practices in the Edmonton area include cultivated fields with annual seeded crops, and pastured land used to feed cattle or other livestock. This area was a mix of grasslands, wetlands and forested areas, being along the border of the grassland and the Boreal forest regions of Canada. Edmonton's location is shown on Figure 37. Over time, most

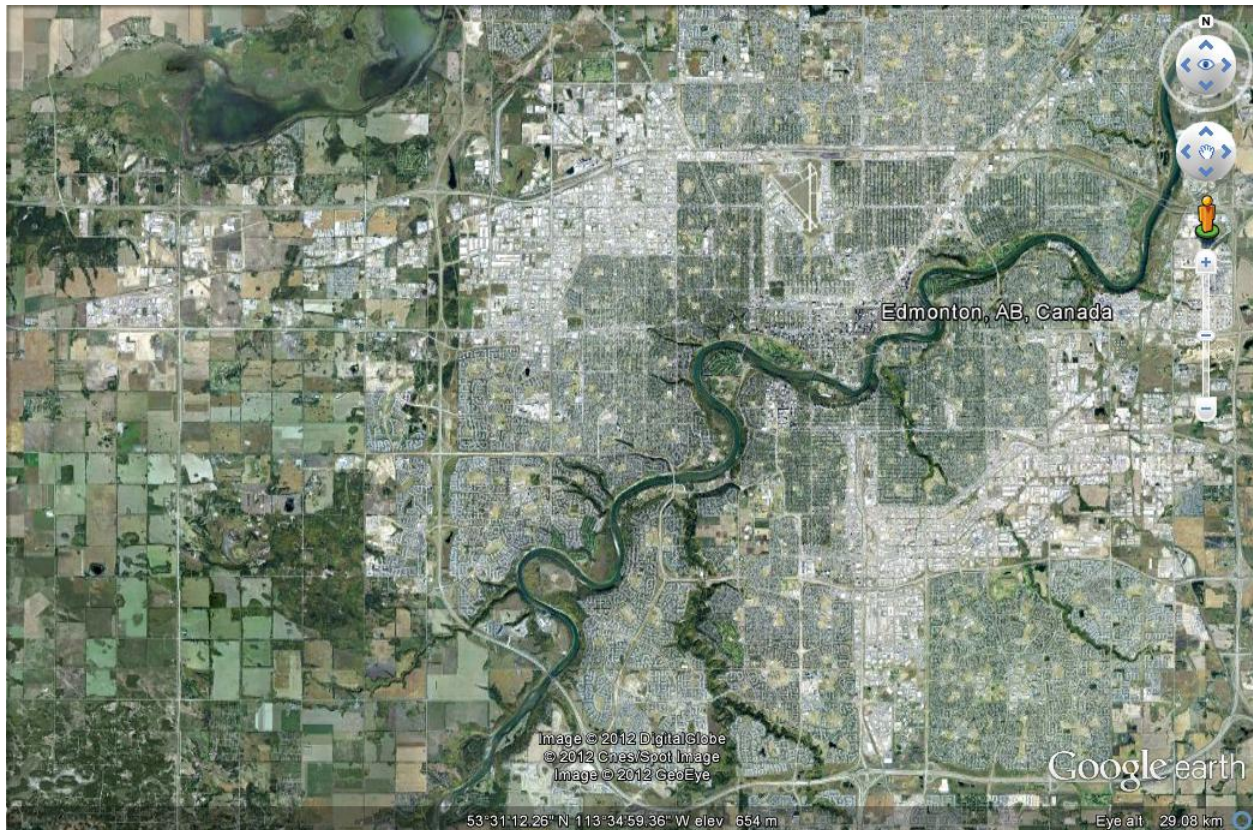


Figure 36 – 2011. Image of west Edmonton and adjacent agricultural areas, demonstrating the patchwork configuration of undeveloped lands, broken up into quarter sections. Source: Google Earth, accessed January 7, 2012.

treed areas were removed to accommodate larger tracts of land for agricultural purposes, and wetlands were drained to make greater extents of land viable. Within the region, modern agriculture resulted in the conversion of over 95% of native grasslands to crops and pasture land and loss of half of western Canada's pre-settlement wetlands (Cox, 1993). The prospect of large returns to a landowner through development or agricultural use will likely stack the deck toward development (Boyer, 2004). From an economic perspective, trees and wetlands have very little value in an agricultural operation, and as a result held low economic value to leave intact. From an intrinsic perspective, these natural areas had significant value, and in many occasions land owners recognized a balance between economic value and care and protection of the land.

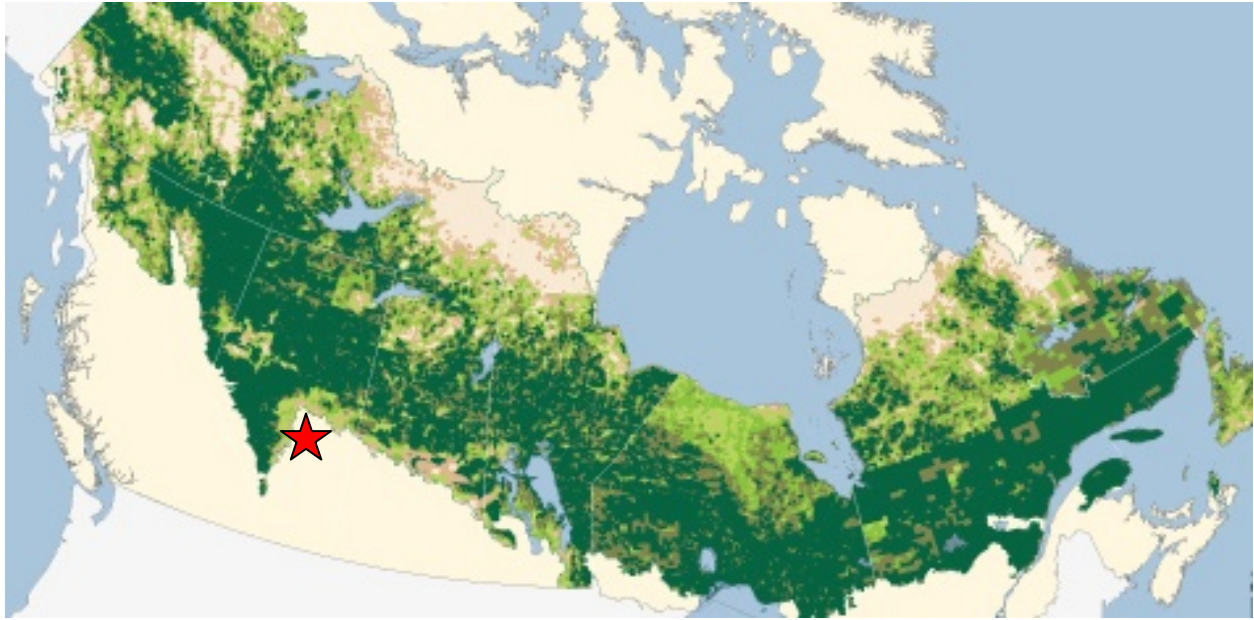


Figure 37 – extents of the boreal forest in Canada. Edmonton located at the edge of the boreal and grassland ecosystems.
Source: Adapted from image provided by Natural Resources Canada (2001).

Over 85% of the wetland loss and alteration on the Canadian prairies is attributed to agricultural activities (Turner, 1987, Cox, 1993). There are numerous impacts that farming practices have on natural areas (Voldseth, 2009). In recent decades, the use of fertilizers and pesticides has drastically increased yield productivity of land, while in more recent years the adverse effect of nutrient loading on nearby water systems has become more apparent (Lemke, 2010). Research conducted by Shutler (2000) assessed rural Canadian prairie wetlands and natural areas, finding that farming practices have direct impacts on species diversity of birds. Extensive land drainage systems have been developed throughout the rural areas of much of the three Prairie Provinces, to allow land to be accessed sooner in the spring and more often during rainy months. These drainage systems lead to aquatic ecosystems such as streams, rivers and wetlands, which are the downstream depository of excess nutrient buildup. In urban subdivisions, pesticides and herbicides are equally prevalent as in agricultural areas. Drainage

regimes are also similar, in that surface water from the public realm as well as private lots passing through urban stormwater management facilities all ends up in regional water systems such as rivers and lakes.

We have also learned a lot over the past decade on the impacts that erosion has on the viability of soils. Both erosion by flowing surface water and by wind are common, especially on land that has been cultivated. While zero tillage practices for seeded annual crops is becoming more common practice in the greater Edmonton area, retaining rows of trees as shelter belts has always been a common practice. Trees provide a wind break to reduce the effect of wind on soil movement. As a result, many of the remnant tree stands that suburban development approaches includes long and lineal native tree stands that were a result of shelterbelts.

In order to increase economic viability of farming operations, many landowners have taken advantage of new technologies and strategies for actively farming land that was traditionally not viable. Practices such as developing new drainage ditches and swales, the addition of organic matter and fertilizers, and the use of low pressure gravity farming equipment have allowed the agricultural industry to expand land use for active farming. Over the past decade, however, there have been numerous land areas returned to a natural state, as a result of ongoing challenges to maintain efficient use of these marginal lands (Drummond, 2010). While these recovering ecosystems do not have near the species richness that once was found during their pre-disturbance state, newly established natural areas do provide a higher ecological value than active agricultural areas. Suburban development in Edmonton in many areas is encountering these types of environments where lands were once highly disturbed, yet are now

in a state of recovery. These types of ecosystems, for the sake of this analysis, are also considered to be natural areas.

Economic Value of Nature: The Discovery of Oil. With significant oil deposits discovered in the mid-1900s, the Edmonton region was quickly exploited with testing, drilling and extraction processes. While oil drilling and extraction allowed for large areas of subterranean deposits to be exploited from a single at-grade well site, primitive drilling activities had detrimental effects due to a lack of knowledge on environmental impacts (A. Bates, personal interview, February 7, 2012). In and amongst agricultural areas and many communities in the Greater Edmonton area is a network of oil and gas infrastructure (as seen on Figure 38), including underground pipeline right-of-ways (ROW), battery sites, pump jacks, and oil wells.



Figure 38 - Oil pump jacks located in the heart of a residential subdivision.

Oil and gas refineries are also common in the Edmonton region, with the Industrial Heartland just to the east and northeast of Edmonton with North America's largest

conglomeration of industrial refinery facilities. As development continues to spread beyond city limits, much of this infrastructure becomes integral to community planning and oftentimes is engulfed on all sides by new urban development.

Pipeline ROWs are lineal cuts through the landscape upon which, once underground utility lines are installed, development is not permitted. There are some exceptions, such as recreational features including sports fields and public open space. Restrictions deviate somewhat based on the company policy for specific ROW lease holders. The City of Edmonton has adopted an Oil and Gas Policy that establishes protocols and expectations for the orderly and safe co-existence between oil and gas facilities and urban development in and around the City of Edmonton (Edmonton, 2012c). These scars in the landscape provide opportunities for linkages for both people and wildlife, as all surface vegetation is removed and the ground is left generally level. While these alignments deviate to some extent, they often do not take a new course in order to avert going through treed areas or small wetland complexes.



Figure 39 – 2010. Walking trail built over top of a utility ROW, Rutherford Neighbourhood, Edmonton Alberta.

Nature Appreciation: Intrinsic Value. Residential subdivisions in Edmonton are commonly advertised using place-based approaches identifying the community as an “escape” from urban living. Sense of place is often marketed around remnant natural areas that are retained within the community, such as an urban forest, native grassland, or wetland complex.



Figure 40 – Website advertising for a new subdivision in Edmonton called Trumpeter by Big Lake. Advertising includes numerous images of natural scenes and wildlife. Source: United Communities, Edmonton.

While many of the images used by developers in promoting their community for perspective buyers are not entirely reflective of the actual community (ie. images of deer and moose when the residents will never actually see one) they evoke human emotions toward direct access to nature right in their own backyard. With growing concerns with peak oil and travel costs, many people seek these types of experiences closer to home and as part of a more regular routine. The success of nature-based themes in advertising new residential neighbourhoods as seen in Figure 40 has been surprisingly high in Edmonton. Beginning in the early 2000s this theme has now become the most common theme of any other (K. Hurd, personal interview, June 3, 2011). The development industry has obviously recognized that nature has intrinsic meaning to perspective buyers, which in turn has economic benefits to the land developer.

Investigation and literature related to human appreciation for wetlands in rural settings is quite common, while the same is not true for urban wetlands. Our understanding of the cultural experience and perceptions of urban wetlands is scarcely explored (Manuel, 2003). In research conducted by Manuel (2003), residents of three urban communities in eastern Canada were surveyed for their knowledge about and perceptions of a small wetland in each of their respective neighbourhoods. Results of the study demonstrated that:

“the participants were aware of the wetlands in their midst but were not especially observant of or knowledgeable about ‘their’ sites, nor do they visit their wetlands regularly . . . despite this apparent disinterest, they readily identify the wetlands as part of their neighbourhoods and as assets, especially as natural features and habitat for urban wildlife. The study participants do not consider these neighbourhood wetlands nuisance environments or waste of land. Instead respondents revealed an appreciation of the aesthetic attributes and habitat value of wetlands in the city and of urban natural space” (p. 921).



Figure 41 – 2006. Constructed wetland in an urban area, early spring.

Smardon (1988) explores the intrinsic value of urban wetlands (like the one shown on Figure 41) as it relates to providing a recreational experience, as well as aesthetic appreciation. Some of their concluding comments suggested that urban wetlands may take on special significance as buffers against development, such as privacy, and that cultural – especially aesthetic – experience may be the most important source of value of urban wetlands (Smardon, 1988). Within the greater Edmonton area, new residential lots that back onto natural areas are classified as “amenity lots”, meaning they have immediate access to a useful amenity. This may also be only visual access, having a natural area for example along the back of lot that provides privacy from other nearby homes.

There have been many challenges associated with getting public support for a naturalized aesthetic for constructed public open space. After over ten years of implementing constructed wetlands as part of neighbourhood stormwater management planning, there are still strong public concerns for the wild and un-kept look of naturalized systems. There is also considerable concern with the introduction of naturalized systems in communities, as it is perceived that they attract mosquitoes, mice, and other rodents that cause annoyances to homeowners.

Preservation of Natural Areas in Suburbs

Loss of Natural Ecosystems. Suburban, exurban and rural development are leading causes of biodiversity loss (Milder, 2007). While the actual impacts of urban development is often very complex (Hansen, 2005), impact in its most simplistic form can be measured by the eradication of natural areas for conversion to urban form. Due to new urban development between 2000 and 2007 alone, 31% of Edmonton's designated natural areas were permanently lost to the development of new subdivisions (Edmonton, 2009), amongst all identified naturally-occurring ecosystems within City limits.

Wetlands. Over the past 20 years, the most prevalent naturally-occurring ecosystem that is retained within Edmonton suburbs is wetlands. There is a growing body of literature that has captured many grassroots initiatives by the public to protect and restore local wetlands in a variety of settings (Schnieder, 1995). In a previous section of this research I identified that wetlands are a privileged landscape, in that provincial and federal acts and laws are much more rigorous in protecting wetlands than any other ecosystem. While wetlands are in fact retained in some instances, wetlands within developed landscapes are subjected to a number of stressors that alter their structure and function (Meyer, 2005; Pickett, 2001). These stressors can include

changes to the hydrologic pattern, nutrient inputs from both aquatic sources and atmospheric transfer, exotic species from adjacent development, and enhanced dispersal of deleterious matter from human and animal traffic on trails (Ehrenfeld, 2008). The following are some factors why wetlands are the most prevalent natural areas retained in modern-day neighbourhood design in Edmonton:

- provincial and federal acts and legislation are very stringent as they relate to water bodies such as wetlands;
- naturally-occurring wetlands have highly saturated soils which are not compatible with building roads, buildings and other services over, and therefore present additional costs to develop;
- wetlands are located in the lowest elevations of a development, and this is usually where stormwater management facilities are located as to keep grading costs as low as possible by relying on existing terrain for surface ground water flow; and
- wetlands are now used for stormwater management facilities, and can be altered to be more conducive to more frequent flooding; every development requires a stormwater management facility.

Urban development brings along a multitude of disturbances to wetlands. The following table, modified from research by Zedler (1998) notes some of the disturbances prevalent in Edmonton as it relates to urban wetlands. Most of these factors are also true for urban forests:

Disturbance to Wildlife	Movements of people and pets startle some animals Lighting may deter use by nocturnal species Infrastructure development such as roadways, utility installation Noise can startle animals and interfere with communication Vehicles cause road kills People release unwanted animals and fish People take plants or plant parts
Habitat Loss	Space allocated to visitor amenities, such as trail heads, parking areas, trails Overall degradation, fragmentation and loss Invasion of aggressive plants and negative impacts on native vegetation
Overuse by Visitors	Trampling, vandalism Trash accumulation Pests, such as feral animals and increased predation on native wildlife
Hydrology	Altered hydroperiod due to damming, flooding, excess runoff Decreased water quality due to contaminants Eutrophication

It was mentioned earlier that many natural ecosystems may be incorporated into a stormwater management regime within a neighbourhood. We are only now seeing the long term effects on these systems, given this practice has only been in place for just over a decade. It is impossible to replicate pre-development conditions for any of these systems after development surrounds them, and as a result there is obvious degradation and changes from their original state.

Urban Forests. The second most prevalent type of natural area that is preserved within Edmonton suburbs is forested areas. From an economic perspective, tree stands offer early on visual interests when marketing an emerging subdivision, opposed to those that are entirely regraded and barren moonscapes. Urban forests also create amenity lots, whereas lots backing onto or adjacent to trees have a significantly higher value than non-amenity lots.

Urban forests are designated as municipal reserve at time of subdivision, meaning that their area is deducted from the ten percent total open space allocation. These natural areas are commonly complimented with amenities such as pedestrian trails and perimeter fencing, both of which control human access to certain areas of the ecosystem.



Figure 42 – 2009. Retained urban forest in a suburban development. Image shows the development of back of lot buffer and fencing to separate the tree stand with private lots.

Because treed areas become municipal reserve and therefore become property of the municipality, the municipality assumes all responsibility for any liability associated with public safety and damages to any private individual or their property. Figure 42 shows the proximity of trees to homes. Crime prevention through environmental design (CPTED) principles apply to many of the design elements within urban forests, such as trails. Applying these principles result in a significant amount of natural vegetation being removed to improve sightlines and to eliminate predator hiding locations. All walkways are also complimented with electric to

increase pedestrian safety, while light lighting has unnatural effects on wildlife (Terrel, 2010).

To reduce risk of fires, fuel loads including any deadfall and dead understory vegetation must be removed. To avert any risk of trees being windblown and falling onto fences and other private property, any hazard trees are removed as a proactive measure. All of these practices are part of best management practices and municipal standards when retaining tree stands in urban areas.

There are numerous challenges associated with retaining tree stands in urban areas, some including:

- tree stand edges that have not historically withstood wind pressures do not have suitable root systems and as a result are very susceptible to being blown over;
- pre-development drainage patterns are usually altered, which affects the amount of water that trees have historically received;
- pets cause significant disturbance to wildlife including predation, disturbance to nesting activities, noise, unnatural movements;
- with a significant demand for public open space for traditional parks, there is no incentive for land developers to over-dedicate municipal reserve areas, hence tree stands are not necessarily in public demand;
- area residents go beyond private property and cause disturbances such as dumping grass clippings, clearing trees for more advantageous views, planting non-native trees for personal benefit;
- formal trails and informal human traffic causes soil compaction on tree roots which affects tree viability; and
- perceived safety risks.

Notable Historical Enabling Policies

Knoot (2011) notes that “while land use and land cover change have been repeatedly linked with diminishing ecosystem goods and services, there is continued frustration heard within ecological circles questioning why policy makers and citizens do not respond appropriately, and with an equal sense of urgency, to this information” (p. 297). This assessment will demonstrate a considerable amount of municipal policy that supports the preservation of natural areas, yet there is still alarming losses of these environments. It will become clear how most of these losses are attributed to the ability for private landowners to alter landscapes on their land, and the openness in provincial and federal Acts and legislation to simply compensate for damaged ecosystems that are perceived to be protected.

City of Edmonton General Plan (1972). The 1972 General Plan provides a comprehensive strategy for growth in Edmonton based on current conditions and projected trends for the City. As it relates to the natural environment, the plan’s introduction indicates that “natural features, such as climate, physiography, soils, drainage, mineral resources, flora and fauna reinforce the general homogeneity of the region and the determination of its limits” (p. 2.1). The latest census to this plan was 1965 with a population of approximately 620,000 people within the greater Edmonton area, and almost 370,000 people within the City limits. Since the early settlement of the City, population surges were directly proportionate to periods of economic boom and periods of relative recession. The plan noted that projecting future growth is very difficult, given population is directly correlated with resource development and most of the region had yet to be explored. At that time, the local economy was primarily based on

agricultural production of grain crops and beef cattle, with meat packing being the largest industrial employer.

The plan notes that areas to the west and to the north of the City were predominantly forested, consisting of largely spruce, pine, poplar and birch. “Although these forests presently support lumber, plywood and pulpwood operations, the type, size and rate of maturation of local trees suggest a greater expansion of pulpwood operations. Good forest management is necessary to ensure a continued supply of treed areas and should be coordinated with management of water resources, forest recreation and wildlife” (pp. 2.1-2.2). City of Edmonton, 1972, recognizes the value of the natural environment at the periphery of the City and stated:

“Recreation and wildlife resources are important to the Edmonton region and should become more so as population, leisure time and incomes increase. Through population expansion the supply of wildlife and natural areas for recreational use have been drastically reduced in many parts of the world. The present abundance of these types of areas should not preclude the early provision of a strong conservation program for wildlife and recreational resources throughout the Edmonton region” (p. 2.2).

Given the above statement, there was an obvious recognition of local values for proactive preservation of intact natural areas throughout the region. One of the primary objectives that the City identified was to encourage the conservation of the region’s resources as well as “their wise and careful development” (p. 2.3). One of the tactics proposed by the plan included developing strong partnerships between municipal, provincial and federal government agencies through actively sponsoring and participating in regional development conferences with these three levels of government participating. On the other hand, while the previous objective sought conservation, a subsequent objective noted in the plan “encourages industrialization that utilizes

the region's bulky raw materials to produce low volume, high value goods, for example fine paper and other stationery materials" (p. 2.3).

The region was only beginning to experience significant growth as a result of oil resource development, evident by new industrial facilities being built such as oil refineries, petrochemical plants, pipe mills and related administrative, scientific and supply centers within the City limits. The plan included three stated criteria for the placement of residential, commercial, transportation, and leisure time areas. As they relate to recreation, placement criteria included:

- convenient proximity to living areas;
- major parks and large open spaces should (to the extent possible) be located so as to take advantage of natural features such as ravines, valleys and treed areas. land not suitable for other urban purposes can very often be most appropriate for park and open space use; and
- cultural and spectator sport facilities that usually requires a reasonably central location with transit and thoroughfare access from all parts of the City (p. 4.2).

While meeting these criteria would seemingly support a more ecocentric approach, natural areas were not a priority during the period that the 1972 Plan described.

City of Edmonton General Plan (1979). The main goal of the 1979 General Plan is to guide Edmonton's long term growth, from 1979 to 2001. The plan defined an urban growth strategy and set out broad policies regarding future development of land for residential, commercial, industrial, transportation, and other uses (City of Edmonton, 1979d). The plan also provided a framework for decision-makers to react to planning matters. The plan begins by stating that "growth is the major issue at the heart of the Edmonton General Plan" (p. 1). With a surge in economic conditions the City was seeing new growth pressures for all services,

including residential, commercial and industrial growth. In the context of the 1979 Plan, the term “growth” included three elements. These included human population, physical development of the City as well as economic development. In relation to this research, what is significant with that definition of growth is the lack of ecocentric considerations for the natural world, and how the environment was evaluated exclusively for its intrinsic value to humans.

In comparison to other cities in western Canada that were impacted by growth of the oil and gas industry, Edmonton had the greatest function of a manufacturing, distribution and warehousing hub. While economic growth was very evident, population growth was limited to less than two percent per year, due to the rise of suburban development outside the current City limits that began in the early 1970s. Another significant contributor was a decrease in fertility rate, with less than two children per woman on average (Edmonton, 1979).

The 1979 General Plan was prepared based on three goals on an economic, physical and social perspective. The following outlines the goals (see Figure 43) noted in this plan:

1) Economic Goals:

- stable and prosperous economy;
- equitable treatment of business sector, especially development sector;
- tax burden as low as possible;
- equitably distributed tax burden; and
- balance of public and private interest.

2) Physical Goals:

- orderly, efficient development;

- aesthetically pleasing development;
- environmentally acceptable development;
- minimize transportation costs;
- convenience & accessibility to urban services;
- preservation of quality of residential environments; and
- adequate open space.

3) Social Goals:

- variety of choice to residents with respect to housing and community services: type, location and cost;
- healthy and safe development;
- equality of opportunity; and
- strong civic and community identity.

As it relates to the natural environment, the City's goals were limited to calling for "environmentally acceptable development". The preservation of natural areas or even using natural areas as a useful recreational amenity was not included in this document, and obviously not within the current mindset of residents or the municipality. This attitude was consistent with other overarching governmental mindsets of provincial and federal agencies.

In the creation of this plan, the City initiated a very comprehensive public consultation process to engage its residents. This took the form of workshops to involve citizens in developing and evaluating alternatives for land use issues, public hearings to allow citizens to make a presentation or submit a written brief, as well as the ability to provide the Planning Department with a written brief at any time in the process. For its time, this was a fairly

comprehensive approach to community involvement and engagement with the public and interest groups. From evaluating this 1979 Plan, there was no indication that the public was calling for more opportunities to interact with nature.

An Hierarchy of Urban Planning Goals

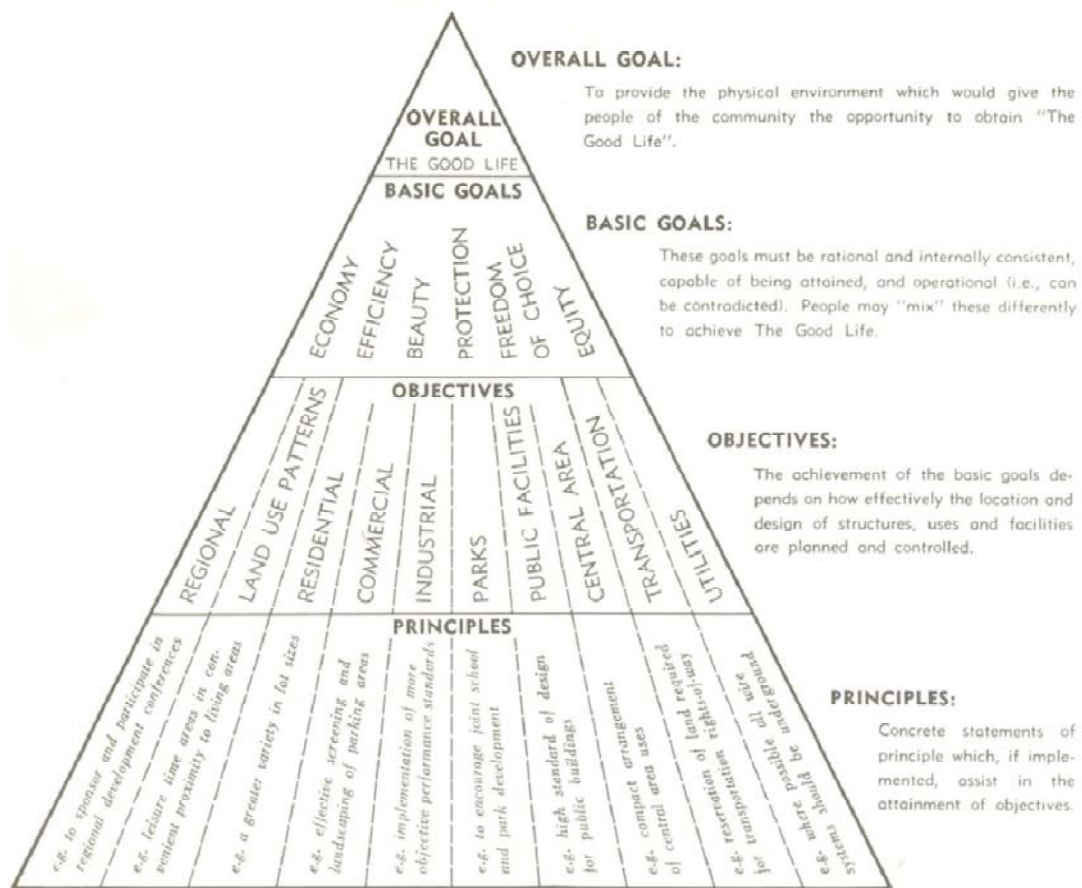


Figure 43 – Hierarchy of urban planning goals in the 1979 General Plan. Source: City of Edmonton (1979d), p. v.

City of Edmonton General Plan Working Paper: Suburbs (1979). The plan elaborated on quality of suburban development. The plan indicated that the reason for a surge in suburban growth was because “people had placed greater priority on having privacy, open space, fresh air

and safety rather than on the urban amenities offered by older communities: a sense of character and history, mature trees, and convenient access to entertainment opportunities” (Edmonton, 1979b, p. 12). Noted characteristics of quality suburban development included reduced noise and pollution, increased safety, open space, fresh air and privacy, whereas some of the tradeoffs included more expensive services, less compact development, and the cost of implementing design guidelines as homes are built. The natural environment was in no way recognized as either a benefit or impediment to suburban development.

The 1979 plan recognized that, if the current sprawling pattern and densities were sustained for another six years, the City would be short of land to develop within its boundaries (Edmonton, 1979b). This would cause development to occur within the sub-region and outside the City boundaries, which would lead to the loss of agricultural land, added pressures on transportation networks, and a lack of control by the Municipality in how peripheral developments occur (p. 13). In the eight years leading up to this plan, the City grew by 72,000 people, 42,000 of those people moving to the outlying suburban areas and 84% of all new housing units in these subdivisions; during this period, the suburbs grew by over 950 gross acres per year (Edmonton, 1979c). With such extreme growth, some of the suburban growth issues noted by Edmonton, 1979c, included:

- increased travel time – transportation congestion leading into the downtown;
- dissatisfaction with the design of neighbourhoods – more crowded, less private and less attractive than many of the more established neighbourhoods;
- configuration of parks – the public would prefer smaller and more dispersed parks rather than large consolidated open space; and

- delays in providing community services – newly constructed parks and open space takes considerable time to mature, and does not feel established for many years after move-in.

City of Edmonton General Plan Working Paper: Parks and Recreation (1979). City of Edmonton (1979c) begins by noting that “recreation serves many of man’s physical, psychological, and social needs. Through recreation, man renews his spirit, explores his potential, develops friendships and expresses himself. Recreation enriches the lives of both the individual and the community. The City’s goal was to ensure that all citizens have opportunities for recreation” (p. 1).

The 1979 plan indicates a sudden surge of recreational demands throughout the city in the last couple of years, due to rapid population growth, declining work hours, earlier retirement and increasing income of Edmontonians. Recreational demands at this point in time are changing and becoming more diversified, extending beyond general provision of parks, athletic fields, pools and arenas. New demands had arisen for specialized cultural facilities, all-terrain vehicles staging areas, racquetball and squash courts, visual and performing arts, crafts, and skateboard parks. Future recreation trends anticipated at this time included photography, drawing, ceramics, drama and other social-cultural activities (pp. 1-2). The new trends for recreation do not include passive activities that involve natural areas such as wildlife viewing and general nature appreciation.

The report recognizes that the pressures for new types of recreation with limited open space to accommodate these facilities and activities can be resolved through intensification of existing open space. This called for incorporating several activities in the same park space and more active programming of the entire open space network within subdivisions. This

intensification would lead to the inability to protect any remnant natural areas in these parks, demonstrating that the public was not demanding human interaction with nature in these park areas.

Current Enabling Policies, Guidelines and Initiatives

Conservation of Natural Sites in Edmonton's Table Lands, Policy C-467. With a significant body of provincial and federal Acts, legislation and bylaws to protect the environment, urban natural areas were still lost to development throughout western Canadian municipalities. It became clear that policy at the municipal level would be needed. The City of Edmonton had responded to dramatic degradation, loss and fragmentation of its remaining urban natural areas (Cassady St. Claire, 2010) by implementing a series of studies, reports and policies to encourage the protection of remaining ecosystems. Counteracting the dramatic effect that suburban development was having on natural areas, the City of Edmonton began with the passage of Policy C-467, entitled *Conservation of Natural Sites in Edmonton's Table Lands* (superseded by Policy C-531 in 2007 entitled *Natural Areas Systems*), which was the result of an inventory completed by a consultant of all natural areas (Geowest, 1993).

The rapid pace of residential and industrial land development within the City of Edmonton over the past few decades has dramatically altered the City's natural landscape. Concern over the loss of remaining natural areas led Edmonton City Council and the Administration to begin taking steps in the early 1990s to conserve some of these sites (Wentworth, 2001). Subsequent to this mandate, the City of Edmonton commissioned this inventory of environmentally sensitive and significant natural areas. Despite being authored in 1993, this report remains the most current compilation of natural areas, and identified 246

Natural Areas, 27 Significant Natural Areas (SNAs), 38 Environmentally Sensitive Areas (ESAs) and 17 other ESAs within the NSRV system (Geowest, 1993). Since the completion of this assessment, numerous current policies have been established.

Envision – ISO 14001. In conformance with the International Organization for Standardization (ISO) 14001 standard, the City of Edmonton has recently endorsed an Environmental Management System (EMS) called *Envisio - ISO 14001*. While the framework was established in 2004, several municipal departments have worked over the subsequent seven years to create department-specific implementation plans for their services. There are five basic components to this EMS, including: commitment and policy; planning; implementation and operation; checking and corrective action; and management review (Edmonton, 2004). For municipalities in particular, an EMS works best for those matters over which the municipality has direct influence, such as internal operations, and is not well suited for managing environment impacts related to residential and commercial lands, buildings and behaviours (Savelson, 2010). As the majority of remaining natural areas surrounding Edmonton are privately owned, the City has no control over the management and protection of any of these areas using the EMS or other related policies. While Policy C-467 included an inventory of all natural areas – both publically and privately owned – the City once again has no legislative authority to protect these areas.

Environmental Strategic Plan (2006). In 2006 the City released Edmonton's Environmental Strategic Plan, which reflects the City's commitment to sustainability and to public engagement. This plan was a result for a higher degree of public involvement in municipal business that was demanded by residents. The plan was also a result of a nation-wide efforts for all municipalities to address sustainability. It was a significant step forward in the

way Edmonton incorporates environmental considerations into City decision-making processes (Edmonton, 2006). As an update to the 2006 Plan the City is currently completing an initiative called *The Way We Green*, which is an environmental strategic plan that demonstrates the environmental challenges the City faces as it grows – in the areas of water, air, fossil fuels, minerals and soil, climate, renewable resources, ecosystem services and waste absorption (Edmonton, 2011). Over 130 stakeholders are currently participating in this process. Ultimately, this plan intends on identifying how the City will manage operations and growth in a sustainable manner. The term “sustainable” can be defined in many ways, while the premise of *The Way We Green* is founded on defining sustainability as being “able to be maintained over time” (Heinberg, 2010). This suggests that all aspects of our built environment are to be maintained, which is a very anthropocentric view of humans’ role in the ecological matrix. Without proper tools to maintain natural areas for years to come, designers are faced with the challenge of uncertainly prescribing design parameters in the hope of long-term sustainability of these natural areas. The City’s *Environmental Strategic Plan* and its 2011 update express the urgency to protect natural areas, yet do not at all tell designers how this can be done.

Natural Area Systems Policy C-531. In the absence of rigorous laws and regulations to promote biodiversity and resilience (G. Pearsell, personal interview, April 19, 2011), the City of Edmonton endorsed *Policy C-531* in 2007, entitled *Natural Area Systems*. As noted by Edmonton (2007), “the purpose of this policy is to:

- enhance and sustain the quality of life for Edmontonians;
- conserve, protect, and restore biodiversity throughout Edmonton recognizing the urban context that we work within;

- direct Administration to conserve, protect, and restore natural area systems through the physical planning and development process; according to the provisions of municipal, provincial and federal policy and legislation;
- encourage voluntary conservation and corporate and private sponsorship of natural areas; promote the awareness and participation of landowners, the general public and non-government organizations in conserving, preserving, and restoring natural areas; and
- incorporate the local ecological knowledge of Edmonton's citizens and organizations into our decisions."

Upon review of *Policy C-531*, there was a clear statement made by the City to promote the protection of natural areas. This Policy became a very encouraging tool for land planning professionals, given the latest in science related to biodiversity was being applied to a system of recognized natural areas. To this date, so such policy existed. For the development industry this Policy created some worry that development would become more challenging, now having to address natural areas in a new way through the development process.

Natural Connection (2009). Subsequent to *Policy C-531*, the City released a strategy document entitled *Natural Connection: Biodiversity Action Plan, 2009*. The purpose of the document is to protect, manage and restore local natural areas and biodiversity, and engage the community in that effort (City of Edmonton, 2009). This document describes the importance of biodiversity and stresses the need to accommodate connectivity between existing, reclaimed and constructed natural areas. Through municipal policies such as this, long-term ecological function, resilience and biodiversity can be addressed.

Conservation Atlas. The City of Edmonton maintains an online summary of those natural areas that are retained throughout the City called *The Conservation Atlas* (Edmonton, 2010). While there is no policy associated with this database, it provides the general public and land planning professionals with a quick overview of the current natural areas within the City limits. This compilation provides a broad description of 30 existing natural areas remaining, ranging in size from 1.2ha to 22ha in size. Due to the limited size, number and connectivity between these spaces patterns of ecological degradation, loss and fragmentation are apparent threats to a retention of urban biodiversity in Edmonton (Cassady St. Claire, 2010). As a result of new urban development between 2000 and 2007, 31% of Edmonton's designated natural areas were permanently lost to development (Edmonton, 2009), amongst all identified naturally-occurring ecosystems within City limits.

Supporting Provincial Policy. Provincial Acts related to the protection of natural areas in urban environments include the *Environmental Protection and Enhancement Act, 2000*; the *Municipal Government Act, 2000*; the *Water Act, 2000*; the *Wildlife Act, 2000*; and the *Public Lands Act, 2000*. The most rigorous of these Acts related to the preservation of natural areas would be the *Public Lands Act, 2000*, which stipulates that any land that is the bed and/or the shore of a surface water body may be claimed as public land, giving the Province the ability to take title to this land and prohibit any alteration or disturbance to the land. Within the City of Edmonton, bed and shore claims prevail in numerous places, including any permanent standing water body as well as any named creek, river, stream or water basin. Protection of these lands is at the discretion of the Province, and on occasion it may not exercise its right to claim shoreline areas. The *Water Act, 2000*, is arguably as pertinent as the *Public Lands Act, 2000*. The *Water*

Act, 2000 states that the Province has jurisdiction over any water body, regardless of its permanence including any wetland, drainage channel, river, creek, stream, etc. No alterations can be done without approvals under this Act.

Supporting Federal Policy. Federal laws and Acts that pertain to the protection of natural areas within the City of Edmonton include the *Fisheries Act, 1985*; the *Migratory Birds Convention Act, 1994*; the *Species at Risk Act, 2002*; *Navigable Waters Act, 1985*; and the *Canadian Environmental Protection Act, 1999*. However, as history shows, given the loss of 31% of Edmonton's designated natural areas between 2000 and 2007 the Federal and provincial policies play a limited role in saving natural areas.

Current Development Conditions: Plan View

Expanding urbanization is very prevalent throughout western Canadian municipalities. Over the past 20 years, the Province of Alberta alone grew by just under 50% from 2.5M to over 3.7M people with 69% of residents living in cities (Statistics Canada, 2011). While choosing to live in cities, many urban residents have a common desire for contact with nature that all too often takes the form of suburban development where natural areas are more available (van den Berg, 2007). Human contact with nature, manifest as suburbanization, is a barrier to densification. The five largest urban centers in Alberta are surrounded by active agriculture, with pockets of native tree stands, ravines, rivers and wetland ecosystems intermixed. Suburban sprawl – predominantly single-family housing and big box commercial development – is the commonplace development strategy for these expanding areas. This is important, as these types of development are much more detrimental to natural areas, primarily due to required infrastructure and lower development densities (Moos, 2006).

Along with low development densities, physical layouts of these urban fringe communities have largely been designed to serve the needs of the automobile (Christoforidis, 1994) that requires substantial roadway and parking networks. To reverse the trend of development that is detrimental to natural areas, design professionals must seek new land use and natural systems regulations and design strategies to increase the retention of these natural resources.

Today, typical suburban development continues to follow sprawl patterns that heavily rely on automobile transportation. Public transit is limited to passenger bus service using the roadway network for all new subdivisions around the perimeter of the City. In the absence of a more efficient transit system, such as rapid transit options including light rail, subway or having dedicated bus lanes, the transit system is reliant on conventional roadways.



Figure 44 – 2011. Typical suburban streetscape in the City of Edmonton with road carriageway, sidewalks on either side of the road, and limited vegetation planting.

Today's developments predominantly include a mix of single family and multi-family housing units, with some commercial amenities such as gas stations, grocery stores, liquor stores, restaurants, coffee shops and personal convenience stores in a concentrated commercial development area. Commercial development areas are not within a ten minute walking distance for much of the residential areas, and as a result many residents are still reliant on vehicular transport from their homes to these shopping nodes. Business parks and other corporate office areas are not common in these developments, and as a result most people leave their community for daily work. Schools are emerging in many of these communities, while only a few of the new suburban developments are designated for new school sites. In essence, current development patterns result in the majority of residents using vehicular transport to go to work, go to school and go shopping. Figure 45 illustrates a typical, vehicular street dominated plan.

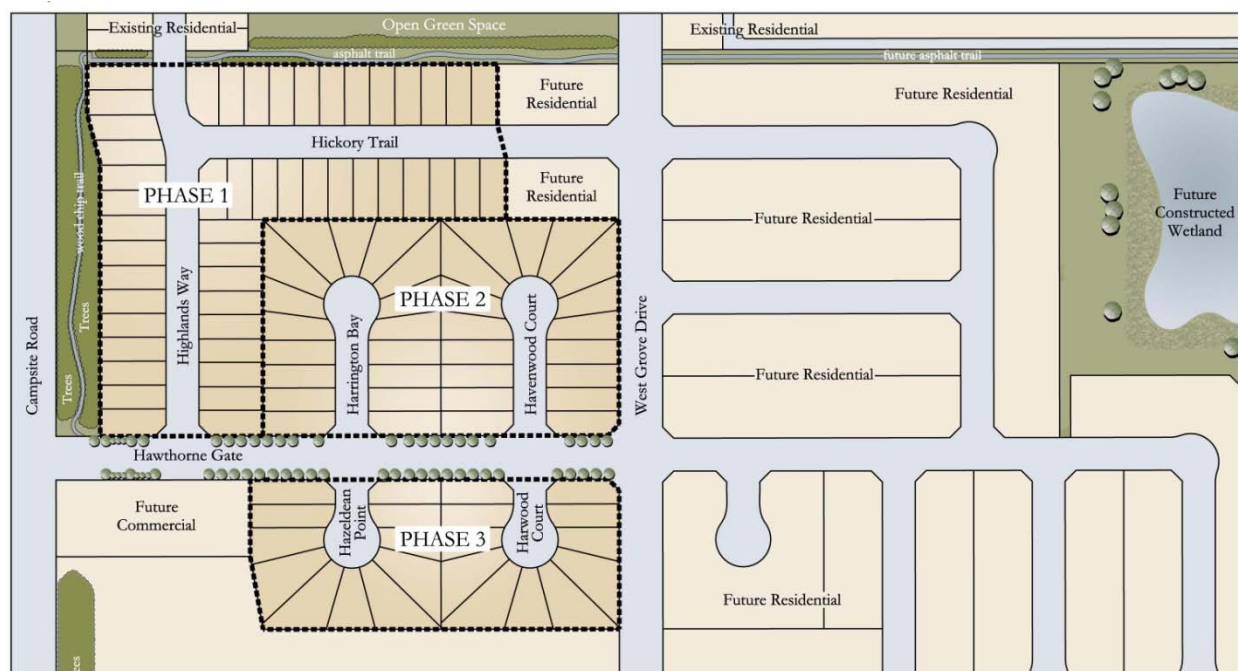


Figure 45 – Typical neighbourhood layout, including residential, commercial and stormwater management parcels.
Source: EDS Group Inc. (2003).

As part of municipal requirements for public open space, a land developer must provide minimum ten percent of the total land area to be subdivided as municipal reserve (MR). MR can include treed areas retained, public parks, walkways and school park sites. In lieu of designating MR areas, developers have the legal right through their development agreement to pay the City cash for the value of the land area based on fair market value of the land at the time of subdivision. This cash is then designated to the City as general revenue, and is not spent directly on public open space improvements for that community. There is no incentive for developers to designate more than ten percent of the land area as MR, and in many instances it makes more economic sense to pay cash in lieu of MR up front, given land price escalations over the duration of developing the entire parcel. Ultimately, in many instances communities do not end up with much public open space.

Under the *Municipal Government Act of Alberta, 2000*, municipalities have the opportunity to also take possession of land as environmental reserve (ER). According to the Act:

“A subdivision authority may require the owner of a parcel of land that is the subject of a proposed subdivision to provide part of that parcel of land as environmental reserve if it consists of: (a) a swamp or gully, ravine, coulee, or natural drainage course; (b) land that is subject to flooding or is, in the opinion of the subdivision authority, unstable, or; (c) a strip of land, not less than 6 meters in width, abutting the bed and shore of any lake, river, stream or other body of water for the purpose of (i) preventing pollution, or (ii) providing public access to and beside the bed and shore” (p. 371).

Wetlands, as an example, can be taken as ER with ownership then transferred to the municipality. A tree stand on the other hand cannot under this legislation. As part of the neighbourhood development plan, ER areas can still be used for public functions such as stormwater management areas, recreational trails and interpretive areas, providing that the uses will not adversely affect the long term sustainability and ecological integrity of the parcel.

Allowing passive recreation is often essential to garner public support for habitat protection, restoration and research (Zedler, 1998). Zedler (1998) also notes that public support for habitat protection is a top priority for growing communities with continual pressure to modify wetlands, to make the accessible for passive recreation (low-impact activities such as bird-watching). This is certainly a trend in Edmonton as well. An environmental reserve natural area management plan, prepared by a qualified environmental planner or scientist with appropriate competencies, must create a management plan that outlines the proposed uses and sustainability of the ecosystem and indicate suitable development buffers surrounding the natural area. In some cases, if peripheral development exceeds the carrying capacity of the ER area, the municipality can choose to not delineate any ER and allow the developer to entirely remove the natural area for conversion to other land uses.

Wetlands provide a range of valuable ecosystem and human services from water purification and nutrient retention to recreation and aesthetics (Boyer, 2004). Urban wetlands that are incorporated as part of a neighbourhood's stormwater management facility systems receive contaminants from roads, private property, storm drains and occasional wastewater spills (Zedler, 1998).

Current Development Conditions: Perspective View

Community Identity and Sense of Place. As new suburban communities are developed in Edmonton, each developer endeavours to create a unique brand that is not used by anyone else to set them apart from their competition. As indicated earlier, developers have clearly identified the need to create a strong sense of identity and place to make their community memorable in order to capture consumer attention. With cost of developing a new home being equal amongst

several communities in a competitive housing market, homeowners then have the luxury of selecting a community with which they best identify. While many communities now embrace a theme of nature in your back yard, the open spaces provided are usually contrived and a much reduced replication of the natural areas that not so long ago were already there.

Social Structure and Activities. New suburban communities favour a younger generation of homeowners, with predominantly first or second time home buyers consuming current available lots. This consumer class usually includes young families with children, and as a result developers lean toward a public realm that is compatible with an appropriate type of recreation. Types of recreation include walking trails and sidewalks, formal playgrounds, and open play space. Features such as community gardens, nature playgrounds, performance or public event venues or communal gathering spaces are not common in Edmonton subdivisions.

Daily Social Life. There is a very low amount of socialization between fellow residents in these suburban communities. Some of the contributing factors include:

- a colder winter and spring climate that is less compatible with gathering in the outdoors;
- limited daylight hours during fall, winter and spring seasons that limit use of the outdoor realm in evenings;
- people working extended hours with less available free time;
- formal recreation programs for children are rarely offered within the community which leads to most families' leisure time away from the community; and
- an automobile driven mindset that leads to a culture that spends less time on walking trails and more time getting place to place in the comfort of their own vehicles.

The Rise of a New Aesthetic: Naturalization. Over the past five years there has been an emerging trend for more naturalistic approach to treating public open space. This is in part due to a more popular theme chosen by developers to promote the “natural escape” right in your own community. Also, the consulting industry has made great progress with the Municipality to explore ways of lowering maintenance and operations costs to care for the public realm using more naturalized approaches. While more natural open space is becoming more common, there is still considerable public resistance and demands for more formal open space such as sports fields, playgrounds and manicured parks.

Site Specific Examples

Langdale in Windermere Neighbourhood. This project began in the mid-2000s with a land developer purchasing this property. This land parcel was nearly a full quarter section at approximately 60ha. At time of the land transaction, this land parcel was mostly in cultivation for annual agricultural crop, with a large remnant tree stand near the north-east end of the site. Prior to formally initiating any development plans on this site and engaging the City of Edmonton for preliminary direction on natural area protection, the developer cleared a substantial amount of trees from the site to suit a preliminary design drawing. This would avert any future challenges in dealing with the City related to protecting this tree stand.

Upon completion of the neighbourhood structure plan (NSP) for the site, the land developer chose to retain a portion of the natural tree stand. Of the 5.2ha natural tree stand on this site (left image of Figure 46), 1.3ha of trees were planned to be retained (right image of Figure 46). According to the proposed NSP would be bordered by single family residential homes on three sides, and a newly constructed stormwater management facility on the fourth. In

compliance with municipal policy, an urban forest management plan was required to ascertain the long term viability and sustainability of this ecosystem. The plan resulted in recommendations that supported retention, while the designated size could not be any smaller in order to ensure adequate ecosystem function.



Figure 46 – 2004 (left) and 2008 (right). Aerial images of this tree stand prior to development, and post-development, same scale for both images. Source: EDS Group Inc. (2010).

Due to adjacent development in the installation of utilities, further disturbances took place that had direct effects on the viability of the tree stand. A stormwater utility line was planned through the trees, almost bisecting the forest in half. The original intent was to not harm the trees and to directional drill this pipe beneath the tree stand without any surface disturbance. Due to the significant cost of this approach, a swath of trees approximately 12m wide was cut to allow for an open trench installation. Upon backfilling, a paved pedestrian trail as shown on Figures 48 and 50 was installed through the centre of the alignment, with peripheral disturbed

grounds planted with a variety of native plant species set back from the trail edge to allow for increased perceived safety and minimized hiding locations for potential predators.

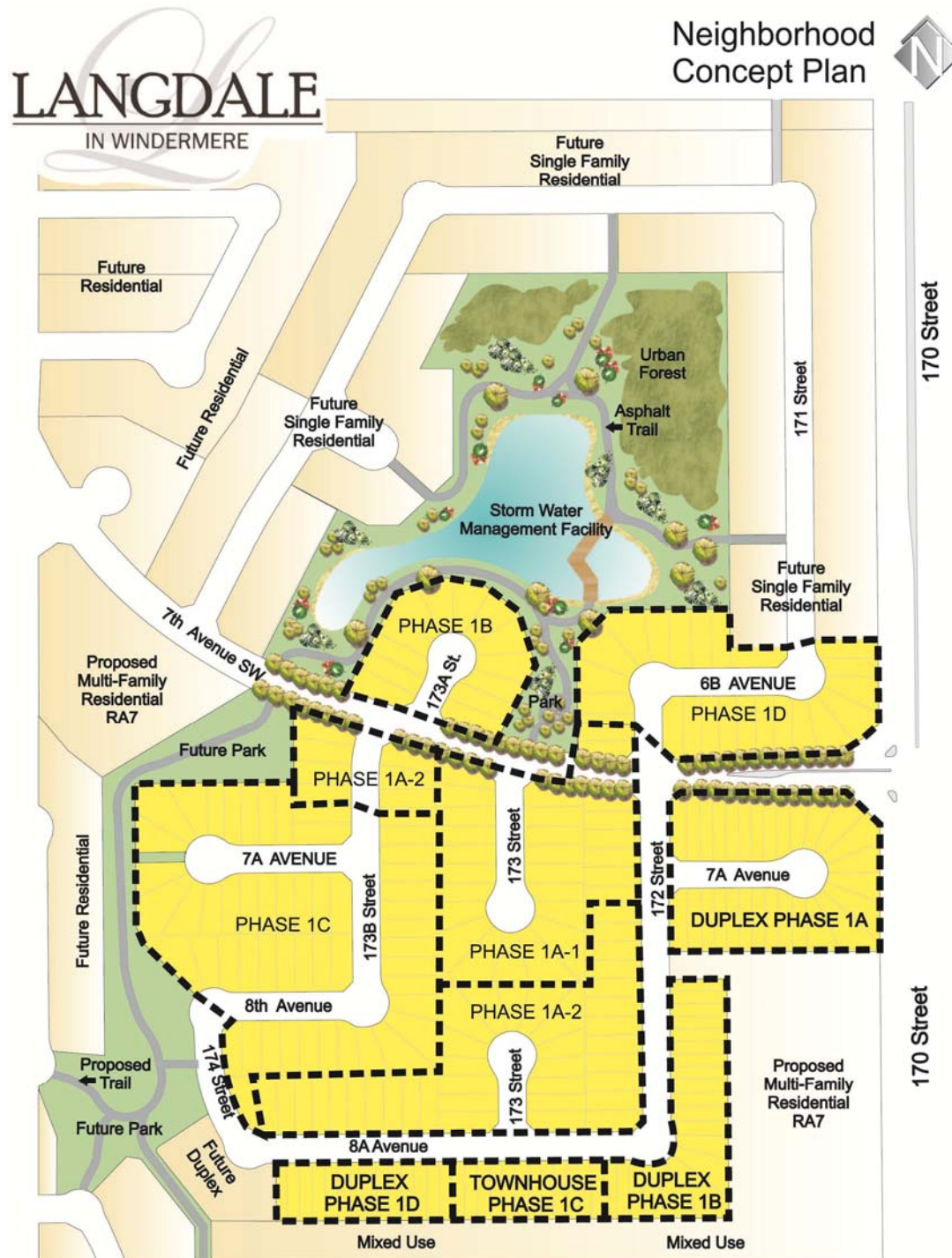


Figure 47 – neighbourhood plan for the Langdale community. Source: EDS Group Inc. (2010).

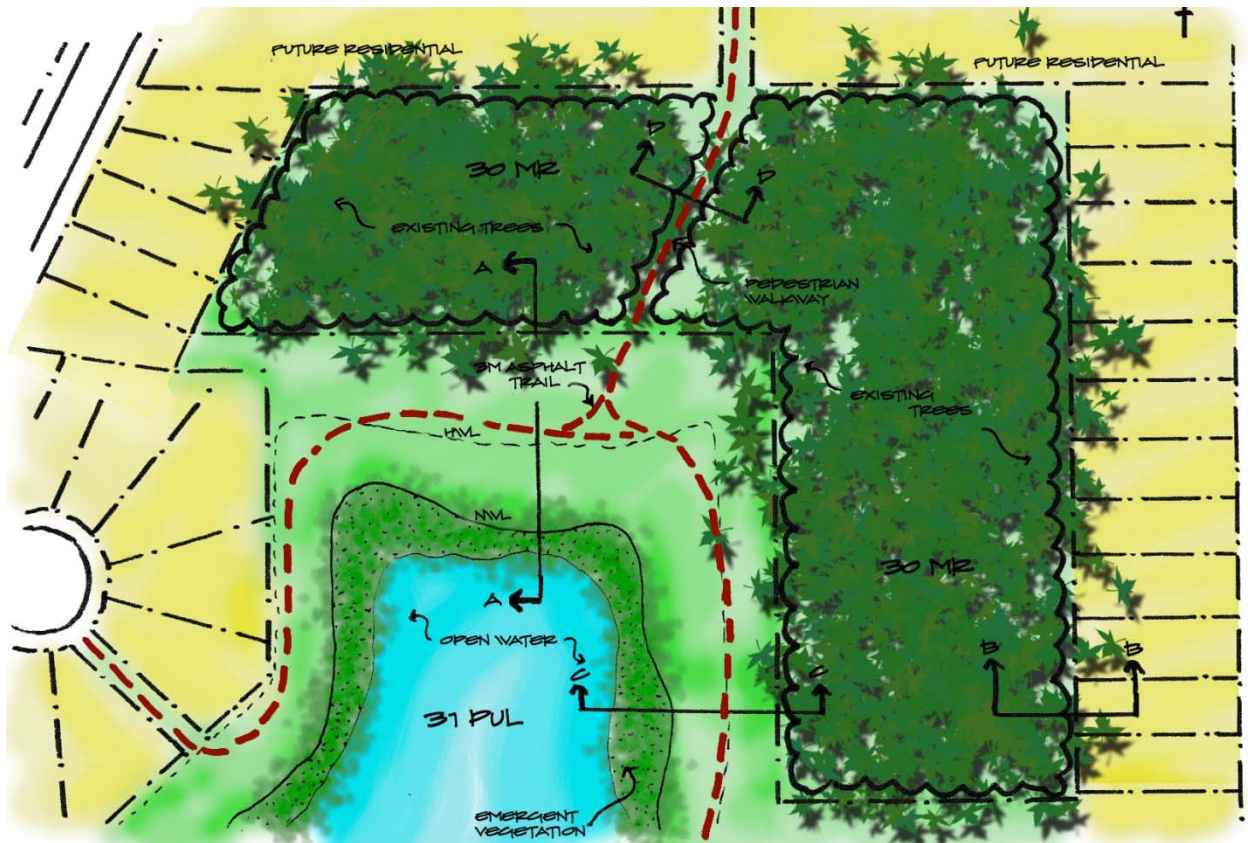


Figure 48 – Plan view of concept plan for tree stand and constructed wetland SWMF. Source: EDS Group Inc. (2010).

The municipality imposed a few additional requirements as conditions to retain the urban forest. A continuous 8m wide clearing between the treed edge and private property was required on the three sides that bordered homes, to provide a “maintenance buffer” to allow maintenance and emergency access around the forest. In addition, the buffer would minimize the potential for trees to be windblown and fall to disturb private property. Because all four edges of the retained urban forest were newly exposed to wind, the tree root systems were not resilient as to be well prepared for wind loading. Today, the remaining area of trees is only approximately 1.0ha.

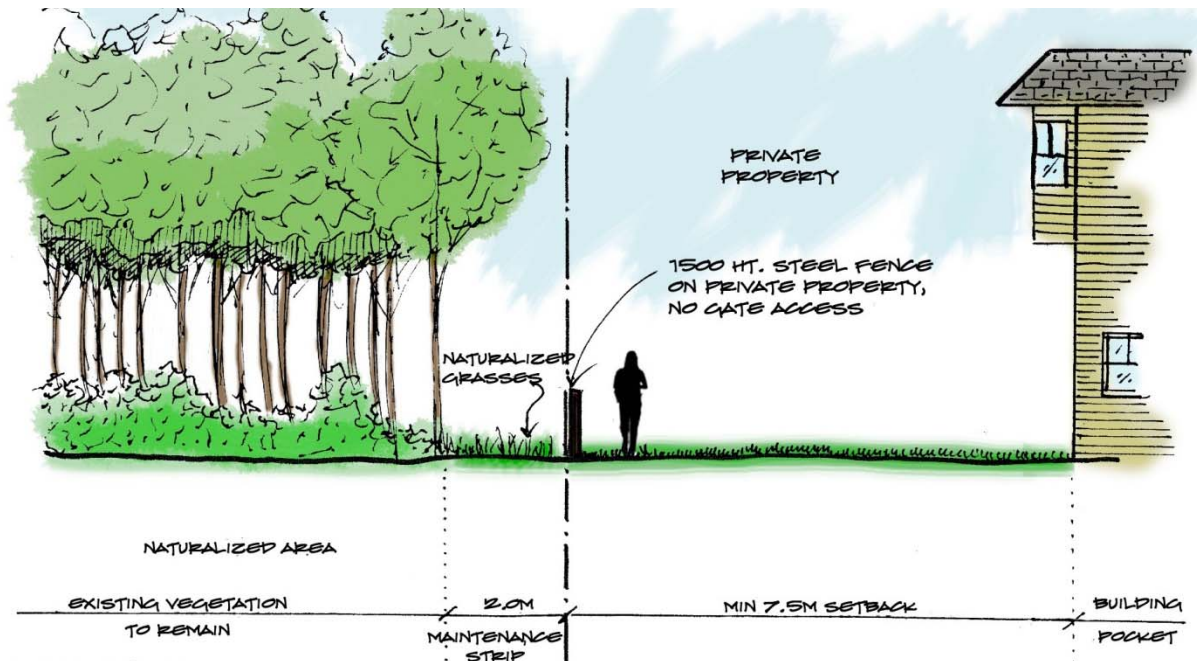


Figure 49 – Cross section of back of lot interface with tree stand, including maintenance buffer. This buffer was originally proposed at 2.0m width, while the City of Edmonton insisted on an 8.0m width. Source: EDS Group Inc. (2010).

At the time of site visits, the first phase of houses had been constructed in this neighbourhood with numerous families already living in their new homes. There are many challenges in retaining natural areas which homes are adjacent to, and these residents quickly take ownership of this public land as an extension of their own back yard. In order to mitigate for resident concern of alterations to natural areas as part of regular maintenance, current marketing materials provide information for residents. Qualico (2012) provides information for current and perspective residents related to potential management of natural areas:

“When selecting a home or lot that is adjacent to a natural area, park, urban forest, environmental reserve of open space, where trees or vegetation have been left in their “natural state”, it is important to know that hazardous trees, diseased trees or trees that prevent maintenance access, may have to be removed from time-to-time. The extent of removal and the visual impact can vary depending on the reason for removal.”

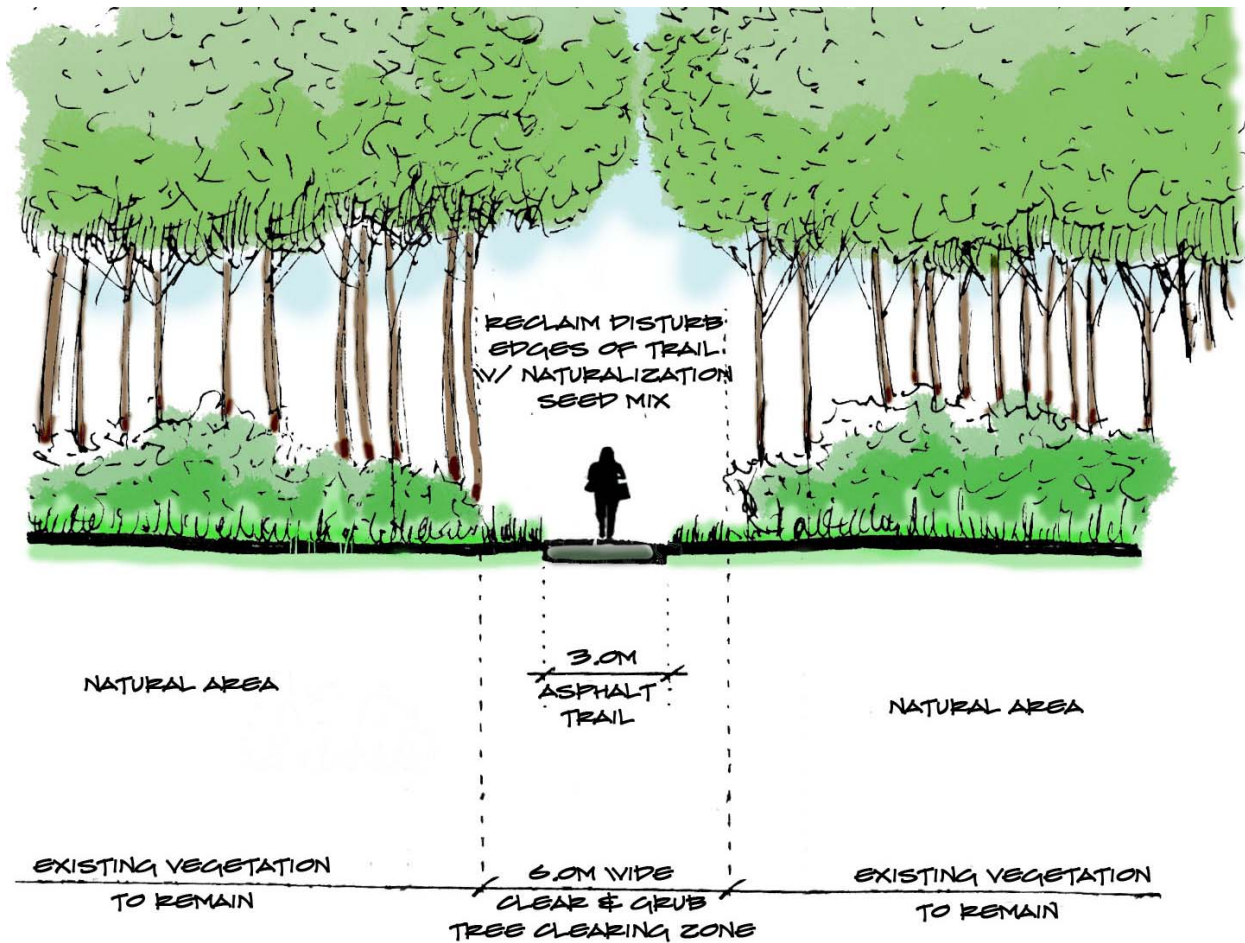


Figure 50 – Cross section showing trail leading through tree stand. Source: EDS Group Inc. (2010).

The forest management plan stipulated required clearing setbacks around the perimeter of the tree stand to meet municipal requirements for safety and maintenance access (Stantec, 2010). The plan did not recommend that new plantings be put in as hazard trees were removed. This information was to be conveyed verbally to perspective homebuyers by their homebuilders, while the plan itself remained an internal document and not released to the general public. In the summer of 2011, the developer had received complaints from new residents due to openings in the tree stand where hazard trees were removed and had subsequently asked their consulting

team to infill open areas in order to appease residents and create more privacy for homeowners (Urban Systems, 2012b).

The stormwater management facility to the south of the tree stand was designed with two different aesthetics – one as a stone lined wet pond along the “estate” lots, and a more naturalized wetland motif along edges of other lots and the urban forest. The variation of styles were directed by the Client, with the opinion that estate lot owners typically prefer a more manicured and formal water’s edge, while some naturalization would be required to conform to municipal design requirements for naturalized stormwater management facilities and would be more compatible with purchasers of standard lots. In essence, this newly constructed pond has some features that appear naturalized, yet a disarray of ecosystem functions that have low habitat value for potential wetland or aquatic species. A trail system was also implemented throughout the pond area along most of the pond edges, providing an abundance of pedestrian access.

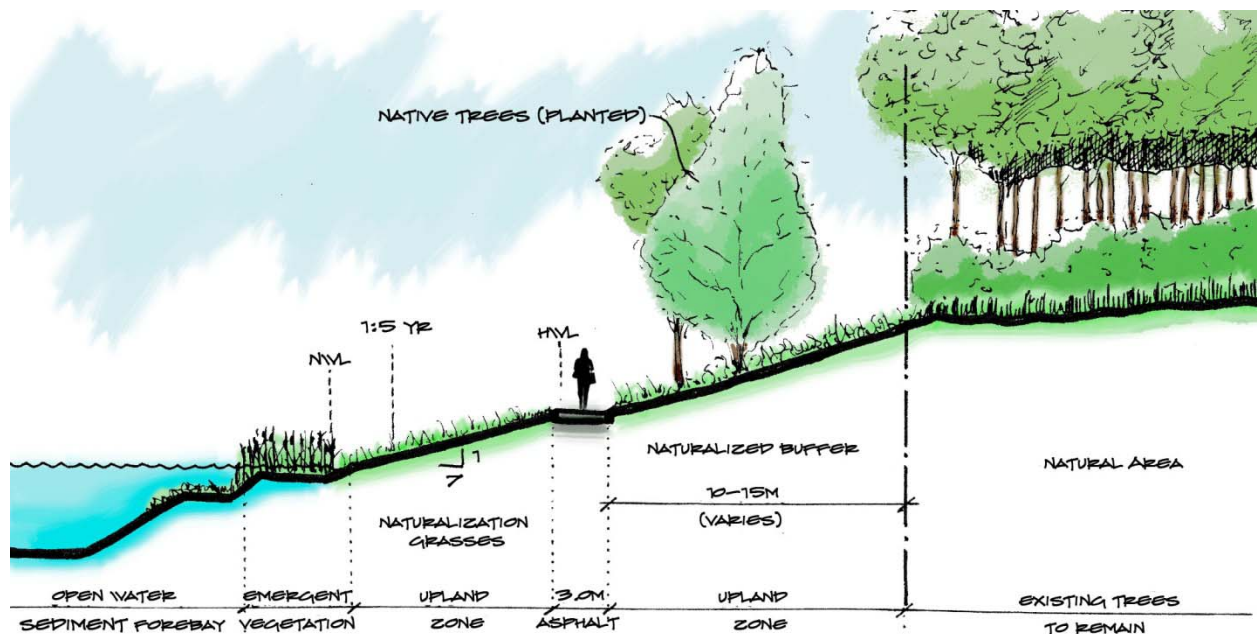


Figure 51 – Cross section of SWMF and tree stand interface with steep slopes between trees and the riparian area, causing an unnatural interface for wildlife. Source: EDS Group Inc. (2010).

A wood boardwalk was also implemented to provide access across the pond. Plant material was a range of native and exotic plant species, placed in such a way that it complimented the formal vs. naturalized zones of the pond. The developer chose to maximize the pond side slopes to use as little land as possible, and this creates an unnatural connection between trees and riparian areas.

The marketing theme for this neighbourhood used imagery of nature as a selling feature to buy a home in this neighbourhood. The urban forest was an important part of this marketing, with the tree stand and stormwater management facility designated in the first stage of development. The consulting team was tasked with accelerating the design, approval and construction process in order to have these amenities ready for pedestrian access prior to the first lots being made available to the general public. As noted on current marketing material for this subdivision, the developer perspective homebuyers can “enjoy the splendor of Mother Nature” while:

- blading, riding or walking to the North Saskatchewan River Valley, parks, green spaces and adjacent neighbourhoods with several kilometers of paved trails;
- being enchanted by Langdale’s urban forest, 3.6 acres of natural trees; and
- relaxing by the 7.4 acre fully landscaped pond and area enhancements including trails, benches and viewing decks (Qualico, 2012).

The subdivision marketing team used numerous references to old English times as a means of establish a strong sense of place, and an individualistic character that sets it apart from dozens of other communities competing for new residents. Qualico (2012) states that “Langdale in Windermere is a master planned community that was designed with charming old-English

flair. Enjoy walks through the park down cobblestone paths, relax on a bench under an old-fashioned street light or simply enjoy looking out over the water on the community lake.” The community fabric of this subdivision has followed standard municipal guidelines, therefore streets are near identical in character as all other new communities. There are no cobblestone walkways, no fairies amongst the trees, nor are there benches beneath old fashioned street lights. Imagery and marketing tactics are used to establish a unique sense of place for perspective buyers. Sense of place is recognized by land developers as an effective marketing tool, and using elements of nature as attractive amenities is commonly used. Sense of place in suburban communities is essential in developing social cohesion (Corcoran, 2010).

Overall, development within the Langdale neighbourhood demonstrates how natural areas are still lost despite an extensive overarching framework of legislation and policies at all three levels of government. Prior to initiating the subdivision process, land developers are not subject to most of the above noted municipal policy that protects natural areas during the development process given land owners have this discretion on private land. Retaining only a small portion of the native tree stand still met the developer’s need to provide an attractive natural feature, creating amenity lots around its perimeter and having a visually appealing feature seen from the entrance road to the new neighbourhood. Despite not demonstrating an interest in truly protecting natural features, the developer still marketed this community using nature as a theme to develop a sense of place.

Rapperswill Neighbourhood. In the early-2000s, a 130 ha (two adjacent quarter sections) parcel of land was acquired by a land developer for the purpose of mixed use development, located at the north end of the City of Edmonton and within City limits. This

parcel of land was comprised of numerous wetland complexes, native tree stands, and open grasslands that were at one time farmed. As part of initial studies required by provincial and municipal government bodies, a natural area site assessment was completed to determine the extent and quality of the numerous natural areas. Under the requirements of both provincial acts and municipal policies, the assessment was circulated to demonstrate which of the natural areas would be left intact post-development, and have the resiliency to withstand long-term pressures of surrounding urban development.



Figure 52 – 2006. Air photo of the site including two quarter sections of land. Mix of agricultural use, residential, and natural areas. Source: EDS Group Inc. (2010b).

Based on an economic evaluation, otherwise known as a pro-forma, the developer chose to prepare the application with the intent to remove all natural areas. Because the location of any naturally-occurring wetlands were not in ideal locations to fulfill an efficient plan, wetlands were not considered for protection and use as a stormwater management facility. Upon circulation of

this plan to provincial authorities, a compensation strategy was put in place that allowed the developer to compensate for lost wetland areas by replicating constructed wetlands on the site at a 3:1 ratio (three times the area of all selected wetlands), and a cash payment for remaining areas of land that cannot be compensated for onsite through reclamation. Most of the compensation would come in the form of a cash payment rather than on-site compensation. In order to avoid any public controversy for new residents, the developer chose to have all of the wetland areas eliminated immediately upon receiving approval from provincial agencies, and prior to the first homes being built.

Upon circulation of this plan to the City of Edmonton, the City had insisted upon an overall neighbourhood plan that incorporated a consolidated natural area that consists of a mix of trees and grassland. The developer was able to accommodate this request. This area of land would be taken out of the ten percent MR dedicated area and therefore reduce the overall parks and open space network for programmed activities such as playgrounds or sports fields. A condition required by the City of Edmonton is for the developer to conform to all municipal requirements for maintenance buffers and clearing setbacks for future trails. This will reduce the number of trees retained significantly, as seen in the previous example for the Langdale development. The park site shown in Figure 53 will become a school site, and natural areas will only remain until which time the school is ready for construction and all natural features will be eliminated (UMA, 2009).

As part of the stormwater management plan for the site, a series of storage basins are required to fulfill stormwater storage. In order to compensate for lost wetlands on site,

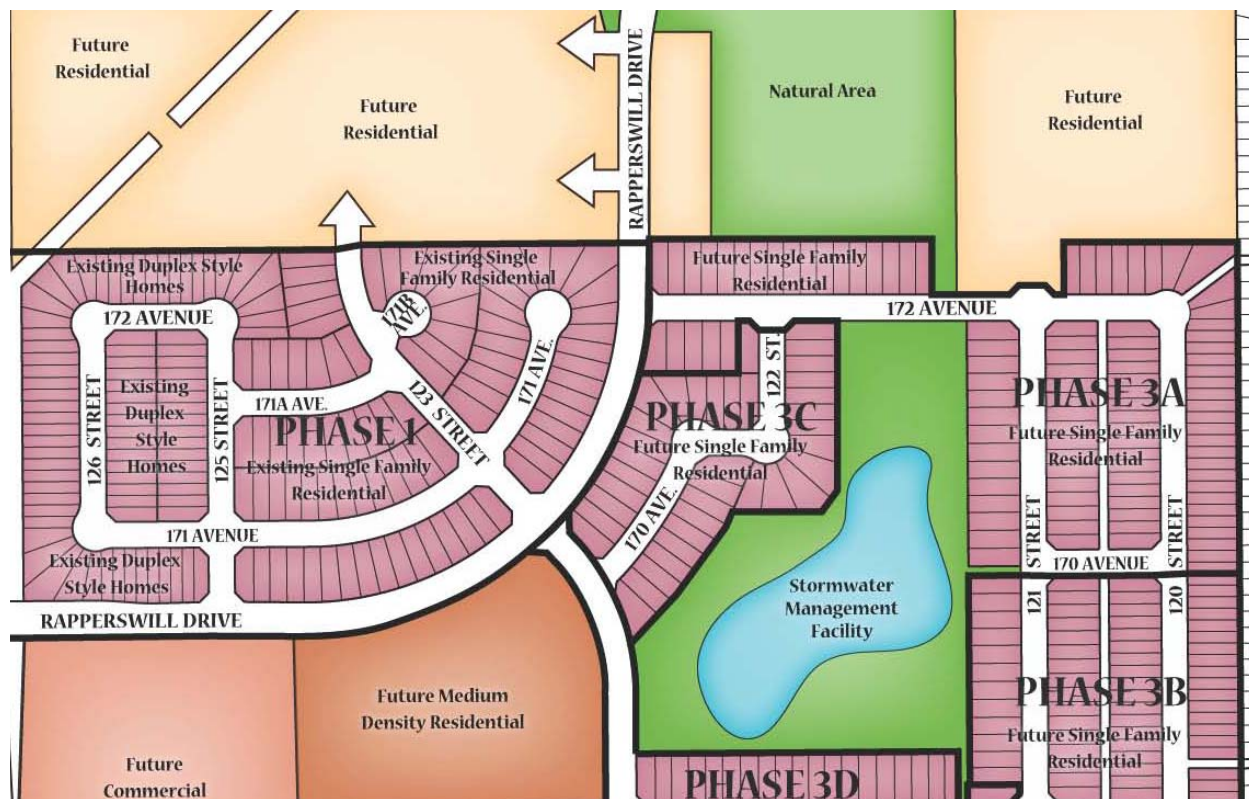


Figure 53 – neighbourhood concept plan for the first stages of the Rapperswill community. The majority of natural areas will be removed.

constructed wetlands are being implemented. Designed in accordance with Alberta Environment guidelines and best management practices for constructed wetlands, the design of the first stormwater management facility design proceeded. Federal legislation under the control of Transport Canada and the Department of National Defense then came in effect, given this site was located along a flight path of CFB Edmonton, an Air Force Base located approximately 14km north of this site. Legislation stipulates that any constructed or altered water body may not be conducive to attracting large flocks of large birds. With this legislation overriding any municipal or provincial legislation, bylaws and standard practices, the design team was no longer able to replicate one of the naturally-occurring ecosystems that once flourished on this site.

While the ultimate design does in fact appear natural, it does not have nearly the potential for species richness due to limitations in its design.

This constructed stormwater management facility will be bordered on two sides by commercial development, a collector roadway on the third, and residential single family homes on the fourth. To minimize the land area required for this stormwater management facility to meet its capacity requirements for temporal storage of stormwater, side slopes were maximized to 5:1 slopes, which is the greatest slope permitted under municipal standards. As seen in the design plan above, very little open water areas have been accommodated in order to prevent landing of large flocks of large birds. Vegetation within upland areas would typically be dispersed in a more naturalistic manner, while plant material has been focused to the water's edge as a means of minimizing the use of the shoreline for annual nesting. Pedestrian trails are also included within the site, allowing for controlled access for people to view the facility. Typical wetlands have open water to emergent vegetation ratio of approximately 60:40, whereas this constructed wetland was designed with a ratio of approximately 10:90 and having very little open water areas.

This design, while having many visual qualities of a wetland having intended emergent vegetation within the water basin, does not provide the same potential for species richness as a naturally-occurring wetland. Regulatory agencies at the provincial and federal level have recognized that nature cannot be replicated. This is most evident through the compensation models that suggest that replicated naturalized areas must be at least three times larger than the naturally occurring ecosystem that was removed. The minimum 3:1 ratio is a way of accounting for the inability to provide the same natural qualities as they relate to ecological function. At the

municipal level, design guidelines do not allow for purely natural landscapes when human-made. Some examples of municipal standards in Edmonton that inhibit naturalness include:

- the requirement for pedestrian trails in all public open space including within stormwater management facilities designed as constructed wetlands as well as urban forests;
- lighting along all walkways that has adverse effect on some wildlife species;
- mowed grass adjacent to trails and property lines, which does not occur in nature;
- mixes of coniferous and deciduous plant material, despite many of the prescribed coniferous species not found in most local natural areas; and
- many remnant natural areas in Edmonton subdivisions are used as public utilities, such as stormwater management (flooding) which introduces unnatural ecosystem functions.

Case Study Assessment: Questions and Findings

1. What public reactions to different ecosystem types or characteristics of natural areas can be observed in Edmonton? Public reactions to different ecosystems were clear in this case study. There have been several instances described in site specific examples of Edmontonian suburbs wherein resident expectations are catered to by developers through the design process and also after residents move into these new communities. The sense of ownership that residents have on adjacent natural areas cause developers to react by the way in which natural areas are treated, and how newly constructed naturalized areas will appear. Residents seem to enjoy living adjacent to natural areas for privacy and a buffer from actively programmed open space or other private lots, and therefore densely forested areas are in high demand. Residents also favour public open spaces for their aesthetic beauty, with a higher preference for formal treatments such as treed areas without deadfall, formally mowed upland

areas of parks and ponds with manicured edges. Less preferred landscapes include wetlands, sparsely populated forests with deadfall, and naturalized upland areas of parks.

2. *Is there a correlation between the human values observed in case studies and the protection of natural areas in Edmonton's urban environments?* There is a direct correlation between human values and the protection of natural areas in this case study. Land developers have a keen understanding of social demands based on success in selling lots in emerging neighbourhoods. By evaluating the successful marketing trends for suburban communities it is very evident that there has been an emerging trend toward selling an “escape from urbanity” through implementing nature in subdivisions. Developers have recognized that there is some demand by consumers to have nature in suburban environments, while these developers also interpret that complete naturalness is not preferred. Municipal standards also reflect residents’ interest in “nature light” in the public realm, which includes naturalized elements that are somewhat manipulated. Current residents in these neighbourhoods demand amenities such as trails with lighting and manicured parks opposed to purely naturally occurring land. These values by homeowners influence developers to not protect natural areas to a greater extent. Further, developers are driven by economic gain, and in the Edmonton region the development industry will only begin to retain more nature when there is economic benefit.

3. *What are the historic trends of natural area preservation and uses within Edmonton subdivisions?* At the inception of subdivisions in Edmonton, natural areas were not at all retained. The General Plan of 1979 noted that one of the challenges with suburban development was the delays in amenities coming to these new developments. Retained natural areas, opposed to newly constructed public open space, come with mature vegetation and established

ecosystems that are in place immediately upon move-in. This plan outlined discontent of the public with the way in which emerging neighbourhoods were being developed, while incorporating naturally-occurring ecosystems such as trees stands, grasslands and aquatic systems was not contemplated. Perhaps including natural areas as part of the public open space fabric would have helped to satisfy the aesthetic concerns of plant material in parks taking many years to mature. The delay in the municipality building formal recreational amenities would also likely not have been satisfied by relying on the passive recreational opportunities of natural areas given the stated recreational trends of that era did not include natural area appreciation.

Today, natural area preservation is inhibited by residents actively manipulating public land to suit their personal preferences. There are often challenges associated with the “ownership” of natural areas, as homeowners oftentimes go beyond their private property and adversely alter these landscapes. Kaplowitz (2003) summarizes their research with, “the regulation and management of wetlands is often contentious because wetlands share characteristics of both land, typically a private good, and water, typically a public good. Landowner’s desires to develop “their property” with wetlands tend to conflict with the public benefits associated with healthy, intact wetland ecosystems” (p. 267). Within Edmonton neighbourhoods there is a significant problem with residents, who live adjacent to or near natural areas, using these areas for personal benefit and making personalized adjustments to the landscape. As seen in previous examples, homeowners manicure natural grasses with mowers, plant exotic trees, dump grass clippings, and clear vegetation to create favourable views. This simply demonstrates a lack of education and ignorance toward one’s control of the public realm and natural environment.

4. Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection? Land planning professionals do demonstrate the ability to facilitate a strong human-nature connection. This is evident through a strong understanding of principles such as biodiversity being an integral part of municipal policies and bylaws, and many of the background reports including very clear verbiage to support human-nature connection. While land planning professionals demonstrate that they have the skills and knowledge to facilitate this connection, suburban developments in Edmonton are increasingly challenging venues for human-nature interactions to take place.

5. Is the current overarching institutional framework effective in promoting a strong human-nature connection? The current overarching institutional framework is not effective in promoting a strong human-nature connection, primarily due to the inability for most of this legislation and policy to delineate actions on privately owned lands. While this framework does require that some types of natural areas be retained, there are avenues available to these landowners to destroy natural areas and simply provide financial compensation.

6. What information would Edmonton seek in order to promote a stronger human-nature connection? Additional policies are needed to protect publically owned natural areas from private citizens making self-serving adjustments to these lands. While there are signs of public support for including natural areas in urban environments, there is an obvious lack of respect for maintaining a careful balance between human use and preservation. Evaluation and implementation of policies affecting natural area protection and management often requires measurement of economic value of these policies to individuals and groups (Bergstron, 1993) in order for a common measurement of value to exist. There is a large body of literature that

discusses ways of putting an economic value to natural areas, however they are oftentimes limited to licensing fees accumulating by recreation activities such as hunting, fishing and wildlife observation. Monetary value is oftentimes the baseline value system for political decision-makers, and as a result there are challenges when natural area protection is simply relayed in intrinsic values. Knowing how people understand and perceive ecosystems is a necessary first step for designing policies that are ecologically and politically sustainable (Kaplowitz, 2001).

Ultimately, the success of any initiative at the municipal level is predicated by receiving public support by residents, which inadvertently leads to support at City Administration and Council. The City of Edmonton has demonstrated a significant effort toward public and stakeholder consultation as an integral part of any planning process. In review of the inventory of reports related to protecting and enhancing natural areas, the public demand is consistently very high (Edmonton, 2011; Edmonton 2009; Edmonton, 2006; Edmonton, 2004). On the other hand, in many cases Provincial and Federal legislation overrides locally supported initiatives, such as the eradication of natural areas as a result of proximity to an air force base under legislation from the Department of National Defense. Despite public interest of protecting natural areas, these overarching legislative authorities are far removed from local interests and demands therefore are not as accountable to public opinion. In order for provincial and federal authorities to have more site-specific influence on development sites, there needs to be stronger inter-jurisdictional cooperation between the three levels of government. Another effective way of better instilling public interest in provincial and federal regulatory processes would be

including more public input and consultation. Provincial and federal regulatory processes do not involve public advisement, consultation, or ongoing input.

While public demand for retaining natural areas is high (Edmonton, 2011; Edmonton 2009; Edmonton, 2006; Edmonton, 2004), consumers must also be willing to pay for higher development costs to retain these natural areas. Development costs associated with natural area protection is predominantly the loss of developable land. As larger proportions of land are dedicated to environmental reserve, developers have less developable partitions to spread costs of development over. Lower density developments will directly correlate with higher consumer pricing. With the many solutions that they offer, green communities can provide clean, healthy, and resource efficient living (Butterworth, 2000), which may be appealing to consumers for economic, social, health, and environmental reasons; determining what is currently appealing about green communities and finding ways for marketing efforts to make other facets equally desirable is crucial for the advancement of green communities (Noiseux, 2010).

In the context of incorporating natural areas in urban development, some of the current challenges faced by the City of Edmonton include:

- an urgency to protect any remaining natural areas within urban development areas in light of explosive urbanization in fringe areas and subsequent impacts to these ecosystems;
- understanding ways of encouraging natural area protection for unprotected areas of land that are on privately-owned land;
- establishing strategies to encourage increased physical activity in these natural areas to help reduce global trends such as sedentary lifestyles and obesity (Foresight-Butland,

2007) - such as implementing walking trails - while limiting disturbance of development to ensure the protection of these ecosystems;

- ensuring public safety in natural areas in light of both actual and perceived danger; and
- an absence of design strategies to maximize our effectiveness in designing for strong human-nature connections in those natural areas that are retained.

Based on personal experience working in the land development industry, other challenges that are prevalent in Edmonton include limited financial resources from developers to fund in-depth studies of natural areas, and a lack of site-specific investigation to establish environmental planning guidelines such as adequate setback buffers or the effect on subsurface water flow by urban development.

7. What impact has the rise of technology had on the human-nature connection, and on the integrity of natural environment in Edmonton? The automobile is likely the greatest impediment to protecting the integrity of the natural environment and promoting a strong human-nature connection. Personal vehicle use has led to significant sprawl patterns and a very limited public transportation system leading out to suburban developments. This network of very large roads bisect many ecosystems, change regional watersheds and create a substantial obstacle to wildlife movements. Even within subdivisions, vehicular dominated streetscapes create impediments to the movement of both wildlife and pedestrians. The bi-products of vehicle use include the speed that cars travel, noise, increased impervious surfaces, and hydrocarbon inputs into downstream ecosystems. While getting from place to place with our vehicles, people are less likely to have the opportunity to experience intricate details of nature such as the smells, sounds and up-front views.

With a better understanding of ecological principles such as biodiversity, new knowledge in the natural sciences has advanced our understanding of how to protect natural systems. Biodiversity also supports retaining much smaller patches of natural areas that for generations were considered invaluable. Improvements in science-based knowledge related to the function of ecosystems is providing for a stronger human-nature connection than past generations when areas of natural landscapes were deemed insignificant and therefore eliminated as urban development progressed.

8. What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection within suburban development in Edmonton? The City of Edmonton has a comprehensive framework of supporting policies to promote the preservation of natural areas. On the other hand, this case study assessment demonstrated the inability for the Municipality to apply many of these policies on privately owned land. As a result, it is clear how land planning professionals urgently need to better educate their clients on the importance of strong human-nature connections. By bringing an interdisciplinary mindset to problem solving, practitioners can provide an argument that is multifaceted and contributes varying perspectives to land planning solutions. Demonstrating that nature not only adds to the aesthetic quality of a community, but also has economic, social and health benefits to humans is one possible strategy.

Question ten of this assessment outlines how compensation models for lost ecosystems is often more financially viable to developers than protecting natural areas and reducing developable land. One possible strategy that can be implemented to help land planning professionals be more successful in encouraging the protection of natural areas would be for

governments to eliminate financial compensation as an option for lost ecosystems. Requiring one of two options, including on-site compensation or natural area protection, would ensure that adequate natural areas are left in-tact and therefore be included into the urban fabric. A human-nature connection cannot take place in the absence of natural areas.

9. *How have emerging global trends affected the land planning process or the observed planning strategies in suburban developments of Edmonton?* Emerging global trends were not seen to have an impact on planning strategies in this case study. There is no apparent desire to reduce personal reliance on vehicle use within these new developments. With an abundance of water available through civic infrastructure, water scarcity is not an obvious concern. Recreational amenities that serve residents are located outside individual communities yet there is no obvious outcry for these amenities to be closer to home and promoting more walkable communities. Residents appear to be complacent with current development patterns and the global trends included in the literature review do not have an obvious effect on the land planning process for suburban Edmonton.

10. *What strategies are prevalent in Edmonton's suburban developments to help minimize ecosystem degradation?* Through municipal policies there is a strong framework of supporting statutory documents to help minimize ecosystem degradation on publically owned land. Unfortunately these strategies are not applicable on privately owned lands, wherein most suburban development takes place. Provincial and federal Acts and legislation include mechanisms for developers to provide financial compensation for lost natural areas, and this avenue is more economically effective than setting aside natural areas from development.

Not all land developers eradicate all natural areas as a routine practice in the land planning process. Having a comprehensive inventory of remaining protected and unprotected natural areas is a strategy that Edmonton currently uses to work with developers to minimize ecosystem degradation. Looking at ecosystems on a biodiversity level and as a large system gives land planning professionals a convincing tool to convey the importance of retaining any natural area, despite its size or configuration.

11, *What are the varying views and values of nature that can be seen in Edmonton, and do these perspectives result in an attitude that supports natural area protection?* Based on a high market demand for amenity lots that back onto natural areas or constructed naturalized areas, there is an apparent demand for nature on our cities. On the other hand, the actions of residents and many of the recorded concerns that they have with naturally occurring ecosystems demonstrate that unaltered natural areas are less desirable. These residents exhibit that they value nature, however for anthropocentric and individual benefits. While this attitude supports natural area protection, it comes with an interest to manipulate these natural areas to have preferred conditions that benefit humans.

12. *How has human reliance on nature changed over time within Edmonton, and what has any change had on the human-nature connection?* Based on the assessment of suburban development in Edmonton over approximately the past 40 years, nature has never been an integral part of the urban fabric and there has not been a significant human-nature connection. At the onset of suburbs in the 1970s recreational trends did not include passive activities such as nature appreciation. It was not until the 2000s when natural areas began to be included in conventional suburban developments. At the same time, the inclusion of natural areas within

urban fabric does not demonstrate a reliance on nature. Today natural areas are used for passive recreation (i.e. trail walking through tree stands) and also as public utilities (i.e. stormwater management facilities).

3. SUBURBAN DEVELOPMENT: SHERWOOD PARK – STRATHCONA COUNTY, ALBERTA

General Description

Surface Features. The natural landscape of Strathcona County consists of sandy hills, agricultural land, wetlands, lakes and residential areas. The Cooking Lake moraine, which consists of deposits of gravel, sand and silt from melting of glacial ice, created a knob and kettle topography of small hills and depressions (Geowest 1997). There is also a mix of both conifer-dominated boreal forest as well as deciduous-rich aspen parkland. This vast array of habitat results in very high species richness. Approximately 50% of the entire municipality is covered by a series of natural areas which have been consolidated into a protected area called Beaver Hills (Beaver Hills, 2011). The Beaver Hills Moraine is by far the largest natural feature in this Municipality, with the North Saskatchewan River being the other notable natural feature. This river segment is downstream from the City of Edmonton, and provides connectivity to Edmonton by water-based vehicles as well as by hiking trails along the riparian edge.

Population and Development Patterns. Strathcona County is the fourth largest municipality in Alberta, at nearly 1,250 square miles. It is located in central Alberta, south of the Regional Municipality of Wood Buffalo and east of the City of Edmonton. While Strathcona County contains several clustered developments the entire population is part of the same municipality. There are currently eight hamlets located throughout Strathcona County. The

largest hamlet is the urban service area known as Sherwood Park, with a current population of approximately 62,000 people, and an area of approximately 80sq.km. This population is a dramatic increase from only about 2,900 residents in 1961 (Strathcona County, 2012b). While this population would make this urban service area the seventh largest city in Alberta (Statistics Canada, 2011), by choice it only has the status of being a hamlet along with the other eight hamlets within the municipality. A hamlet is a cluster of development within a municipality that does not have any statutory powers – the government of the surrounding municipality has full jurisdiction over all matters of government within all hamlets, as well as rural areas (Government of Alberta, 2010). By not incorporating as a city, Sherwood Park benefits from having governance provided to it by the overall municipality, and also from the revenues generated by the industries of the region. Other development in the municipality includes a number of rural subdivisions with lot sizes ranging from 0.5 to 6.0 ha, agricultural operations and heavy industrial uses.

The hamlet of Sherwood Park began to develop in 1954 with the first residential subdivisions beginning to form. At its inception, it was envisioned that this development would include only about 100 homes and provide residences for people working in the nearby industrial developments. Growth within Strathcona County primarily took place in the urban service area of Sherwood Park, while there was still a significant amount of development including country residential developments throughout the Municipality. Most of the municipality has a continuous grid of roads at one mile intervals to provide access to farm land that was partitioned in one by one mile sections. Rural subdivisions, such as the one shown on Figure 54, were a result of quarter sections of land partitioned into smaller lots, ranging in size. All subdivisions

were subject to municipal policy that requires a dedication of no less than ten percent of the land to be identified as municipal reserve.



Figure 54 – Typical rural subdivision layout in Strathcona County. These developments contain a significant amount of natural areas including trees, wetlands, and grasslands. Source: EDS Group Inc. (2003).



Figure 55 – Typical urban development layout in Sherwood Park. This urban service area does not contain a significant amount of natural areas as compared to the rural areas. Source: EDS Group Inc. (2003).

Residential and commercial development patterns within Sherwood Park are very similar to Edmonton and other western Canadian cities during the latter half of the 20th century, as shown in Figure 55. This includes a grid of urban roadways and predominantly single family bungalow style homes from the 1950s through to the 1980s, then more current sprawl patterns leading to today. There are approximately 16 subdivisions in the Sherwood Park urban service area (Strathcona County, 2012). Big box commercial development is part of the typical fabric of the urban service area.

Preservation of Natural Areas. Geowest (1997) provides a good perspective on the perception of wetlands in Strathcona County and surrounding area, noting that:

“For most of this century, wetlands have been viewed narrowly either as wastelands or as areas providing little benefits beyond the support of wildlife populations. Over the past few decades, however, there has been a growing appreciation that wetlands are not only essential to waterfowl but also to protecting fisheries, drinking water supplies, and flood-prone landscapes. The link between maintenance of wetland ecosystems and preservation of biotic diversity has become increasingly clear as more and more initiatives . . . are acknowledging the non-waterfowl resources supported by wetland and adjacent upland ecosystems (p. ii).

Based on air photo review and site visits to numerous communities, many of these subdivisions have a large proportion of natural areas including wetlands, grasslands and treed areas. Sherwood Park also has a large number of natural areas within its conventional urban fabric, while based on site research and reconnaissance many of these are not naturally-occurring and have been constructed as development continued to eradicate previous landscapes. As compared to other western Canadian municipalities, Strathcona County has among the most stringent development guidelines as it relates to the preservation of natural areas within new development. This research will describe some of the current enabling policies at the municipal level that leads to this protection of natural areas.

Beaver Hills is a natural area that includes a number of lakes, streams and wetlands, covering approximately half of the entire municipality.

“ . . . The Beaver Hills/Cooking Lake Moraine is a geophysical feature that was created by glaciation more than 10,000 years ago. It is an extensively treed, upland area consisting of rolling to hummocky terrain rich in native wetlands and aspen dominated Boreal mixed wood forest habitat. There are several federal and provincial protected areas located entirely within the Beaver Hills, including Elk Island National Park, the Ministik Bird Sanctuary, the Cooking Lake–Blackfoot Recreational Area, Miquelon Lake Provincial Park and a number of smaller provincial natural areas. Nearby, there are other ecologically significant areas that are ecologically linked to the Beaver Hills including Beaverhill Lake, a designated RAMSAR site (a Wetland of International Importance)” (Beaver Hills, 2011).

Although past land use in the Beaver Hills has mainly been restricted to agriculture, demand for recreational, urban and county residential land use is placing increasing pressure on the area (Beaver Hills, 2012). Throughout Alberta, lake water levels have been declining over the past twenty years (McEachern, 2012) and global trends of increasing mean temperatures have been believed to cause this recession (University of Alberta, 2012). Receding water levels are having considerable impacts on the integrity of many of the natural areas within Beaver Hills.

Sense of Place. Strathcona County promotes its sense of place around sustainable living and the abundance of natural areas protected within its confines. Strathcona County (2012c) notes that “Strathcona County is a safe, caring and autonomous community that treasures its unique blend of urban and rural lifestyles while balancing the natural environment with economic prosperity.” Because of the municipal requirements for retaining natural areas when possible in new urban development, new subdivisions are also seen to promote natural escapes and an intimate connection with nature right in your backyard. Examples of this will be explained in more detail in site specific examples within this municipality’s case study.

The Rise of the Subdivision

Strathcona County's Growth Patterns. Strathcona County has both urban and rural subdivisions within its confines. Rural subdivisions began to develop approximately 50 years ago, with clusters of development leading to 0.5 to 6.0ha parcels of land per individual home. More urban subdivisions were limited to the urban service area in Sherwood Park, which had experienced the same sprawl patterns seen in other western Canadian cities. Industrial development including crude oil refineries and petrochemical upgrader facilities are located along the western and northern edges of the municipality, near the North Saskatchewan River as a reliable source of water for their operations.

Challenges with Sprawl: Local Mindset. Within the previous case study I included a summary of the challenges associated with urban sprawl. Sprawl has the same effects on ecological systems as development consumes more land as the municipality grows. Since its inception, Strathcona County has maintained a stronger environmental ethic that values the natural environment and incorporating naturally-occurring ecosystems into built form. This may have been accredited to the prominence of the Beaver Hills area, and early on understanding of the significance of the natural environment. Development also began in the Municipality after the environmental movement described earlier that began after World War II where local mindsets were more in tune with natural area protection. This was the same period of time where growth in Strathcona County began.

With undulating terrain throughout the region, land must be somewhat leveled to accommodate building pockets, roadway networks and public utilities in developed areas. This re-grading leads to direct impacts to ecological features and also affects localized drainage

regimes. Altering drainage patterns creates a new regime of water infiltration and changes the available water to downstream locations. These conditions are common in many of the urban subdivisions in Sherwood Park, while development in rural areas seem to be much more compassionate to the natural terrain – retaining drainage regimes and avoiding site grading that affects the ability to retain natural areas.

The Public Realm. Strathcona County boasts its network of trails that accommodates a range of active transportation modes. The Heritage Parkway Trail includes a continuous 3m wide paved trail that passes through numerous neighbourhoods within the urban service area, and provides linkages to the rural areas surrounding Sherwood Park. A trails master plan was completed in 1998, providing a strategy for connecting both urban and rural areas and recreational features using multi-use trails. A premise of the plan is to ensure that trail opportunities are no more than 15 minutes away for any resident (Strathcona County, 1998).

Stormwater Management. As in the City of Edmonton, all developments within Strathcona County must provide adequate stormwater management. While constructed wetlands became commonplace in the mid-2000s in Edmonton, this was the case as soon as the mid-1990s beginning with the design and construction of Craigavon Meadows constructed wetland, and the planning of similar facilities in Heritage Hills and the Summerwood community.

Views As Related to Nature

Economic Value of Nature: The Rise of Agriculture. Strathcona County is covered in native trees, agricultural pasture land, cultivated fields and wetlands. With approximately 50% of its area including the Beaver Hills protected ecosystems, a large portion of the municipality is naturally occurring naturally-occurring and protected through various means of legislation and

policy. There are pockets of cultivated fields throughout the Municipality, in locations where land is well drained and upland from the numerous lakes and wetlands in the region. Many other areas are not suitable for cultivated fields, and as a result agricultural activities here mostly include cattle grazing and livestock production. Cultivated crops require land that is more arid than this region, and the low lying land of this municipality tends to be more acidic and wet than desirable for most cultivated field crops. Throughout the region's agricultural areas, air photo review suggests that approximately 20% of all privately owned land in agricultural use is currently treed and undisturbed land. An example is represented by Figure 56. These trees in many areas, however, are frequented by livestock and leads to some disturbance to these natural areas where livestock is prevalent.

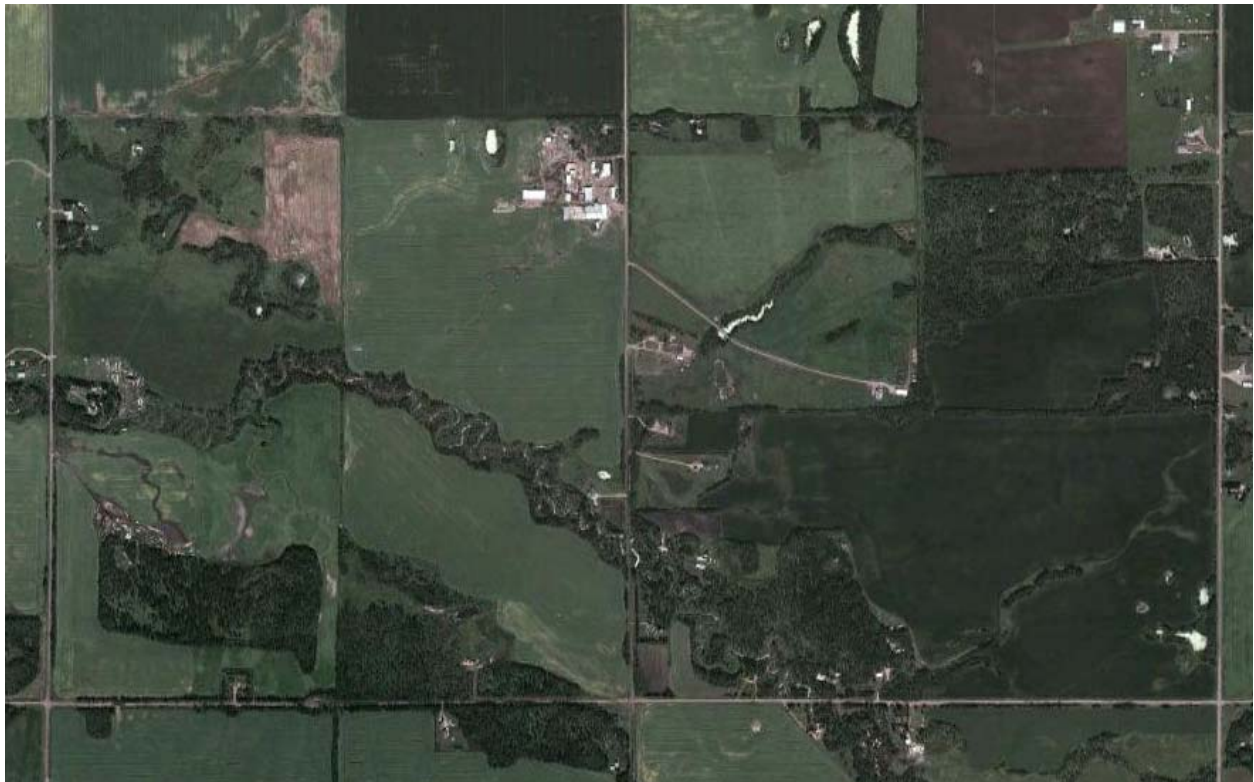


Figure 56 – air photo of typical agricultural area of Strathcona County. Significant amounts of natural areas are retained in and amongst cultivated fields and pasture lands. Source: EDS Group Inc. (2003).

The agricultural industry is highly dependent on the land. Long-term ecosystem health ensures that farming operations thrive for many years. The agricultural community in Strathcona County has demonstrated a very strong connection to the land by evidence of the amount of natural areas that are still intact. Many remaining natural areas could very well be eliminated and converted into either cultivated or pasture land, yet this has not been the case. The naturalness of this region helps to define the sense of place of Strathcona County. The ways in which Strathcona County markets its identity is very consistent with actual site conditions on the land. The long-standing conservation and preservation ethic of the farming community and their strong interrelationship with nature may have contributed to a deep seated public appreciation for place attachment, local identity, and involvement with nature.

While most of the remnant natural areas in the Municipality are privately owned and are not subject to municipal policy, many farm operators have expressed a strong interest in learning how to help preserve these ecosystems. Several non-government organizations have developed partnerships with many local land owners, such as Ducks Unlimited, the Prairie Farm Rehabilitation Administration, Cows and Fish, Alberta Fish and Wildlife and Alberta Prairie Care.

Economic Value of Nature: The Discovery of Oil. As oil reserves were discovered and exploited throughout Alberta, the need for processing and refining crude oil was needed. The Industrial Heartland is a large heavy industrial area within Strathcona County that contains almost all of Alberta's refineries. An example image of a refinery is shown on Figure 57. These developments lead to the complete elimination of natural areas given the scale and density of mechanical units placed on the site. Consistent with any other development in Strathcona

County, these sites must also provide for stormwater management on site, to accommodate surface runoff from the development prior to release to downstream areas. To date, these SMWFs have been developed as wet ponds, square in configuration and without any enhancements or habitat recreation features such as plantings or aquatic vegetation.



Figure 57 – typical oil and gas refinery facility in Strathcona County. Source: Google Earth, accessed February 3, 2012.

Nature Appreciation: Intrinsic Value. Nature appreciation is very popular in Strathcona County. Bird watching and other passive nature appreciation is very common, particularly due to the high abundance of species in this area. As an example, there are approximately 230 species of birds that are seen throughout the year (EDS Group, 2003) within the natural areas of the Heritage Hills neighbourhood. There are numerous interpretive opportunities throughout the Municipality to enjoy nature appreciation, such as the Heritage Hills Wetlands, the Ministik Bird Sanctuary, the Beaver Hills region, and Cooking Lake. There are numerous amenities throughout even the urban service area of Sherwood Park for nature appreciation, including

wetlands, forests and grasslands that have interpretive panels (as seen on Figure 58), information signs as well as trail and seating areas for this activity. Equestrian activities are very common throughout the Municipality, with an array of natural area trails for people to enjoy nature by a more passive means than off-highway vehicles. These natural area interpretive opportunities provide a recreational opportunity for all ages.

Figure 58 – Interpretive sign at a constructed wetland at the Summerwood subdivision. Source: EDS Group Inc. (2010).

Loss of Natural Ecosystems. Suburban development in Strathcona County still comes with the loss of intact ecosystems that existed pre-development. This is due to the alteration of drainage regimes through grading as a result of minimizing road grades, developing suitable building pockets, and the development of stormwater management patterns that use gravity-

based surface flow for the movement of water. The Municipality, however, strongly encourages natural areas to be retained in any growth areas, and has been proactive in identifying any vulnerable natural areas many years in advance of any development. With early-on communication with land developers, Strathcona County has been successful in working with these private land owners to encourage development that retains as much natural area as possible, while still conforming to the limitations of the *Municipal Government Act, 2000* that ultimately dictates terms and conditions of subdivision.

Current Enabling Policies, Guidelines and Initiatives

2007 Municipal Development Plan. Strathcona County updated their MDP in 2007, and this document has a strong focus on the conservation of the natural environment as well as agricultural lands. Decisions regarding the growth and development within Strathcona County are based on the premise that there is limited land within the Municipality, and that land uses will be competing for these land bases (Strathcona County, 2007).

The MDP outlines an overall governance structure for this document that is based on three pillars upon which a bottom line is assessed. Strathcona County (2007) notes that, “the triple bottom line or “three pillars” approach to assessment of our community’s sustainability focuses on the social, economic and environmental elements of the community” (p. 1.2).

This document indicates a realization that certain lifestyle choices can lead to resource consumption at a faster rate than the world can replenish them, or one that can work within a resource’s ability to regenerate. The MDP includes an analogy that states “if everyone in the world lived as we do in Strathcona County, we would require four planets to support us” (Strathcona County, 2007). In order to maintain a sustainable lifestyle and encourage a new way

of living off the land, the MDP suggest the following definition of sustainability. “Sustainability for Strathcona County, means developing in a manner that meets the needs of the present without compromising the ability of future generations to meet their own needs, while striking a balance between economic prosperity, social responsibility and environmental stewardship” (Strathcona County, 2007).

The document outlines four principles of achieving a sustainable community, using science-based sustainability principles that include:

- solutions and activities that preserve, enhance and regenerate nature and life-sustaining ecosystems;
- solutions and activities that free us from our dependence on substances that are extracted from the earth’s crust and accumulate in nature;
- cradle-to-cradle solutions and activities in design, manufacturing and consumption such that substances produced by society do not accumulate in nature; and
- social solutions and activities that allow every person to meet basic human needs and achieve their potential in life now, and in the future.

The MDP also outlines some practices that can be implemented to help achieve these principles. Strathcona County (2007) notes these to include:

- redeveloping existing sites and buildings before constructing new ones: integrate ecological features to serve as green infrastructure elements; create a well-defined “edge” of natural space and agricultural lands; reduce water use and recycle waste eater; biological sewage treatment; etc.;

- develop pedestrian & bicycle oriented communities; development heated and powered by renewable energy; intensification; mixed-use development; public transit; incentives for organic agriculture that minimizes phosphorus and petrochemical fertilizers and herbicides, etc.;
- incorporate healthy building materials and construction techniques that reduce or eliminate the use of toxic building materials, landscape design and maintenance that use alternatives to chemical pesticides and herbicides; and
- diversity of housing types and affordable housing; supporting locally-based business and food production; encouraging eco-industrial development, participatory community planning and decision-making (pp. 4.1-4.2)

There are several environmental management objectives outlined in the MDP, including:

- minimize the impact of human activity and development on the natural environment;
- sustain and where necessary improve upon water, land, air and natural resource quality;
- increase community awareness regarding the impact of activity on the environment;
- promoting environmentally friendly programs; and
- encouraging the use of conservation easements & other tools to protect the environment.

As stipulated by the requirements of the *Municipal Government Act of Alberta, 2000*, an MDP does not require all directives to be written in legalese that is clear and measurable. While an MDP is in fact a statutory document, details that relate to site-specific and on-the-ground actions by land owners are further refined in other policies and bylaws. As a result, an MDP can make more generalized recommendations that are somewhat subjective, such as “minimizing

impact” or “creating awareness”. This language is used to set a general tone related to development within the municipality, and establishes themes for more detailed policy and bylaw.

Priority Management Areas. Within the MDP there is reference to a local policy that includes a matrix for priority area management. The entire Municipality was assessed for its existing natural areas, and each was given a priority ranking that ranged from high, medium and low priority. The priority management area map (Figure 59) demonstrates that almost the entire county is within either medium or high priority zones. The fact that most of the Municipality is considered worthy of some degree of ecological protection and management demonstrates the desire to preserve the ability for humans to interact with nature for years to come.

High priority areas, such as the North Saskatchewan River valley, lakes and areas with protected rare and sensitive flora, fauna or habitat, must be preserved. These areas require adequate buffers to ensure protection. Human intrusion and vandalism of natural ecosystems in urban areas is a continuing problem, which can be mitigated through implementing upland buffers as a necessary feature for retaining habitat value (Zedler, 1998). A biodiversity approach to planning is taken with high priority areas, in that a large network must be maintained between these high priority areas including physical habitat corridors. Biophysical assessments are required for any development that has any effects on these classified high priority areas. Medium priority areas are to be protected through environmental management areas through the use of tools such as reserves as identified by the *Municipal Government Act, 2000* and conservation easements. Low priority areas are to be encouraged for protection through conservation easements and through educational programs. All three priority management area types involve a grassroots approach whereas people are actively engaged in the process.

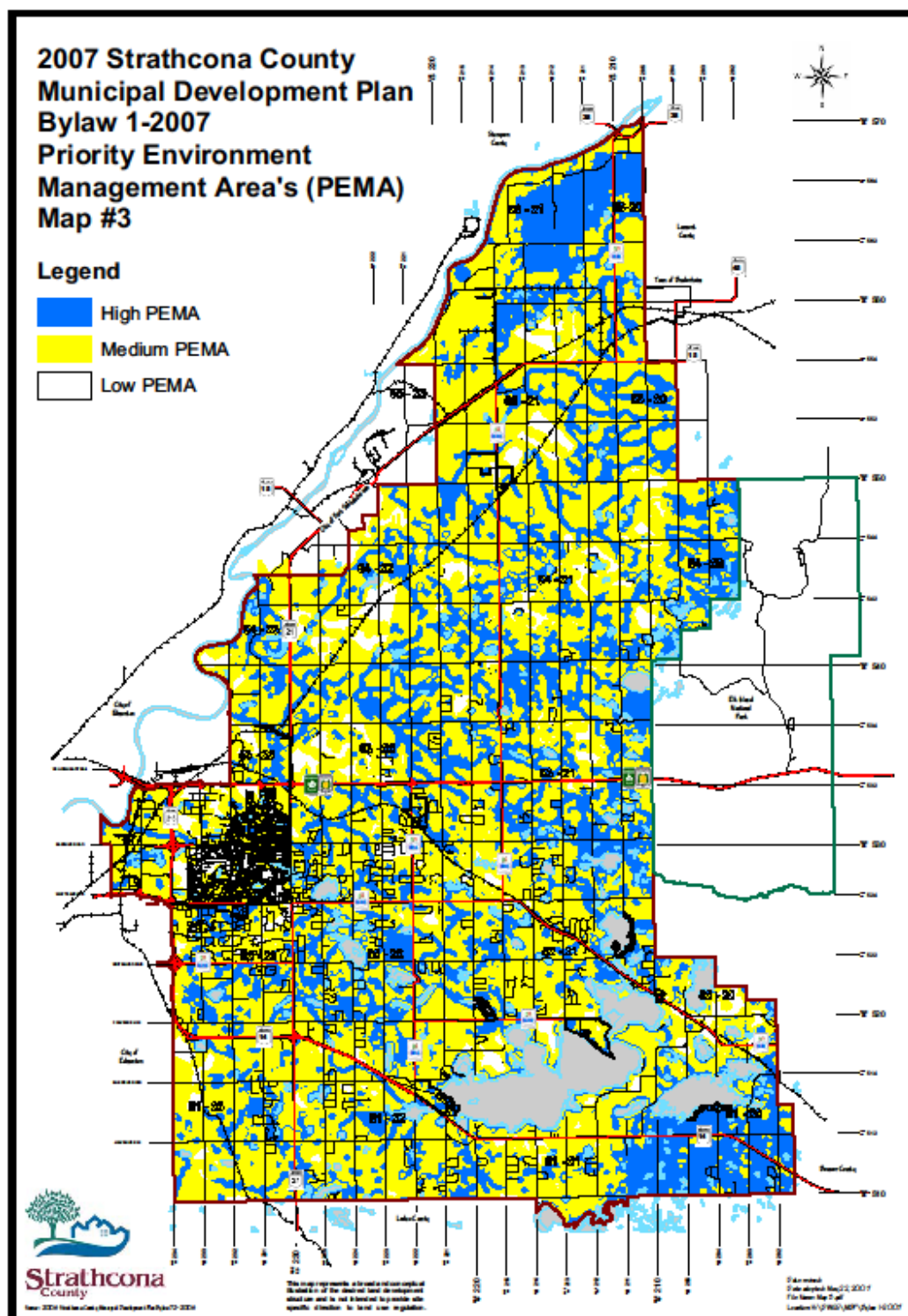


Figure 59 – Priority Environmental Management Areas of Strathcona County. Source: Strathcona County (2007)

This policy makes numerous stipulations such as prohibiting any development within the 1:100 year floodplain of any river, lake or other water body. This is much more stringent than the example shown in Fort McMurray that required all development to only be above the 1:40 year floodplain. The policy encourages the development of educational programs for Strathcona County residents and industry to raise awareness about environmental issues and promote actions or initiatives that work toward creating a more environmentally responsible community (Strathcona County, 2007, p. 8.2).

Environmental setback buffers that have been included within this policy are quite significant, which are stipulated for all water bodies and watercourses in the Municipality. These buffers range from 30 to 50m in width from the top of bank of any water body or watercourse wherein no development is permitted, without special exceptions made by the approval authority. Public notification is required for any exceptions made to these provisions, making the approval authority and the applicant subject to public scrutiny during this process.

Bylaw 54-2009. Municipal councils are composed of elected officials that serve on approximately four year terms. These elected officials come from all walks of life, and not often do these individuals have specialized expertise in the natural environment. Municipal councils have the power to create bylaws that enact task forces and committees that have either statutory powers, or simply play an advisory role. In 2009, Strathcona County adopted *Bylaw 54-2009*, which enacted an environmental advisory committee. The role of this committee is to advise council of matters that relate to the natural environment, and to help create policies and initiatives to help promote natural area preservation.

An example of an initiative created by this committee is the Strathcona County Reduction of Abandoned Products (SCRAP) initiative. This program is the first of its kind in Canada, which encourages the removal of abandoned products and materials from privately owned and public lands for proper disposal and recycling. Through this program, the Municipality helps residents through information sharing and partnerships to convert materials that are typically abandoned for many years on the landscape to recycled and properly disposed materials. This program has become highly successful in eradicating waste from natural areas, on both public and privately owned lands. The initiative helps reduce pollution, encourages more materials to be properly disposed of or recycled, increased local pride and develops a strong partnership between local government and individuals.

Prioritized Landscape Ecology Assessment (1999). In partnership with Ducks Unlimited Canada, Strathcona County hired a consultant to complete a comprehensive inventory of prioritized natural features and wildlife habitats across the Municipality. The Prioritized Landscape Ecology Assessment (PLEA) project demonstrated the potential in partnerships between non-government organizations and local government, which is not a very common approach in western Canada. The need for this study was the result of land and resource development being driven by economic considerations, with little to no consideration given to the ecological constraints associated with these developments (Geowest, 1997).

This report acknowledges that many of the remnant habitat patches in Strathcona County are on privately owned land. It suggests that historically there was a lack of knowledge of how to manage remnant habitats, a lack of appreciation of the value that these habitats have to the bigger ecological picture. Geowest (1997) then states that this attitude has changed drastically,

and many landowners are now keenly interested in learning how to best retain, restore or otherwise manage their remnant natural areas (p. v). This is evident through the significant number of landowners that have now partnered with one of several non-government organizations to ensure proper care and suitable conservation techniques are used.

Cooking Lake Moraine Pilot Project (1996). Located in the east central region of Strathcona County, this project was initiated in 1996 in an effort to provide landowners with an avenue to preserve natural areas on private lands. The study focused on wetlands, as the primary ecosystem that was targeted by this work included the preservation of wetland areas. In essence, landowners were encouraged to sign legally binding conservation easements with the purpose of keeping ecosystems entirely in their natural state. They are also provided with information that they can use to enhance habitat for particular species, and provide waterfowl enhancements such as nesting boxes and duck tunnels (Strathcona County, 1996). Different types of agreements facilitated by this pilot project included:

- a letter of understanding – a five year agreement stating that the land owner will maintain enhancement such as nesting boxes and duck tunnels (see Figure 60 for a duck tunnel), but makes no commitment to preserve the habitat;
- a wetland agreement – the landowner agrees to leave the natural areas undisturbed for a period of no less than 10 years; and
- a conservation agreement – an agreement to leave the natural areas entirely in a natural and undisturbed state for no less than 10 years.



Figure 60 – 2009. Interpretive sign (foreground) and a duck nesting tunnel (background).

Trails Master Plan (1998). This document begins with the rationale for why trails are important to Strathcona County. Some of the noted benefits of leisure provided by trails include physical and mental health, economic development, family bonding, environmental awareness, physical fitness, and coping with everyday life stress (Strathcona County, 1998, p. 25). Some of the specific health benefits noted include relief of stress, improvement to self-esteem, improvement in sleep and overall longevity of life.

There are also benefits included in this plan as they relate to natural ecosystems. Trail corridors are often called “greenways”, which are linear corridors of land that often have vegetation on either side of the trail such as the one shown in Figure 61. These greenways often



Figure 61 – 2008. Trail leading through a lineal natural area within the Heritage Hills neighbourhood, Sherwood Park.

provide physical linkages for many species of wildlife, even through urban service areas. Within urban fabric they also provide habitat for plants and small animals, and movement corridors for large animals such as deer and moose. Sightings of large animals such as these are common in the urban service area of Sherwood Park.

Strathcona (1998) also notes other environmental benefits, including:

- encouraging the use of alternative transportation which is less polluting;
- serving as a buffer zone to watersheds and wetlands;
- providing access to rivers and lakes; protecting ecosystems; and
- providing green spaces for the enjoyment of current and future generations.

This plan describes the recreational trends of Strathcona County over the past two generations, since the time that the Municipality began to significantly develop. For the baby boomers growing up in this area, sports such as tennis and hockey were very popular. Now that these individuals are much older, this generation of people are more commonly found recreating through activities such as gardening, trail walking and bird watching. Strathcona (1998) states that, "Somewhat comically, forecasts show that "resting" will be one of Canada's most desired leisure "activities". Even with the impact of the youthful echo generation, Canada probably has all the football fields, squash courts and volleyball courts it needs. If funds are available for new facilities, they should be devoted to trails, curling rinks and swimming pools for recreational swimming because an older population continues to engage in these activities" (p. 32). The provision of parks and walking trails is what an aging population needs. A community of aging people is a society of gardeners and walkers (Foot, 1996). These quieter, more individualistic and spontaneous pursuits are replacing the more vigorous activities of youth, partly because the human body becomes less limber and less manageable as the years take their toll (Strathcona County, 1998).

The plan outlines trends that will affect consumptive leisure activities. These activities would decline as a result of increased energy costs, restricted financial budgets, reduced personal incomes and rising demand for the protection of natural open spaces. The plan also predicts the increase of individual leisure activities, particularly walking and cycling. This is predicted to be a result of a higher importance of health and fitness, a desire for more fresh air, interest in alternative transportation such as cycling, and the inexpensive nature of activities.

Site Specific Examples

Heritage Wetlands. Heritage Wetlands is the largest known naturally-occurring wetland retained in a western Canadian suburban area. This 17ha. wetland complex serves as both a recreational amenity and a stormwater management facility for three quarter sections of new suburban developments – Heritage Hills, Foxboro and Foxhaven. This naturally-occurring wetland has been expanded with two other stormwater management facility areas, including a wet pond that was developed in the late 1980s and a constructed wetland that was developed in the early 2000s, that are located at either end of the natural wetland complex.

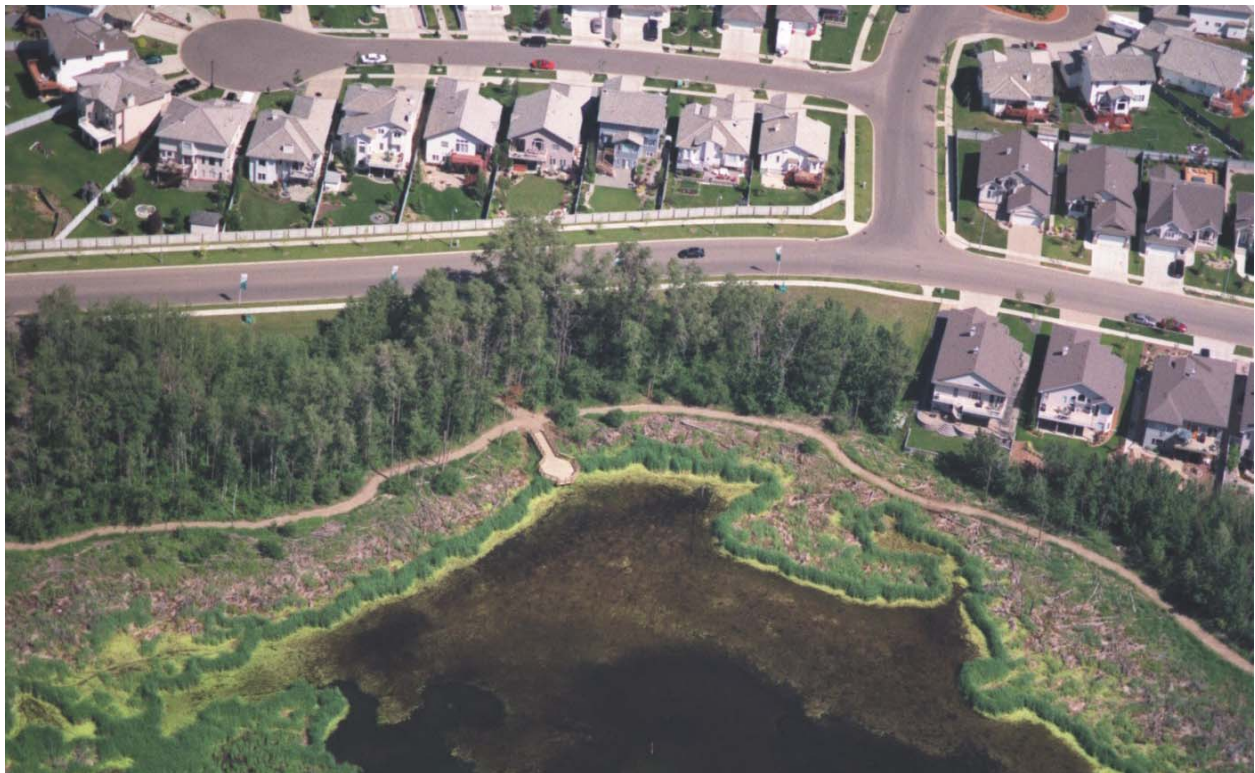


Figure 62 – 2005. Edge of Heritage Wetlands adjacent to typical suburban development.

The initial area structure plan was created by the developer in approximately 1990, and it proposed a roadway that cut directly through the wetland. This road would have provided access from one community to the other without having to drive over 2km to get around this ecosystem.

The draft plans also demonstrated a much greater area of natural wetland land filled and converted into developable area. Upon circulation of the initial plans to Strathcona County, municipal representatives began to work with the developer to modify the proposal and retain the entire ecosystem with as little disturbance as possible. By leaving this wetland in its intact state, the developer was surrendering a considerable amount of potential development area that could be converted to residential development. After ten years of negotiation between the developer and municipality, Strathcona County endorsed a plan to not only retain the entire wetland complex, but also a plan that required the developer to compliment the wetland with fully naturalized stormwater management facilities.



Figure 63 – 2006. Wetlands during the construction of the Foxhaven neighbourhood (foreground) and Heritage Hills (top)

A landscape architectural plan was prepared for the wetland to incorporate passive recreational opportunities within this natural area. Development included a boardwalk that crosses the wetland, gravel trails along the shoreline of the wetland, seating nodes and

interpretive signs. The boardwalk was constructed during winter months as the water was frozen, and the structure was completed using a helical pile system that has little to no disturbance to the wetland. The gravel trail was built on native ground, however without raising its elevation this trail would be flood prone each time there was a rain event. Interpretive signage was designed in partnership between the design team and Ducks Unlimited Canada. To limit disturbance by future residents, the design team insisted on continuous back of lot fences without personal gates. Common disturbances when gates are provided include dumping of grass clippings into natural areas, mowing of native grasses on public property, the removal of trees on public land to improve personal views, and the planting of exotic plants within natural areas.



Figure 64 – 2006. Gravel trail around the perimeter of the Wetland in treed buffer behind homes.



Figure 65 – 2006. Homeowners backing on to the Wetland have selectively removed trees in order to have a personal view of the wetland from their homes.

Because the development of the community was not a public project rather done by a private land developer, public consultation was not required. The development was not scrutinized by the public until after it was implemented, and the first residents surrounding the wetland began to move in. Some of the immediate concerns that residents included:

- the amount of mosquitoes that wetlands produce, and the need for chemical spraying to control populations;
- the elevation of the gravel trail, and the chance that the trail may not be usable every day of the year (as seen in Figure 66);
- the unsightliness of the natural areas including the “weeds” that grow there (otherwise known as native grass and emergent vegetation);

- the fear of wildlife encounters and risk to people; and
- the chance of pets being harmed by wildlife.



Figure 66 – 2005. Photo submitted by a resident to the Municipality to demonstrate trail inundation during rain events.

Due to public concerns expressed over two years of pressure put on the local area councilors, there were modifications made to the wetland and significant oversight by administration on some of the individual actions taken to mitigate personal concerns. Residents proceed to cut in private gates along their back of lot fences, allowing access into the wetland for misuse such as tree clearing and dumping of yard debris. Gravel trails were raised, resulting in fill materials being added into the wetland and years of struggles to reclaim these weed prone disturbed areas. Trees inside the wetland were cut down by residents to improve individual views, and exotic species began to appear. Deadfall that once provided significant habitat for a range of species such as woodpeckers was removed due to unsightliness. The municipality also

implemented a program to oil un-hatched eggs of waterfowl, particularly Canada geese, because of the feces left in and amongst the natural area and the disturbing noise that these birds made. While these activities were a surreal setback to the preservation efforts of this wetland, this facility has inspired a new paradigm of stormwater management and open space for this municipality. In light of these public concerns there is now a demand from the Municipality to increase public acceptance of all naturally occurring ecosystems in both rural and urban areas, and to educate residents on the need for ecological diversity. There are high levels of public acceptance for forests and grasslands, yet acceptance of wetlands has come with challenges.

Successes in some of the rural development of Strathcona County show that a public education program for Heritage Wetlands would have resolved much of the concerns that were experienced in this process. The lack of any consultation during the design and implementation process prohibited the opportunity for people to develop an appreciation for the natural character that was to be preserved. There was also no clear dialogue with perspective homebuyers as to the final aesthetic of this open space. Standard development agreements do not include the provision for consultation by the land owner or developer. This research has demonstrated that until land is under control of the municipality or into the subdivision process, consultation is not required. Retaining the wetland complex, while being driven by the Municipality, was decided prior to any need for public consultation.

Summerwood Neighbourhood. In 1998, Summerwood Land Company purchased a 130ha parcel of land for the purpose of converting it into residential development. An aerial image is shown on Figure 67 that demonstrates the site condition after approximately eight years of development. At the time of purchase the site was predominantly cultivated for annual seeded

crops, and also contained several patches of native tree stands, and a segment of Davidson Creek near its western edge.



Figure 67 – 2008. Aerial image of the Summerwood Community, approximately six years into its development. Source: Google Earth, accessed January 28, 2012.

Being a named water body, Davidson Creek (as seen in Figure 68) was protected by legislation at the provincial and federal level. Upon initial investigation of the watercourse, it was determined that the Creek was in fact fish bearing. In light of the presence of fish, any harmful alteration, disruption or destruction (HADD) would require authorization from Fisheries and Oceans Canada. Being a named watercourse that has the potential of being navigable using any device (ie. canoe, raft, boat, ship) it must also be scrutinized under the *Navigable Waters Act, 1985*. Any alteration would also be subject to approvals through Alberta Environment and Alberta Sustainable Resource Development under the *Water Act, 2000* and *Public Lands Act, 2000*. As part of the proposed neighbourhood structure plan, the developer recommended that

approximately one quarter of the existing creek would be retained as is passed through a tree stand, while the remaining water body would be eliminated. Upon review of the proposed subdivision plan by provincial and federal agencies, the requirements under the *Fisheries Act*, 1985 was by far the most stringent, requiring an on-site replacement ratio of 19:1, meaning 19 times more natural area with similar characteristics was required to be installed on site.



Figure 68 – 2000. Davidson Creek flowing through a forested area prior to development of the Summerwood community.



Figure 69 – 2003. Summerwood Stream system and wet meadow during construction. This constructed feature is on-line with what was once Davidson Creek, and was altered to suit stormwater management needs.



Figure 70 – 2005. Summerwood Stream system and wet meadow after plant establishment, early spring.

The proposed design incorporated a constructed stream course (Figure 69, 70, 72 and 73) system that would form part of the required stormwater management facility for this neighbourhood. In compliance with regulatory requirements, the proposed facility included a confined stream course that included substrate and undulations suitable for the fish species found in the area. During larger storm events, the entire basin would flood, while the inundation period is limited to under 72 hours to ensure that any plant material would still survive temporal flooding periods. The replacement stream course was designed in 2000, and constructed in 2001. This constructed stream and wetland system is now over ten years old, and most of the plant material has matured. The Municipality has found that there is considerable public acceptance of the stream and grassland ecosystem (EDS Group, 2006).



During the construction period there were several challenges to creating the replicated stream course. Because the water was fish bearing and still conveying fish from upstream to downstream environments, any in-stream construction required sediment-free bypass channels while the ultimate channel was constructed, and a regime of electro-fishing was required to remove any abandoned fish in construction areas. Given soils were bare and highly susceptible to erosion, a regimented erosion and sediment control plan was needed. Regulatory approvals also stipulated that construction windows were limited to periods where precipitation was not forecasted for 72 hours. All of these restrictions significantly increased construction costs, as well as monitoring services by the consulting team to ensure regulatory compliance.



Figure 72 – 2003. Stream construction prior to the establishment of plant material.



Figure 73 – 2006. Stream segment shown in Figure 67 after three years of establishment.

Two remnant tree stands were also retained as part of the neighbourhood's MR dedication. The first, which is 2.1ha in size, was included in the first development stage in 2000,

and the second was included with the seventh stage in 2008. The 2000 tree stand included a pedestrian trail through the tree stand with a small bridge crossing that spans Davidson Creek. It also included a large area within a historic farm yard that was designated as a future community garden, with suitable topsoil and a reliable water source for future use once a community group was established. The latest tree stand dedication in 2008 was approximately 6.0ha in size, and again contains a meandering gravel trail to provide pedestrian access. This trail has several interpretive panels along the segment, providing educational information for young children which encourage them to explore more into the tree stand. Challenges with both of the tree stands included windblown trees around the perimeter that were newly exposed to wind, significant changes in the drainage pattern that altered the trees' historical moisture regime, and damages to private property as trees fell onto private property and back of lot fences.



Figure 74 – Two of several interpretive signs found in the tree stands of Summerwood. Source: EDS Group (2006).

Due to the significant size of the neighbourhood, an expansion to the stormwater management facility was required in latter stages of the development. In 2006, the original basin was enlarged to over double its size. To provide the required storage a constructed wetland was designed. The wetland's location and configuration was based on maximizing the number of

amenity lots that would back onto this facility, making the system very long and lineal. The wetland complex provided emergent vegetation to water ratio of approximately 30:70, which is slightly less than design guidelines and best management practices for constructed wetlands. The newly constructed wetland has gravel trails in limited areas, along with a wood boardwalk (see Figure 75). To minimize the potential disturbance of private property owners that are adjacent to these natural areas, continuous fences without gates were implemented. Still, there are public concerns with the wetland ecosystem, such as perceived increases of mosquito populations, fear of wildlife attacking pets, feces from geese and ducks on trails and boardwalks, and the emergent vegetation around the perimeter of the wetland that obstruct views of open water (EDS Group, 2006). Many residents take it upon themselves to alter public lands.



Figure 75 – 2009. Wood boardwalk installed over a newly built constructed wetland area.

There are numerous opportunities for human interaction with natural areas in the Summerwood neighbourhood. The diversity of ecosystems includes dry meadows, urban forests, stream systems, constructed wetlands and wet meadows. There are degrees of naturalness of these ecosystems, with some being naturally occurring and others constructed to appear natural. Pedestrian access is controlled by providing trails in only limited areas of each ecosystem, leaving many areas more difficult for human access. Many of the natural areas are still intact from their pre-development condition, while more regional conditions such as biodiversity and watershed alterations will likely have longer term effects that are not apparent at present day. There is growing uncertainty regarding the ability of ecosystems to respond to human pressures and our capacity to manage natural resources with these pressures in place (Abramovitz, 1996).



Figure 76 – 2008. Construction of a back of lot fence on a newly seeded constructed wetland area in Summerwood.

As part of providing suitable fish habitat within the constructed stream system, vegetation was placed along the edges of the stream course, providing long-term bank stability using root systems but also providing shade to the aquatic areas. These shaded areas are beneficial to fish during hot summer months to provide an escape from warm water conditions. Within the first two years after this SWMF was completed, almost all of the 70 trees originally planted in this area were destroyed by beaver, a species commonly known for being a wetland engineer being responsible for creating many natural wetlands through water blockages (Larivier, 2004). Beaver are manually captured and removed from urban SWMF systems due to their ability to cause significant damage to adjacent properties by plugging outlet structures, in an attempt to force water levels to rise and create more suitable over-wintering conditions for their species. There were also strong public concerns from local residents that beaver would harm household pets, and in one instance an adjacent landowner claimed that their cat had gone missing as a result of a possible beaver attack. As part of a new beaver management plan led by Strathcona County, approximately 30 beaver were removed from this SWMF over a ten year period, and relocated to rural wetlands (EDS Group Inc., 2006).

Since its inception, the Summerwood neighbourhood has been marketed as an escape to nature, with its abundance of naturalistic features. Prior to developing the site there was a significant amount of naturally-occurring ecosystems. In total, prior to development there was approximately 28ha of natural areas, with 8ha retained in their original state and 20ha replicated as best as technologically possible with present best management practices available (EDS Group, 2006). It is important to note that many of the naturalized features seen today have been constructed to replicate natural conditions as best as possible and are not natural. In its opening

year, the Summerwood neighbourhood won the 2002 Canadian Home Builders Association award for the best new subdivision, recognized for its innovation in naturalized open space.

Nature playgrounds are not common in western Canada, while they have been common in European countries for decades. Within the formal parks the Summerwood community has three traditional playground structures, surrounded by mowed lawns, trails, benches and formal plantings. Based on numerous site visits during summer and winter months, the formal playground structures were being used mostly by young children accompanied by their parents, and predominantly during the day of summer and fall months. While Summerwood does not include designated nature playgrounds, the current natural areas serve the same function. These natural areas are year round littered with significantly more children than traditional play spaces. Artifacts of nature play including makeshift bridges (as shown on Figure 77), tree forts, ropes hanging from branches and an array of new trails demonstrate regular use of the forested



Figure 77 – 2009. Makeshift bridge found in one of the urban forests of the Summerwood community.

areas. Children and their families are often found exploring the constructed wetlands and stream system, and walking along trails through the meadows with fists full of wildflowers.

As part of a design proposal for open space within the Summerwood community, the consulting team was asked to provide a design for one of the more formal park areas. Because of the prominent theme in this community related to nature and the ability to play in the natural environment, a series of sculptures were proposed to be located within this park. The sculptures, with examples shown on Figure 78, portrayed children playing in the outdoors using natural elements such as trees. Upon review of the design, Strathcona County representatives would not accept the implementation of these sculptures, given they would encourage inappropriate behavior and did not conform to municipal standards. The position of the Municipality was that the protection of these natural areas was for ecological reasons and only for passive recreation use (EDS Group, 2006). Similar to other challenges identified in the Edmonton context, municipal standards are not in line with many of the policies at municipal, provincial and federal levels of government and therefore challenge many efforts by land planning professionals.



Figure 78 – bronze sculptures that were proposed for the Summerwood community. Source: EDS Group Inc. (2006).

Case Study Assessment: Questions and Findings

1. *What public reactions to different ecosystem types or characteristics of natural areas can be observed in Strathcona County?* Through consultation processes of the above site specific examples it became clear that there is a local preference for retaining natural areas within the urban fabric, while these natural areas were most favoured when some manipulation was permitted. Some of these natural areas, however, have proven challenging to get local support such as wetlands and urban forests, while there was a much strong affinity for streams and grasslands with native plantings and wildflowers. The lack of support for wetlands came with the belief that water quality is poor, mosquitoes and other pests will inhabit these environments, and open space looks like it is in disarray. Urban forests were associated with diminished public safety, with the risks of wildlife encounters, human predators and trees falling. Landscape types that did not come with public resistance included the reclaimed stream system, wildflower meadows and grasslands.

2. *Is there a correlation between the human values observed in Strathcona County and the protection of natural areas in urban environments?* Given the community is only about 60 years old, the window of development in Strathcona County is quite limited as compared to Fort McMurray and Edmonton. It is therefore difficult to assess long-term values of Strathcona County residents. The roots of this region came from an agricultural ethic, where much of the municipality was consumed by farmland in and amongst retained natural areas. Rural subdivisions with 0.5ha to 6.0ha lots were the first clustered residential developments in Strathcona County, and within these developments there has always been an effort made to preserve naturally-occurring ecosystems where possible.

With approximately half of this Municipality being protected by the Beaver Hills initiative, there is a strong appreciation for the significance of environmental protection. Non-government organizations have gone to great lengths and have succeeded in developing partnerships with local land owners to establish formal agreements to preserve natural areas. Local residents within Strathcona County seem to value natural area protection, while still having some control over minor alterations to suit personal use of these areas.

3. *What are the historic trends of natural area preservation and uses within the case study area?* Natural area preservation in Strathcona County seems to have been a priority since the inception of this municipality. While sprawl patterns of new residential neighbourhoods are common, the open space provided within this built fabric favours the inclusion of natural and naturalistic areas. In principle, natural areas are those that have been unaltered and in their original state, while naturalistic landscapes are those that have been disturbed or human recreated and appear natural.

While preservation is important, the way in which people use these natural areas and make personal alterations to natural areas adjacent to their homes goes with a blind eye. The Municipality goes to great efforts to preserve natural areas and encourage the development of naturalized spaces as part of the overall public realm. Case study examples demonstrate that residents still require further education to take on a more responsible ethic to care for these natural areas in the long term. Municipal representatives also need to better understand the value of nature play and exposure to the natural environment through passive recreation.

4. *Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection in Strathcona County?* Land planning professionals are demonstrating the

ability to facilitate a strong human-nature connection through this case study assessment. This is evident by the complexity of many of the example projects that draw a careful balance between preservation and human use of natural areas.

5. *Is the current overarching institutional framework within Strathcona County effective in promoting a strong human-nature connection?* The overarching institutional framework seems to be effective in promoting a strong human-nature connection. Early-on involvement of the municipality during the land planning process allows for ample opportunities for developers to be encouraged to retain natural areas where possible. With the municipality insisting that on-site compensation take place rather than cash in lieu of dedicating natural areas, a very large proportion of identified natural areas are being retained in urban development. As a result, developers have steered away from monetary compensation for lost natural areas as required by provincial and federal legislation related to natural area preservation.

6. *What information Strathcona County is seeking in order to promote natural area preservation?* Natural area preservation has been a priority within this municipality for decades. This approach made Strathcona County ahead of its time compared to other western Canadian municipalities, with an array of environmental policies in place far before other communities. This is also evident in the developments of Strathcona County with the large amounts of natural areas. While Strathcona County has been able to successfully encourage the retention of nature in development areas, there is now a demand from the Municipality to create a local mindset that values all types of ecosystems. Improved public education will help reduce some of the concerns that residents are bringing forward, related to personal preference for less wild and natural landscapes near their homes.

7. What impact has the rise of technology had on the human-nature connection, and on the integrity of natural environments within Strathcona County? The effect that a rise in technology has on the integrity of natural environments was similar to those found in the previous case study for suburban development in Edmonton. Automobiles and the infrastructure required for these vehicles to move from place to place have direct and indirect effects on the human-nature connection. Increased scientific knowledge on ecological processes allows land planning professionals to make more informed decisions as they relate to protecting ecological systems.

8. What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection in Strathcona County? Strathcona County and the land planning professionals working on sites within the Municipality would benefit from more robust development guidelines and standards for natural areas, given some of the conflicts seen during case study assessment. Providing customized guidelines that better incorporate passive recreational activities with natural areas would be a strategy that can create a more genuine nature experience and avoiding the circumstance seen on Figure 79.

Working with residents through consultation processes would increase early-on awareness of residents on the importance of respecting natural areas in their current state. Consultation would also allow land planning professionals to better understand local perspectives and apply more local knowledge to the planning process. Much can be learned through consultation processes, such as preferences for particular landscape types and perceived safety concerns that residents may have with particular aspects of natural areas.



Figure 79 – 2006. Trail leading through a natural area in Strathcona County. Municipal standards require trail signage for all public open space, even when in a pristine natural area. Standards also require 40% of all plant material to be coniferous and surrounded by wood chip mulch, which is not at all common in any naturally-occurring wetland complex as replicated in this example.

9. How have emerging global trends affected the land planning process or the observed planning strategies in each case study municipality? Emerging global trends were not seen to have an impact on planning strategies based on case study assessments in Strathcona County. There has not been a documented public demand to reduce personal reliance on vehicle use within suburban developments in this municipality. A very comprehensive trail system throughout the municipality allows for multi-modal transportation. With an abundance of water available through civic infrastructure, water scarcity is not an obvious concern. Recreational amenities that serve residents are located outside individual communities yet there is no obvious outcry for these amenities to be closer to home to promote more all-inclusive communities. Residents appear to be complacent with current development patterns and global trends do not have an obvious effect on the land planning process.

10. What strategies are prevalent in Strathcona County to help minimize ecosystem degradation? Strathcona County demonstrates a strong network of local guidelines, policies and bylaws that help minimize ecosystem degradation. These municipally-based tools provide clear direction to land planning professionals, and often come with strong public communication and education. While a strong effort is made to communicate with its residents, Strathcona County still faces many of the challenges seen in other municipalities with respect to human disturbance and alteration of public property for personal benefit.

There are strong partnerships with local landowners and non-government organizations in Strathcona County. These partnerships provide residents with added education that comes from experts in various fields of environmental preservation, as well as financial incentives for preservation that the Municipality is unable to provide.

11. What are the varying views and values of nature that can be seen in Strathcona County, and do these perspectives result in an attitude that supports natural area protection?

There are varying views and values of nature within this case study area. The agricultural community demonstrates a strong land ethic with a large amount of naturally occurring ecosystems still intact within rural areas, despite active farming taking place. This respect for the land has resulted in strong natural area preservation. Another commercial use of the land includes oil and gas refineries that are very common in Strathcona County. This research demonstrated that the footprints of these heavy industrial sites are not compassionate to protecting natural areas.

The municipal government has demonstrated a very strong ecocentric value for nature. This was demonstrated by many of the municipal policies in place and the way in which these

documents value the natural environment for non-human and intrinsic benefits. This attitude has resulted in approximately half of the entire municipality being preserved in its intact state for all time. Residents demonstrate strong values for nature, while many of the actions by residents included in this research demonstrate a desire for nature to be somewhat manipulated for human benefit. While the views and values of local residents lead to successful preservation of natural areas, the love for nature is not strong enough to prevent people from making subtle yet self-serving modifications to these natural areas.

12. *How has human reliance on nature changed over time within Strathcona County, and what has any change had on the human-nature connection?* The agricultural community has been in Strathcona County for approximately 100 years, and to this day relies on productive land to support farming operations. Based air photo analysis, the usage patterns on the land has changed very little over the past two generations, suggesting that the land ethic and use of the land. Similarly, there was no observed change in human reliance on nature within urban areas.

CHAPTER FIVE: CASE STUDY QUESTION COMPARISONS AND RECOMMENDATIONS

1. What public reactions to different ecosystem types or characteristics of natural areas can be observed in case study assessments?

Chapter Two: Literature Review included examples of human preferences to particular landscapes and characteristics. Hartig (2005), Kaplan (1989), Lamb (1990) and Ulrich (1983) claimed that humans prefer natural over contrived landscapes – those that are natural, as opposed to urban. Misgav (2000) suggested that humans prefer landscapes that contain a variety of landscape elements and plant species. Gobster (1995) and Ulrich (1986) identify that people have an affinity for landscapes that display a degree of management. Finally, Hunziker (1995), Hunziker (1999), Kaplan (1989) and Ulrich (1983) identify that people prefer landscapes that are open (although not exposed) while containing a high degree of depth and a moderate-to-high degree of complexity.

This research found degrees of public acceptance for different types of natural areas in urban environments. Ecosystem types described in the case study examples include riparian zones, rivers, wetlands, streams, grasslands, and forests. The three case study examples noted that there is the least affinity for wetlands and the greatest affinity for open water. These three examples also supported the work of Gobster (1995) and Ulrich (1986) in that people preferred natural landscapes that display a degree of management. The following is a summary of the indicators of acceptance of three general types of natural areas, and the opportunities and challenges in implementing each ecosystem type.

Wetlands. Over the past ten years, constructed wetlands have been very prominent in the new suburban communities of both Edmonton and Strathcona County. This is due to a wetland's ability to serve as stormwater management facilities and because the end product is less maintenance intensive than alternate SWMF designs. While land planning professionals have the knowledge to design very detailed wetlands that have many natural qualities, municipal standards inhibit completely naturalized wetlands. Because these are public amenities municipal standards require unnatural features such as directional signage, pedestrian access and lighting. These features have an effect on nature experience. The Rapperswill example demonstrated that wetlands are not desirable near airport facilities due to large flocks of large birds that can put planes at risk, while this is not a personal human preference rather a functional one. Naturally occurring wetlands are seldom retained, as neighbourhood drainage regimes usually change. Constructed wetlands also allow designers to make SWMFs more compact, making subdivision layouts more efficient from an economic perspective.

Human affinity for wetlands is questionable, as people seem to favour views of water and are less pleased with emergent vegetation. While Heritage Wetlands was a world class example of being able to retain a naturally occurring wetland in an urban environment, the ability of residents to coerce the Municipality to allow personalized modifications and even the oiling of goose eggs demonstrates the power of the individual. Land developers are very much in tune with marketing tactics that work to sell lots, and there is a clear trend in both Edmonton and Strathcona County for a modified version of wetlands that are more favoured by the market than entirely natural ones.

Upland Areas: Urban Forests and Grasslands. Case studies demonstrated that treed areas were favoured primarily because of the privacy provided to adjacent private land. The exception to this included efforts by homeowners to selectively clear trees in order to obtain a better view of water from their homes. Heritage Wetlands included several instances of this type of disturbance by individuals with the removal of select trees to capture strategic views. In the Fort McMurray context, treed buffers were entirely removed to provide strategic views for future lots. The integrity of forests and grasslands are affected by urban amenities such as trails, lighting and pets. Safety concerns were apparent within urban tree stands in both Edmonton and Strathcona County precedents, which has been alleviated in Edmonton with a municipal standard that requires lighting along all pathways, even within natural areas. There were no concerns observed with respect to grasslands in any of the case studies.

Aquatic Ecosystems. Open water including streams and rivers were most preferred by residents through case study analyses. This was evident by how well preserved and respected the natural areas were found, compared to the other ecosystems described.

Summary. From researching this case study question it was demonstrated that people prefer natural landscapes that have some degree of management, and of the different ecosystem types introduced in this research people preferred wetlands the least. Previous discussions have noted that wetlands are provided with the highest degree of protection of each natural area within the case study municipalities, yet they are least preferred by people. This suggests that alternative approaches are required to ensure that naturally occurring wetlands have the carrying capacity to be somewhat managed, and that alternative ecosystems such as forest areas should be given higher priority for retention. Heritage Wetlands in Strathcona County may have benefited from

better controls to reduce goose migration onto private yards backing on to the wetland to demonstrate some degree of management, rather than implementing an egg oiling program. To increase the prevalence of other natural areas such as grasslands, alternative approaches to stormwater management may increase the retention of grasslands if they could be used as a public utility for stormwater infiltration in addition to aesthetic pleasure. Providing for landscapes in our cities that humans have the highest affinity for will help promote the human-nature connection.

2. Is there a correlation between the human values observed in case studies and the protection of natural areas in urban environments?

Several human values of nature were documented in this dissertation. Barlett (2005) discusses how human values for nature in our cities have changed over time. Frumkin (2011) suggests that nature is valuable as civic infrastructure, and that green infrastructure comes with a range of benefits such as aesthetics, increasing ground permeability and improving stormwater management. Case study analysis of Fort McMurray documented a highly ecocentric value system amongst First Nation people (McKillop, 2000) prior to the influence of European settlers starting primarily in the 19th century. Within western Canada there are ranging human values related to the protection of natural areas and the importance of nature to be included within our cities.

Case study examples demonstrated a direct correlation between world view and the preservation of natural areas in urban environments. Prior to European settlement of western Canada, First Nation people held a very strong ecocentric value set that helped their people survive. Settlement patterns and their respect for nature allowed for long-term protection of

natural environments within settlement areas. As influences from European settlers altered the world view of the First Nation people, attitudes and human health changed, leading to a different way of living off the land. Today, First Nation communities are no longer living sustainably off the land, and now use the land for business enterprise and resource exploitation much alike other western Canadians. As the world view of First Nation people has evolved, their level of respect for caring for the natural environment remains strong.

Case study analysis also demonstrated that when the land is seen as a commodity, nature is less likely to be preserved. Economic gains have taken precedence over environmental protection as seen in the development of the Fort McMurray city centre, and also in subdivision developments in Edmonton and Strathcona County. The loss of natural areas was primarily due to resource exploitation to support local economies. Trends in recreation leading from the early 1900s until about ten years ago resulted in multi-use and open playfields, and did not value natural area retention. Over the past ten years, there has been yet another shift in world view, where there is now pressure from people to once again focus on ecological preservation with an emerging interest in passive recreation such as trail walking and nature appreciation within urban areas.

Land planning professionals need to be aware of evolving world views and the effects that changing global trends have on the way we need to plan our cities. With a higher demand in retaining natural areas, traditional planning professions such as urban planning, engineering and landscape architecture need to work more diligently with other experts such as biologist, urban ecologists and agrologists. These interdisciplinary design teams will be far more effective in dealing with the complex problem of retaining natural areas in urban areas, in light of the

disturbances that urban development can have on ecological integrity. As an example, the city centre of Fort McMurray would benefit from multiple perspectives on how to balance ecological preservation of the waterfront with the addition of significant urban density in adjacent land areas.

3. What are the historic trends of natural area preservation and uses within the case study areas?

J.B. Jackson's classic essay entitled *Westward Moving House* depicted the change in mindset over three successive generations of a family as it moved westward across America. This essay highlighted the change of family structure, human interaction with the land and personal identity of the individual. The case study assessments demonstrated a change in the trends of natural area preservation and uses of the land. Since Fort McMurray began to develop at the turn of the 20th century and Edmonton suburbs started in the 1970s there was no apparent intent to retain natural areas in urban developments. Throughout the 1990s planning documents, municipal bylaws and policies in Edmonton began to introduce language that supported biodiversity and the need to protect natural areas within urban development. Starting in approximately 2000, interest to bring nature back into suburban communities began to emerge in Edmonton with numerous projects taking place on the ground. It was only in 2011 that evidence of this new trend began to emerge in planning documents in RMWB, while despite new language in statutory policies this has yet to take place in practice within the Fort McMurray lower townsite.

In Strathcona County, the agricultural community demonstrated a strong environmental ethic and to this day is recognized for strategic partnerships with NGOs to help preserve natural

areas. There was a much stronger trend of natural area preservation within urban fabric since the creation of the municipality in the 1950s. Within urban development, Strathcona County has been very successful in working with private landowners, particularly the land development industry, to retain intact ecosystems.

Westward Moving House depicted a loss of connection with nature over time and a change in how people interacted with the surrounding landscape. While at different degrees, the trend of a diminishing human-nature connection over time was seen in all three case studies. At the same time, there is a newly emerging environmental ethic that is again changing the way in which western Canadians value nature. This evolution is important for land planning professionals to consider in their pursuit to better connect people with nature. By involving the individual in the land planning process and ensuring that strengthening human values for nature influence planning decisions, the trend of people wanting stronger contact with nature can be better facilitated. Land planning professionals are not actively engaging the perspectives of local individuals, rather are loyal to their clients and predominantly focusing on meeting client demands.

4. Do land planning professionals demonstrate the ability to facilitate a strong human-nature connection?

For generations, land planning professionals have been trusted to provide our cities with sound and reliable advice on how cities are planned. In many contexts these professionals are under scrutiny, especially in light of our lack of success in preserving nature in cities. As we learn more about the complexity of nature, such as the importance of biodiversity, land planning processes have become much more complex. In light of this complexity and a rise in demand for

urban natural areas in recent years, professionals are challenged to meet the needs of these complex design problems.

In the context of the Fort McMurray lower townsite, there has been limited verbiage related to the protection of natural areas and humans' need for nature contact in any historic planning document. It is unknown if this is a factor of client direction, or a lack of knowledge amongst local land planning professionals. Based on the current site conditions and a complete lack of opportunities for a human-nature relationship in the lower townsite, it is questionable if land planners made any attempt at all to try and forge this connection. In both Strathcona County and suburban developments in Edmonton, land planning professionals are demonstrating the ability to facilitate a strong human-nature connection. In areas where natural areas have been retained in urban fabric, there are several venues for a human-nature connection such as walking trails, preservation areas for viewing, interpretive nodes, and restored landscapes.

As identified at the onset of this research, there are many studies completed by people from a number of disciplines that claim health benefits to humans from routine contact with nature. Case study reviews did not assess the health of people with varying exposure to nature, while some evidence was presented to show how human health can degrade due to a loss of connection. In the review of First Nation people losing their ability to intimately connect with nature in the Fort McMurray region, background studies demonstrated how these people have had direct health consequences from being physically and spiritually less entrenched in nature. In essence, this research was able to demonstrate that opportunities for a human–nature connection in urban areas, but did not assess the quality of this relationship or the health benefits to humans having routine nature contact close to home.

5. Is the current overarching institutional framework effective in promoting a strong human-nature connection?

The literature review included an overview of federal, provincial and municipal governance related to natural areas within urban centers. Case study assessment demonstrated how this overarching institutional framework has influenced the land planning process in each of the three municipalities. In all three case studies, federal, provincial and municipal legislation, Acts, bylaws and policies influence the land planning process.

Federal and provincial legislation has not proven effective in promoting a strong human-nature connection. This is primarily due to flexibility for private landowners to exercise financial compensation for lost remnant natural areas. Municipalities have the opportunity to enforce preservation of any natural area at the time of subdivision by declaring particular areas as environmental reserve, while the *Municipal Government Act of Alberta (2010)* only permits this in the instance of aquatic environments or those that frequently flood such as temporal wetlands (Government of Alberta, 2010). Municipalities may only act at time of land subdivision, therefore prior to this process a landowner (farmer, land developer, private resident, etc.) can alter land as they please.

There is a need to establish better municipal design guidelines that include more robust public outreach and education on the importance of protecting natural areas. This will also ensure that residents can overcome fears for particular ecosystems such as forest areas, and more public acceptance of wetland ecosystems without having to drastically alter them to suit personal preference. Public consultation and outreach needs to be included in land planning processes earlier on, as public feedback is usually solicited far too late.

There is a considerable amount of legislation in place to protect natural areas, while most of them are not applicable on privately owned land. This study does not endorse the reduction of landowner rights on private property, rather encourages education and partnerships between landowners and non-government organizations (Lemke, 2010). This has been a very successful model in Strathcona County. More education and partnerships involving private landowners within Edmonton and Fort McMurray may help improve the human-nature connection by increasing the incidence of retained natural areas, and also through better educating those people who will participate in these landscapes on how to respectfully use natural areas for years to come.

6. What information would each case study municipality seek in order to promote a stronger human-nature connection?

In order to even have a human-nature connection, preserving natural areas is imperative. Land planning professionals and municipalities need to work together and bring a variety of perspectives together so that the reason for preserving nature is multi-faceted. Too often arguments for saving natural areas are made using only financial analyses, without other consideration such as the health benefits of nature to humans.

Through the three case studies, it became apparent that municipalities would benefit from a variety of information to promote a stronger human-nature connection. Municipalities would benefit from more knowledge on ways to protect natural areas on privately owned lands. This may be possible through early-on consultation and partnerships with NGOs that bring expert knowledge. Once natural areas are designated for protection, municipalities would then benefit

from more information on how to balance dense urban fabric and human disturbance with sustainable conditions for natural areas.

Creating a local mindset that values all types of natural areas would also be of benefit to municipalities. Current legislation favours the protection of water bodies such as streams, rivers and wetlands, while this research suggests that other ecosystems including forested areas are more preferred by residents. Establishing more awareness amongst residents on the value of a diverse collection of ecosystems using principles of biodiversity may help reduce individual disturbance and alterations of many naturally occurring ecosystems.

7. What impact has the rise of technology had on the human-nature connection, and on the integrity of these natural environments?

It is the best of times in that people today have far more leisure time to enjoy the outdoors, yet it is also the worst of times given the impact that our leisure activities have on nature compared to past generations. To add to the complexity of the land planning process, professionals must now deal with resolving how to protect urban natural areas in light of new technologies such as all-terrain vehicles. Katcher (1993), Louv (2011) and Orr (1993) suggest that our exposure to nature has diminished significantly as technology has become more available. While there is a higher demand for nature amongst western Canadians, this must take into account new technologies in how people recreate and experience the outdoor realm.

Given the paradox of human's desire for intimate participation in natural settings and the modernization of their ways of accessing nature, better control of human access within urban natural areas needs to be implemented in ways that minimize ecological disturbance. Case study analysis, such as that seen in Heritage Wetlands, documented the pressures that even passive

activities can have on natural areas. It also demonstrated the lack of understanding that the consulting industry has on long-term impacts. The recognition of incremental ecological degradation calls for more research on the sensitive ways people can interact with natural systems already in place. Not all urban natural areas need to be made accessible. Preservation policies that minimize people's intrusion into the more sensitive nature settings should be implemented in municipalities rather than focusing on managing for human disturbance on all landscapes. This may be achieved, in much the same way some zoning is mandating building height setbacks to bring more sun to the street, by promoting the value of visual landscapes – those that can be enjoyed by people without necessarily providing access.

Types of interaction also need more study. The effects of multi-modal transport such as cycling on natural areas have not been explicitly studied within urban natural areas in western Canadian municipalities. More research related to these impacts would greatly benefit land planning professionals' work as it relates to the range of ecosystem types that are commonly found in these municipalities. Municipal requirements often dictate that all public open space must be made accessible to multi-use trails and staging areas, which is not reflective of the sensitivities of particular landscapes and their related wildlife. Accommodating more passive means of movement would help to minimize ecological disturbance while allowing people to more effectively explore nature with all of their senses – sight, sound, smell, taste and sense of imagination. Designed well, there is an increased probability that opportunities for more tactile experiences, blended with all the other senses, could offset the desensitization of television and computers on people. A greater inclusion in natural areas is also needed. Evoking experiences for all ages, and not targeting a single age group as seen in many of the case study examples,

may be helped by opening the public participatory process to youth. Doing so would help reduce children's acquiring what Louv referred to as nature deficit disorder (Louv, 2008).

Accommodating a multi-generational population in the public realm increases the audience of users, improves socialization between people, and encourages a stronger sense of community.

By working with ecologists, biologists and other related professions, land planning professionals can improve their ability to design recreational features that are more context sensitive and compatible with the local environment. New technologies in recreation are measured against play value and human preference, and not necessarily on how sincere they are to ecological protection. Current recreational trends are oftentimes forced onto tracts of natural areas that are not necessarily compatible with these uses. As an example, trails leading through natural areas must conform to municipal and national standards for maximum longitudinal slopes in order to assure safety and barrier free access, which can require significant grading. Substantial efforts are made to ensure these standards are met, which often require extensive re-grading, retaining walls, or switchbacks with excessive clearing.

To develop best management practices that respond to new trends for human use and recreation within natural areas, an interdisciplinary approach to planning is essential. Municipalities need to implement new guidelines that require input from a number of professions such as urban ecology, landscape architecture, biology and health. Each profession brings a different skill set that in conjunction with one another will lead to a more environmentally and culturally sensitive result. Landscape architects understand the recreational needs of people, and design strategies for engaging humans with the public realm. Health practitioners can assess the health benefits of the proposed activities and contact with nature. Biologists understand the

nuances related to natural features and the conditions needed for vegetation and wildlife to thrive. Urban ecologists bring knowledge related to the interaction between humans and the natural environment, and potential mitigation strategies to balance human use with ecological protection.

8. What strategies can be implemented to help land planning professionals more successfully promote the human-nature connection in western Canadian municipalities?

Every day there are new discoveries and revelations that add to the mounting collection of knowledge shared by the collective human race. It is an age of wisdom, yet it is also an age of foolishness. Despite the array of knowledge that we have before us, humans continue to live in an unsustainable manner and are making irreversible marks on the world. Land planning professionals, despite a vast amount of information available to them related to urban ecology, are not successful in providing for a strong human-nature connection in western Canadian municipalities. The strategies used by land planning professionals today, as demonstrated through the case study analyses, are not providing for this connection.

Land planning professionals have demonstrated a loyalty to their clients which oftentimes does not reflect the best interest of the natural environment, but rather the monetary success of new urban development. Each level of government needs to better scrutinize the recommendations of the consulting industry as it relates to the protection of natural areas and assures the sustainability of those areas to be retained. Based on case study analysis, this is particularly important at the municipal level, as most site-specific recommendations by land planning professionals are guided by municipal policy. “Value engineering” is an element of design processes that has emerged in the past decade for major civic projects such as bridges and

major roadways. This process provides a comprehensive peer review of designs based on a set of determined criteria, such as cost efficiency, lifecycle and sustainable materials. This type of approach to design that provides a more robust assessment of designs for natural areas will ensure multiple perspectives are brought forward for these projects that have civic importance.

The case studies' display of fragmented natural systems calls for more comprehensive research of the effects that both the physical and social qualities of urbanization have on remnant natural areas. This research is now possible given the large number of local examples already in place. Due to land ownership rights, it is difficult to impose significant requirements on this land while privately owned. On the other hand, land parcels of natural areas that are proposed to be legally transferred to municipalities as part of the subdivision process should be assured a higher level of involvement by practitioners that are not subject to the conflicts of client loyalty, and that has multiple perspectives.

This research described marketing strategies used by land developers and municipalities to promote a sense of place and local identity. Playing off most people's desire to be closer to nature, these strategies often misinterpret local conditions or try to create a whimsical and entirely manufactured local identity. Case study examples demonstrated a strong correlation between sense of place and human care for nature. To take advantage of local assets and to minimize ecological disturbance, land planning professionals should work with land owners and municipalities to develop ecologically-based placemaking strategies. The implementation of genuine placemaking strategies will lead to more successful public support for natural area protection in order to preserve local identity and at some point in the future places like "Oak Grove," may in fact have a grove of oaks.

Educating the public in environmental matters and the impacts of urban living on natural areas is an important role for land planning professionals and non-government organizations that have expert knowledge to share. Often the presumption is that the public would value nature more if they knew enough, while public values need to be based on sound science (Callow, 2009). There needs to be a permanent participative planning approach (Absher, 2010) implemented for the protection of urban natural areas. There is a need to educate the public on the benefits of nature and the science behind this approach while balancing this with the social functions of recreation and use of the natural environment.

Municipal councils have a mandate to advocate public input in community planning projects. Consultation processes allow designers to portray their vision for public open space and natural areas, in order for the general public to provide feedback. The challenge for designers is to provide adequate information during the consultation process that leads to well informed feedback from the public participants. To overcome the challenge of having public consultation adversely affect the preservation of natural areas, designers must better educate the public regarding the need to balance human use with ecological integrity. Reiterating the importance of co-existence in urban areas between people and the natural environment is essential.

Initiating more involvement of individuals using basic knowledge sets and less on professionals guided by best management practices and legislation is important. Understanding varying individual perspectives is essential. Ethnic and racial groups differ in their preferences and in the way they use public open space, as do different age groups. Land planning professionals, like public health professionals, need to take these differences into account as the

address the needs of diverse populations and ensure equitable service delivery (Frumkin, 2011). Public consultation should be mandatory for privately-based design processes for open space that will become title of the municipality and within the public domain. Land developers are able to develop future public open space to suit their needs and use marketing strategies that do not necessarily align with the best interest of the environment or the general public.

This research described a challenge for professionals working within a more qualitative design environment while being scrutinized by a legislative framework that is much more quantitative in its assessment. Legislation has intentionally been clear, measurable, and not value-laden in order to stand the test of legal recourse. More effort needs to be taken by regulatory agencies at all three levels of government to ensure that design practitioners can comfortably apply value laden judgment in design, such as “promoting biophilic tendencies” which has its challenge to be measured.

Interdisciplinary approaches to land planning will improve collective knowledge that will afford better design decision-making as it relates to the human-nature connection. As Frumkin (2008) notes, “this requires collaboration between investigators who know trees and investigators who know health” (p 114). The inclusion of health-related studies in design school would benefit up and coming designers to understand possible outcomes of good environmental design and land planning. Perhaps we need to establish a discipline that specifically relates to the health benefits of nature contact and include the health impact of the built environment as part of routine land planning processes.

Land planning professionals need to explore the health benefits of nature in urban areas as part of design strategies, including a health impact assessment of projects. Not only should

health benefits of nature be considered in the design of our cities, but long-term monitoring and assessment of natural areas would help better understand how to calibrate design strategies in years to come.

In the absence of a strong sense of place, natural areas were less likely to be preserved. The Fort McMurray city centre has always had the perception of being a temporal community, one that would cease to exist once resource exploitation was completed. There is a noticeable lack of respect in this community, primarily due to many of the residents not calling Fort McMurray home. Edmonton subdivisions have been seen to create a manufactured sense of place as a marketing strategy, that still does not lead to an established and deep-rooted respect for nature. The strongest sense of place was seen in rural Strathcona County, where the agricultural community held a strong affinity for nature and to this day balances preservation with active agricultural use of the land.

9. How have emerging global trends affected the land planning process or the observed planning strategies in each case study municipality?

Western society often argues the validity of many of the current global trends that we are facing. A common question related to global warming is whether or not a rise in global temperatures is human-induced, accelerated as a result of human activities, or entirely another cyclical trend in global conditions. Many people are not alarmed by the reduction of available fresh water, holding the opinion that new technology will soon allow us to desalinize an endless supply of ocean water in a cost efficient manner. This epoch of belief and incredulity is a challenge to land planning professionals, given the array of public opinion on the urgency to help counteract global trends.

The ability for people to escape to nature found within walking distance from home is becoming more challenging. We value our ability to enjoy the outdoors and take vacations, while peak oil trends and increased costs of travel are already reducing some people's vacation travel to shorter distances or rely on alternative modes of transport. Obesity rates amongst Canadians is increasing (Statistics Canada, 2011b), and living a more healthy lifestyle is becoming a more common trend (Agriculture Canada, 2011). Biophilia, health and wellness research clearly demonstrates health benefits of nature contact. An increase in the abundance and quality of natural areas in urban environments will help people maintain their past practices, or wishes, to vacation in natural settings.

Professionals that have been entrusted to plan our communities are under scrutiny, especially in light of our lack of success in preserving nature in cities. Land planning professionals need to develop a strategy to renew its legitimacy and credibility to guide city building and balance this growth with environmental preservation. Current environmental movements have demonstrated significant levels of scrutiny by various organizations on land planning decision-making. With a more educated general public, land planning professionals are no longer trusted by default and are subject to more robust examination by fellow professionals as well as the general public.

10. What strategies are prevalent in these case study municipalities to help minimize ecosystem degradation?

With the rise in knowledge that we have related to ecosystem function, land planning professionals are becoming more aware of the impacts that urban development has on natural systems. Over the past decade, it has been determined that biodiversity is an important aspect of

ecosystem function (France, 2006; Loreau, 2001; Lundmark, 2009), which is a theory that was unknown to land planning professionals in previous eras. In the absence of this knowledge, many ecosystems were not retained in cities as their significance (particularly due to limited size) was overlooked. Chapin (2000) and Wardle (2005) support the need for various ecosystems to interact with one another in order to ensure biodiversity, yet for many decades land planning professionals were unaware of the need for this interaction. It is the season of light, in that we are now much more aware of the importance of protecting a diversity of natural areas and the value that even small patches have within a systems-based ecological community. The season of darkness that is before us alludes to the complexity of ecosystem function that is now understood, and the great difficulty in maintaining ecosystem integrity within urban areas.

Stewardship involves individual involvement in reclamation efforts, protection of natural areas, and implementation of new initiatives. There are numerous cited benefits of promoting stewardship and active volunteerism of individuals in urban natural areas (Colding, 2006). Both Jordan (1994) and Allison (2004) propose that perhaps the most important outcome of ecological restoration is a healthier relationship between people and the environment. Restoration projects necessarily affect many people in their daily lives by altering the places in which they walk the dog, commute to work, or do a bit of fishing (Ehrenfeld, 2001). Restoration activities can improve the appearance of degraded sites (Zedler, 1998), and in turn lead to a heightened sense of place. The act of reclaiming a landscape helps us reconnect with our origins (Sahtouris, 2000), and results in a special communion between participants and the environment (Higgs, 2003).

On the other hand there are considerable challenges in volunteer programs. While volunteerism is perceived to be a no-cost strategy, considerable planning and coordination is still required. In order to ensure that volunteers are in fact contributing in a positive manner they require oversight by qualified individuals that oftentimes seek financial compensation. Municipalities throughout western Canada support stewardship programs, while these programs must be led by a formal and credible organization and not a purely grassroots initiative. Primarily due to concerns of insurance, liability and legal implications, volunteer efforts are challenging to implement. Municipalities need to be more responsive to these organizations and provide an avenue to formalize these efforts to avert these legal concerns. In Strathcona County we have seen the success of partnerships that have occurred between non-government organizations and land owners, to create legally binding agreements to protect natural areas on private land. Municipalities, provincial and federal agencies do not have the legislative powers, resources or interests in this initiative, however advocacy by environmental non-government organizations seems to be successful (Femida, 2001).

We face an apparent conflict between the perceived short-term gains from eliminating and altering wetlands and the poorly defined long-term costs to water quality and abundance, as well as the wildlife habitat and other human values associated with healthy wetlands (Murkin, 1998). Murkin (1998) further stated that “successful (conservation of natural areas in western Canada) requires that society, as a whole, perceives broader and more significant values of (natural areas than a singular role). Sound scientific information identifying and quantifying the societal values of these (natural areas) functions is necessary before the public and governments will regard and therefore protect (natural areas) as a vital components of a sustainable healthy

environment” (p. 5). In the absence of policy for private landowners to preserve natural areas, natural areas will continue to be lost to land uses that provide more economic gains. From a social perspective, the exact opposite is true (Boyer, 2004) whereas educating landowners on the array of non-monetary values of wetlands may be all it takes to develop a more compelling argument.

In light of the importance that biodiversity has on ecological function, providing a mechanism to protect systems of natural areas is crucial to ensure long term function and resilience. Current federal Acts and legislation do not provide adequate means of protecting biodiversity, only singular ecosystems. Provincial laws and regulations also do not enforce biodiversity. There are, however, examples of non-statutory guidelines at the municipal level that recognize the importance of biodiversity.

To date, most wetland conservation programs and policies in North America have focused on wetlands primarily as wildlife habitat (Murkin, 1988). Milder (2007) describes “conservation development”, which explores ways of alleviating the impact of urban development on ecological systems by combining land development, land conservation, and revenue generation while providing functional protection for conservation resources (Milder, 2007). Current urban development patterns now incorporate a variety of zoning uses in one area, such as commercial or business parks embedded into residential districts.

Environmental policy should be based on public values, and should be informed by natural science. There are dangers of expert values overwhelming decisions in situations where there are complex interactions between human disturbance and ecosystems – we need better forums for handling these complexities (Calow, 2009).

Current Acts, laws and regulations should be amended to include more direct language related to biodiversity, and the need to explore the integrity of ecosystems beyond the site level. While singular ecosystems are protected by these legal instruments, there is no obligation for the land development industry to value the effects of peripheral lands as a result of development or to retain a system of ecosystems as a cohesive entity. Municipal governments such as the City of Edmonton have implemented local policy related to the protection of ecosystems and addressing long-term ecological function, resilience and biodiversity. While these policies are non-statutory, they do provide design guidelines to help protect natural areas in urban environments.

With recent knowledge of the importance of biodiversity we have come to appreciate the need to explore the protection of natural systems at a watershed or more regional scale. Within our cities, protecting natural areas as a system is important to ensure long-term ecosystem function. Because habitat structure and function depend on hydrology, urban wetlands are greatly affected by their far-from-pristine watersheds (Zedler, 1998). The interaction between different ecosystems is important in providing diverse habitat for wildlife.

11. What are the varying views and values of nature that can be seen in each case study, and do these perspectives result in an attitude that supports natural area protection?

Williams (1973) suggested that over successive generations, humans have radically altered our view of nature, from it being savage and wild to settlement and cultivation, to the idea of a rural retreat. Through this progression of how humans value nature there has also been a change in human attitude toward supporting natural area protection. Applying the paradox “spring of hope vs. winter of despair” to the topic of varying views of nature suggests how personal perspectives can be entirely different between two individuals. These opposing views

may deviate over a person's lifetime, or possibly affected by cultural influences (Buijs, 2009, Van Den Born, 2000). The challenge to land planning professionals is to design for natural areas with site users and interest groups with a different perspective of what nature really is. Through case study assessments, this research demonstrates the way in which values for nature change over time and the effect this has on natural area protection.

Understanding how human appreciation for nature deviates and what "natural" amongst western Canadians will improve our abilities in creating environmental policy for this diverse population of people. It can also help facilitate more effective public participation processes that influence policy making for a variety of community initiatives related to its natural environment. Developing a common language amongst various individuals with differing points of view will strengthen dialogue between the general public and policy makers. As part of design processes, creating that common understanding – a baseline from which design decisions are made – will avert some challenges in public participation. Consultation and education of site users is essential.

There is an important link between human understanding and appreciation for nature, and the success of conservation practices (Buijs, 2009). Buijs (2009) also claims that varying beliefs about nature and natural processes will lead to different orientations toward nature and the management of it. These general attitudes toward nature preservation amongst the general public are important in dialogue between them and land planning professionals.

Manuel (2003) writes:

"With our focus on 'big' nature, we tend to forget that most of us live in very localized contexts – neighbourhoods. Neighbourhoods are the places where we should foster routine contact with nature and natural processes leading to a life-long

appreciation of the natural world, wetlands included. (Urban natural areas), with their four-season attributes, are very well suited to the purpose and small (natural areas) are just as serviceable as large ones in this respect” (p. 934).

CPTED has been a strategy used by land planning professionals to mitigate for human perceptions and to improve both physical and perceived safety of users within the public realm. CPTED strategies such as excessive night time lighting and eliminating hiding places for predators lead to considerable alterations of natural areas that do not consider the welfare of wildlife. A more suitable strategy would be to implement better education and awareness programming for users. Fearing that beaver will consume household pets can best be mitigated through education rather than removing these naturally occurring animals from urban wetlands.

12. How has human reliance on nature changed over time within each municipality, and what has any change had on the human-nature connection?

The literature review identified water as a key element that influenced the placement of cities around the world. Without water no living species can survive, and many of the largest cities across the world have been reliant on water for human consumption as well as a traditional means of transportation. Today we are less reliant on immediate access to water with new infrastructure technology and alternative transportation options such as roadway and air travel. Prior to the arrival of European settlers in western Canada, First Nation people were highly dependent on nature for survival yet today use nature in different ways that affects their human-nature connection. Given our reliance on nature has changed significantly it is important for land planning professionals to understand changing trends that can affect how we plan for a strong human-nature connection.

The most apparent change in reliance on nature was found in RMWB with First Nation people going from dependence on nature for survival to a less significant human-nature connection. Today, nature is still a very important part of First Nation spirituality while day to day living no longer requires nature as a source of basic needs such as food, water and shelter. Alike other people in western Canada, these basic essentials often come from afar and are either manufactured products or commoditized goods.

Within suburban developments in Edmonton, recreational trends have begun to change over the past ten years with the emergence of natural areas within these developments. Activities such as trail walking and nature appreciation are becoming more commonplace and therefore the opportunities for a stronger human-nature connection closer to home are more prevalent. There seems to be little change in the human-nature connection within Strathcona County since its inception in the 1950s to the present day.

CHAPTER SIX: CONCLUSION

The main question of this study was to determine if the phenomena of an inherent connection to nature is supported through governmental policies and local design practices, in light of the complexities and challenges in contemporary planning in urban areas. This research has demonstrated that government policies at the provincial and federal level do not adequately protect the majority of natural areas within growth areas of western Canadian municipalities. In the absence of urban natural areas, our inherent connection with nature cannot be fulfilled. Natural area loss was primarily a result of ability to manipulate or entirely eliminate any natural area through compensation processes outlined in the overarching institutional framework. Municipal policy is the most likely to support the retention of nature in cities.

The most effective strategy to preserve natural areas in urban environments that satisfies our inherent need for nature is through grassroots initiatives at the individual level, with the support of local programs and non-government organizations. Current standards that apply to the public realm of municipalities are not necessarily compatible with the needs of natural areas, and are far more focused on minimizing long-term maintenance, providing consistency for all projects in the municipality, and minimizing public liability. New municipal guidelines and standards are needed for natural areas.

Based on the 12 questions that were directed to each of the three case studies, the following are the most significant recommendations of this research:

- Contemporary society highly values access to natural areas in urban environments yet the overarching institutional framework does not support a strong human-nature connection. Some progress has been made over the past decade in retaining natural areas and

encouraging municipalities to develop policies to support this initiative. Land planning professionals need to bring forward the best knowledge available to them to take advantage of the movement toward stronger support from the public to retain natural areas, and to encourage more stringent municipal policy. Supporting government policies are needed to support a deep-seated inter-relationship and interdependence between humans and nature.

- Land planning initiatives in western Canada do not include an interdisciplinary approach. Considering how multi-faceted the human-nature connection is, a number of professions should be part of the planning process. Collaboration would take pressure off individual practitioners to bring forward the vast array of knowledge needed.
- With the alarming rate of ecosystem loss in urban centers and the rising demand by residents for nature in their communities, there is immediate pressure to implement any measures to improve the human-nature connection. Timely changes are required by western Canadian municipalities to start acting now.
- Given municipalities have little to no control of landowner activities on private property, stronger partnerships are needed to promote the protection of natural areas by private landowners. With a strong economy in western Canada there will continue to be substantial growth of cities, with pressure mostly on peripheral areas where remnant natural areas are most abundant and on lands that are privately owned.
- Professionals need to strengthen their working relationship with individuals and non-government organizations, as this type of a collaborative approach has proven successful based on case study assessment.

- There is a strong correlation between place attachment and the preservation of natural areas in urban environments. Case study examples demonstrated that communities with a temporal mindset and a lack of permanence by residents led to less care for the natural environment. In new suburban developments of Edmonton, manufactured themes to create a sense of place for the purpose of marketing did not prove effective in conveying the attitude needed for residents to buy into protecting natural systems. Placemaking is a complex strategy for designers (as outsiders) and this process requires much more community engagement (as insiders). Creating a strong sense of place will have a direct improvement on promoting a stronger human-nature connection.

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