

**Integrating People And Nature In Urban Wilderness:
Bringing Together Concepts From Ecological Planning, Design
And Restoration To Address The Opportunities And Challenges
Of An Urban Ecological Regeneration Project**

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Abstract

This research paper examines the theories and principles of ecological planning, design and restoration as they apply to the development of a concept plan for a site located within the Rouge Park in the Greater Toronto Area. The paper outlines the theoretical and practical underpinnings used to analyze and assess the site, and develop appropriate recommendations. The disciplines on which this paper draws include: landscape ecology, ecological planning and design, ecological restoration, and public space planning. Concepts and guidelines from these disciplines are integrated into a plan, and accompanying recommendations. Both the plan and recommendations address the human and ecological components, and more importantly, their positive and successful interactions and connections on the site.

Foreword

This research paper serves as a synthesis and application of the knowledge gained through course work, readings and the development of the Plan of Study during the MES I and II phases of the program. The paper uses a site-specific case study to examine, analyze and apply the theories and principles relevant to the author's Area of Concentration: "Ecological Planning, Design and Restoration". In keeping with the researcher's selection of learning quadrant A – Intervention in Practice, this paper draws on theoretical knowledge and its application in practical, on-the-ground situations.

This research has allowed the author to apply many of the principles, concepts and ideas acquired over the course of the MES program, while further developing knowledge of the theoretical foundations of the work. For example, applying the principles of ecological restoration and bioregionalism, the author was able to explore a variety of concepts for regenerating the case study site. Essentially, the development of the concept plan and recommendations, and the detailed analysis and evaluation of the concepts deepened the author's understanding of the planning, design and restoration processes, and provided a framework for addressing the issues and challenges of such work. Finally, this research was an exciting opportunity to explore the intricacies and complexities of creating spaces that integrate vibrant ecological systems with human systems.

Specifically, the completion of this research has fulfilled the following learning objectives from the author's Plan of Study:

From Component 1: Environmental Planning

- To focus specifically on theories and practices related to environmental and ecological planning;
- To develop my knowledge and skills in planning practice, and the understanding of how to apply principles of environmental and ecological planning.

From Component 2: Ecological Design

- To develop an understanding of the theories and principles of environmental design,
- To learn the processes and practices involved in ecological design and environmental landscape design,
- To apply the theories and skills in environmental design through direct experience.

From Component 3: Ecological Restoration

- To gain a solid understanding of ecological principles as they apply to planning, design and restoration. The focus of this knowledge will be on ecosystems in eastern North America;
- To understand the connections between humans, the built environment and the natural environment, and how natural processes can function within the urban context;
- To broaden my knowledge of plant systems and vegetation communities important to environmental landscape planning, design and restoration, especially in Ontario.

CHAPTER 1: THEORETICAL AND PRACTICAL UNDERPINNINGS

1.1 INTRODUCTON

Urban centres are, and have traditionally been, centres of economic development and human congregation. A third and critical element, the natural environment, has for the most part played a minimal role in modern urban development. In fact, traditional urban development processes often require the elimination of nature and natural processes in order to accommodate growth. Natural structures and functions are ostracized from cities, or reduced to isolated, highly manipulated fragments of their original state. The result is city development, which requires intense resource and energy use to maintain artificial processes, and a loss of connection between urban residents and the natural world.

In addition to this pattern of uncontrolled urban growth and development, with little concern for the life-sustaining systems nature provides, at an even broader scale, the problem of the ecologically void city escalates when the issue is considered globally. The majority of the world's population now resides in urban regions, and this trend is expected to continue. As a result, the cumulative effects of urban development occurring at this global scale are severely impacting the quality of the global natural environment. Climate change, air and water pollution, soil and groundwater contamination, and the depletion of natural resources are all problems whose origins lie with human development patterns, lifestyles and politics.

While the quality of the natural environment continues to decline, resulting in loss of biodiversity, loss of habitat, resource depletion, and a diminishing landscape aesthetic and quality of life, there are many theories and accompanying practices, which seek to re-integrate the human and natural realms in the urban context. Such theories originate in the disciplines of ecology, conservation biology, landscape architecture, ecological planning and design, and the concepts of bioregionalism and sustainability. The concept of sustainability necessarily implies that humans must learn to live within the limits of natural systems, and allow the regenerative processes of natural cycles to continue for future generations. Under this broad umbrella of sustainability, the specific disciplines can coalesce to create a vision for a more sustainable, ecological future for city regions.

At the municipal or regional scale, theories of smart growth, green urbanism, and natural heritage systems, offer a broad scale approach to designing and planning for urban growth and development in a manner which protects significant areas of natural cover, and accounts for connectedness of this system. Combined with finer scale implementation of design approaches to reintegrate nature into the urban fabric, these theories and approaches lend themselves to the creation of more sustainable, vibrant and healthy urban regions.

1.2 INTEGRATING URBAN SYSTEMS WITH ECOLOGICAL SYSTEMS: THEORIES OF ECOLOGICAL PLANNING, DESIGN AND RESTORATION

The complex natural systems that sustain life processes, and the intricate interconnectedness of the elements of these systems provide human beings with both the essential elements of life, and the desire to better understand our place in the greater context. Unfortunately, in urban settings, nature and its processes have been devastated by intense human development and sprawl. "Unparalleled urban growth is pre-empting a million acres of rural lands each year and transforming them into the sad emblems of contemporary urbanism"(McHarg and Steiner 1998: 64). Thus, many urban dwellers struggle to reconnect with the natural world and often see this reconnection as possible only by leaving the built urban environment altogether.

The challenge to urban planners and designers, then, is to create an urban environment where humans can interact and coexist with natural processes. Healthy, dynamic and vibrant cities must be cities that include and integrate the natural world (Hough 1995, Register 2002).

Although existing buildings and infrastructure make it impossible to create or restore large tracts of wild places in certain parts of the city environment, proper and diligent planning, coupled with creative and ecologically-sensitive design and ultimately, restoration of degraded environments can have far-reaching effects on the quality of life in the cityscape.

There are many models of planning and design that attempt to integrate the natural environment and natural processes into urban regions. Such techniques range from the local landscape level to the watershed or bioregion, to the life zones level, and beyond. To be truly successful, any plan or design project should consider the broader scale. Similarly, planners, designers and governments must consider large-scale ecological and social sustainability and connectivity issues and requirements.

Ecosystem, watershed and ecological planning all work to develop strategies for land-use, conservation or development sensitive to natural processes. One attribute that these planning models share, is the idea that boundaries should, as much as possible, be in tune with natural landscape patterns, functions or processes. For example, planning for the regeneration of the Toronto waterfront can only be truly effective if the plan incorporates the protection and regeneration of the watersheds, which feed into Lake Ontario. Any contamination, sediment or pollution that occurs upstream will eventually affect the Lake into which the watershed empties. Therefore, unless the entire system is considered, the final result will be ineffective.

Ecological, or sustainable landscape planning differs from the ecosystem or bioregional approach in that it focuses strongly on the human element and its interaction with the natural world. This interaction may work within, or between natural boundaries and so planning based on natural boundaries alone may not be sufficient to achieve a truly sustainable result. Ecological design and planning can be broadly defined as "a way of directing or managing change in the landscape to bring human actions in tune with natural processes" (Ndubisi 1997: 10). The basic premise of sustainable landscape design is to allow the ongoing processes that sustain all life to remain intact. (Franklin 1997) According to the principles of sustainable design, these processes must not only remain intact, but also continue to function alongside development.

One of the original measures of a sustainable design process was its minimal impact on the natural systems of a site. Modern designers, however, increasingly deal with sites that are degraded by human impacts. Sustainable design today, must therefore go beyond the goal of minimum impact, to one of facilitating landscape recovery. This recovery, or restoration, involves re-establishing the processes necessary to sustain natural systems. Consequently, the intent of this design and planning process is about more than simply the aesthetic or components of a system, it is about the interactions of those components.

Where the terms planning and design differ most obviously seems to be in the course of action associated with each practice. Planning, as the word implies, involves managing an area for a particular purpose or set of purposes, and does not necessarily involve changing or shaping the physical landscape. In fact, part of the planning process may include an absence of action, for the purposes of protection. Design on the other hand, is a more direct action on the environment, "intentionally shaping matter, energy and process to meet a perceived need or desire" (Van Der Ryn and Cowan 1996: 8). Both planning and design seek to make decisions about land-use patterns and practices, and are therefore, both significant in determining the future of our cities and regions.

The principles that guide both ecological design and planning stem from a systems approach. This type of design is holistic in nature, recognizing the many diverse components that constitute a healthy environment, including culture, heritage, and natural processes. It is important to note that this systems approach does not exclude humans from the natural environment; rather, it stresses the interconnectedness of humans and the natural world. The holistic method

approaches design and planning from the perspective that the process must consider the entire spectrum of resources, and seeks to manage this whole set of resources. Thus, this systems approach looks at the project or problem, as a whole unit comprised of complex and interacting component parts.

In contrast to the complex and interactive nature of ecological design, traditional design and planning processes offer single-faceted solutions to a single-focus problem. Many design professions are geared to solving arbitrarily defined problems and providing solutions, "which may appear reasonable from the point of view of a single professional discipline, client or interest group, but cannot resolve the multidimensional problems of the land"(Franklin 1997: 264). In the terminology of Action Research, the complex character of an ecologically based planning initiative can be considered a 'metaproblem'. Such a problem is one in which there are many components, issues, opinions and other factors which must come together, and interact before any decisions can occur.

Urban planning often provides a hierarchical top-down approach to problem solving. The planner is the expert who gathers the information and provides viable options, which are then open to public consultation. Once the desired alternative is selected, the process is implemented and evaluated. This method implies a simplistic view of planning in which the expert, an individual or group external to the affected community, synthesizes the information and decides on the best alternatives. The experts, who direct and focus the project in a sense, patronize the public participants. The remaining stakeholders, such as the residents, NGO's, and community groups in turn, perceive the 'professional' as cumbersome and restricting. The stakeholders must concede to the designers' vision, which does not necessarily engage the expertise, resources and needs of the stakeholder group itself. In this sense, critics of the traditional planning and design process view it as "exclusive, linear and compartmentalized."(Franklin 1997: 264).

Conversely, ecological designers and planners see themselves as part of a collaborative effort in the planning process. In an ideal setting, this collaborative assembly of individuals and groups would be inclusive and exhaustive, considering all relevant parties. All concerned parties are empowered to advocate their needs and desires. Ultimately, the stakeholder relationship is one of consenting equals that builds consensus as a project proceeds.

There are many interacting groups and individuals that are included under the stakeholder heading. Each project will have its own specific and unique stakeholder group. Among the typical interest groups are residents, community groups, local government officials and agencies, local businesses, Non-government organizations and the professional planners and designers (Evergreen 2000). Two important, but often overlooked elements of the stakeholder group are the unseen users and the land itself. The unseen users can include tourists or users of the site not initially expected, as well as future generations who will use the site. Assessing the needs of these users is difficult, but critical to the long-term success and survival of any site.

Understanding how a site and its users needs will change over time can help assure that the planning and design process will result in a project that adapt and persist.

The land, site or landscape area of the project is therefore an important stakeholder in the planning process. "There are few sites that are self-contained packages where planning and design simply entail designing the required...landscape for the proposed client [or community group]. Site programs and clients come and go, but the land remains" (Franklin 1997: 266). The term land may refer to derelict lands, brown fields, vacant lots, or even areas of city parkland. This definition of the land, then, differs from a definition of the natural environment as applied to the ecological planning process. These sites may or may not express natural processes, but they most often lack the characteristics of a healthy interacting natural environment. Assessing the needs of the land to be designed involves realizing its potential for natural processes, its limitations and its current and future uses. Omitting the land from the stakeholder group results in an incomplete plan, since the land is the ultimate determining factor.

The complex and extensive nature of the stakeholder group and its interactions can be overwhelming, and lead to the assumption that building consensus is an impossibility. Building consensus among a group of individuals with different and sometimes conflicting needs is one of the most challenging, but essential elements of a successful planning and design process. Consensus decision-making is, in theory, a truly democratic process. This approach to making decisions in the meta-problem context is not based on a majority vote, but rather a decision that all parties can accept. In such a complex network of stakeholders, such a decision can only be reached if the parties first agree to participate in the process. Once this happens, then each issue for discussion becomes open to approval or concern, and consensus decision-making begins to take shape.

As part of this process of reaching consensus, stakeholders have the opportunity to bring forth unresolved issues or concerns (Evergreen 2000). Even in a site-scale community stewardship initiative, the range of problems or concerns can be vast. For example, a community group may decide to undertake a naturalization project on city owned parkland, but they first have to build in approval from all users of the land area, park government officials, local politicians, and residents. In this scenario, it is plausible to expect members of the surrounding community to express concerns of possible pest species, or fears of wild animals moving into the neighbourhood. Other issues that may arise are ones of visibility and subsequently safety, especially where small children are concerned.

Along with the extraction of the many opinions or ideas, the parties must be willing to compromise in order to reach a mutually agreeable decision. This practice will continue until all members of the group agree. The proposed decision is discussed until everyone in the stakeholder group finds it acceptable. The ideas of consensus, democracy and inclusion of all parts of the system in no way suggest that the sustainable design and planning process is not hierarchical; The difference between conventional planning and ecological planning is the direction of the hierarchy.

In a conventional model, the hierarchy is imposed from the top-down. The planning process is linear with the focus on the final product. The ecological model of planning and design, on the other hand, structures its hierarchy from the bottom-up, and with an entirely different view of hierarchy altogether. In the sustainable model, the stakeholders interact with both the natural and built environments at the base layer of the hierarchical structure. A successful interaction has the emergent property of being an ecological planning and design process on the next level of the hierarchy. This process allows the components of the system to determine the outcome, rather than having the outcome dictated downwards. "In complex, dynamic human and ...[natural] systems, plans should emerge and take form in a self-organizing evolutionary way, rather than being imposed as rigid blueprints"(Franklin 2001).

The ecological design and planning process is very much process, rather than product, driven. It allows for feedback loops, which inform the process and allow for change and adaptability based on the needs of the various components. This is not to say that a product is without feedback. The process can be likened to theories of creative management, like Gareth Morgan's analogy of termite colonies (Morgan 2001).

Termites begin by moving earth in random patterns, until eventually distinct piles of earth begin to emerge. These piles become the focus of building activities, which result in the formation of columns in random positions. The columns are built up to a certain height and then joined together with rounded arches. The nest begins to evolve as an increasingly complex structure with the arch as the basic unit. The result is a free form architectural structure with interlocking caverns and tunnels, ventilation, humidity control and complex and intricate form. In other words, termites do not follow predetermined plans. Work in a termite colony reflects a self-organizing process where order emerges, driven by vision, at the edge of chaos (Morgan 2001).

Unfortunately, in urban and rural settings, this approach is secondary to one that focuses strongly on the built environment, often compromising both the natural and participatory processes needed for a healthy art of city building: "In that anarchy which constitutes urban growth, wherein the major prevailing values are short term economic determinism, the image of nature is attributed little or no value"(McHarg and Steiner 1998: 8). Yet, many citizens, professionals and societies realize the need for nature in our cities, and work diligently to educate, inform and inspire a change in public perception and policy. Ian McHarg, a landscape architect, educator, writer and active environmentalist eloquently summarizes this point:

"...[T]here is a need and place for nature in the city of man. An understanding of natural processes should be reflected in the attribution of value to the constituents of these natural processes. Such an understanding, reflected in city building, will provide a major structure for urban and metropolitan form, an environment capable of supporting physiological man, and the basis for an art of city building, which will enhance life and reflect meaning, order, and purpose"(McHarg and Steiner 1998: 10).

Consequently, ecological design focuses on a value system, a paradigm that differs from reductionism in its principles and processes. In order for this type of planning and design to gain momentum, there must be a paradigm shift. Societies must shift their focus from the dominant paradigm of economic gain and development of the built environment to an emergent paradigm focused on natural processes interacting with humans alongside development. This requires a value system rooted in an understanding of the importance of natural processes, and an appreciation for nature and humans in the urban and rural settings.

Local initiatives, happening at the site or landscape scale can be effective tools in bringing about these shifts in public perception. To be truly effective, however, city societies must have a holistic vision, which includes, in an intricate way, natural processes in the city. Each project, then, must be part of a network of interacting projects, working for change on a larger scale. In conclusion, societies must work locally, for change, and the cumulative and connected efforts of local stewardship can act as catalysts for changes in perception and policy over time.

1.3 ECOLOGICAL DESIGN, LANDSCAPE ECOLOGY AND ECOLOGICAL RESTORATION: THE FRAMEWORKS FOR ADDRESSING THE PLAN AND DESIGN OF THE VISTA TRAIL CELEBRATION FOREST SITE

In traditional forms of urban planning and design, the built or manicured environment is often the focus of the project. Such projects or plans are typically product, rather than process driven, and pay little attention to the ecological impacts, benefits or context of the particular project. Ecological planning, design and restoration strives to incorporate all relevant stakeholders, including the land itself, and focuses on an evolving and adaptive process, rather than simply a final product. Additionally, as the name implies, an ecological approach to planning and design places priority on how a particular project fits into the larger ecological context, and how such a project can be implemented so as to minimize negative impacts, and hopefully enhance rather than destroy the natural environment.

While ecological restoration or rehabilitation projects may work reactively to improve the quality of natural processes that have been degraded by urban development, and promote urban environmental stewardship, planning and design can work proactively to protect significant natural areas, and develop urban areas within an ecological context. To plan and design with ecological processes as a fundamental component, it is necessary to first understand the principles of design, and how ecological processes can be integrated into the design process.

Additionally, to craft designs and plans which accurately reflect ecological principles, it is essential to recognize the spatial context within which such activities will occur. If planning, designing and restoring are considered from an ecological perspective, then it should follow that a

solid understanding of the ecology of a place, region or landscape is essential. Finally, examining the philosophy, guidelines and objectives of ecological restoration provides insight into how to apply this area of expertise to generate balanced approaches to project designs and plans, and how to enhance the ecological quality of the outcome of such projects.

1.3.1 ECOLOGICAL DESIGN AND PLANNING

The planning and design of open space and the incorporation of ecological knowledge and themes is not a new concept in urban planning and design. The pioneers of urban planning, Frederick Law Olmstead among them, understood the significance of natural systems to the health and well being of human populations, especially in the face of urbanization and industrialization (Spirn 1984, Hough 1995, Nassauer 1997, Forman 2002). "They successfully tied together nature protection, recreation, sewage treatment, transportation, land restoration, visual quality, solid waste disposal, and water quality" (Forman 2002). With an even greater developed understanding of ecological principles, urban planning and design and the economies of cities, the opportunities for integrating nature and culture into sustainable urban spaces seems greater than ever. The challenges to such integration, however, are equally great, with pressure on fertile lands from increasing populations, and the driving forces of economy and growth dominating the political agenda.

Nevertheless, ecological design practices occur in these densely populated urban spaces, on all scales, and mesh nature and culture into sustainable design solutions. Yet, despite the efforts and ingenuity of designers, planners, ecologists and others working towards a sustainable future for our land uses, the overall effect remains minimal compared to the vastness of status quo urban development and sprawl. According to Richard T.T. Forman, three key steps are required to achieve sustainability and bring the fields of planning and design to the forefront of integrating nature and culture successfully. These steps include:

1. Ecology must form a central foundation for design and planning;
2. Theory must become clearly stated and put to use in design and planning;
3. Boldness, as an alternative to the status quo, must become the norm (Forman, 2002).

Ecology here may refer to site-specific ecological processes, or to the larger scale theories offered by landscape ecology. Both streams of the science have much to offer the planner or designer with respect to ensuring that designs enhance ecological structure and function, while also ensuring that the development of such a design or plan minimizes negative impacts to the land from the implementation process. At either the site or landscape scale, the implication for the fields of landscape design and planning, is that in order to create ecologically based solutions, practitioners require a solid understanding of ecological principles as they apply at the micro as well as macro scales.

The ecological design process, rooted in ecology, has as its basis five key principles:

1. Solutions grow from place;
2. Ecological accounting informs design;
3. Design with nature;
4. Everyone is a designer;
5. Make Nature Visible (Van Der Ryn and Cowan, 1996).

The first principle refers to an intimate understanding of the place or project site in question. Understanding the ecology of that place, its uses, both cultural and ecological, and searching for a solution from within rather than outside the site. Building on the first principle, 'ecological accounting informs design' tells the designer to take stock of what already exists on the site, and what opportunities exist for improving that ecological structure or function. Additionally, ecological accounting refers to assessing the environmental impacts of existing or proposed designs on the site. This information can then be used to determine the most ecologically sound design solution.

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The third principle, 'design with nature', encapsulates the pioneering work of Ian McHarg which calls for working with living processes, instead of against them, towards solutions which respect the needs of all species, while striving to meet the needs of humans (McHarg 1969, Van Der Ryn and Cowan 1996). Fourthly, Van Der Ryn and Cowan call for the acknowledgement that all voices must be heard, in other words, 'everyone is a designer'. Allowing current and future users of a site into the design process increases the possibility of creating a design which will meet user needs, while also ensuring continued stewardship of that site through a sense of ownership and participation.

Finally, 'make nature visible' implies bringing the ecological processes and cycles to the forefront of a design, and literally making them visible to the users of the site. For example, the concept of a 'living machine' uses plants and animals in an aquatic environment to filter impurities from water, and can become a visible part of a building's design. This visibility enhances learning opportunities, and reconnects users to the natural processes often removed from the daily routine in urbanized environments.

A common thread in the literature on ecological planning and design is process. Ultimately, despite our best intentions to design with nature, nature itself is our perception or interpretation of it. It is impossible for us to design and plan in a non-anthropogenic manner, as we are tied to our perceptions, values and human nature. Design then, is the result "of an anthropocentric process of intentional change,...[whose] primary aims and decision criteria are social relationships"(Steinitz, 2002). Carl Steinitz, a professor at the Harvard University Department of Landscape Architecture proposes that design is ultimately about changing people's lives "by changing their environment and its processes, including its ecological processes"(Steinitz, 2002).

To find a means for organizing the design process, and ensuring appropriateness of designs and plans, Steinitz has created a framework for design, which focuses on process and adaptation. The intention of this framework, comprised of six questions and their associated models, is to examine the landscape-planning project downward through the framework, and then from the bottom-up. According to Steinitz, this two-way process is necessary to fully understand the context of the project, and make appropriate decisions about implementation and action.

Recognize Context		Perform Study
I	How should the landscape be described?	REPRESENTATION MODELS
II	How does the landscape operate?	PROCESS MODELS
III	Is the current landscape working well?	EVALUATION MODELS
IV	How might the landscape be altered – by what actions, where, and when?	CHANGE MODELS
V	What predictable differences might the changes cause?	IMPACT MODELS
VI	How should the landscape be changed?	DECISION MODELS

FIGURE 1: Steinitz's Framework for Design (adapted from *Steinitz 2002: 233*).

This framework allows the design team or planner to move freely back and forth, revisiting each question and model, and making adaptations as necessary. As Steinitz points out, the two-way movement is necessary to understand each step in the process. For example, the decision to make a change or proposed design requires the designer to be able to compare alternatives and decide on the most appropriate action or inaction, hence the Decision Model. To compare alternatives, this same designer must be able to predict the impacts of these proposed changes,

hence the Impact Model. One can move backwards through the framework to ensure that each level of inquiry is building on, and drawing from the level above.

Essentially, then, ecological design is a process rather than product driven exercise (Franklin, 1997), which is adaptable and flexible to the needs of the human and non-human components. Additionally, the ecological design process, by its very nature, seeks to minimize negative impacts of the ecology of a place or region, with the ultimate goal of improving the ecological quality of the site to be designed. Furthermore, ecological design seeks to educate through the design process, and the eventual design itself, bringing nature and natural processes to the forefront of the final design. Finally, through ecological design, we can strive to create a more sustainable human environment, and one that closely interacts and meshes with the natural world.

1.3.2 LANDSCAPE ECOLOGY

Although there are differences in examining the ecology of a region from that of the smaller scale landscape or an area of even finer scale, the concept of a landscape, and the specific subject of landscape ecology are helpful in understanding the patterns and processes of ecology, as it exists alongside human development (Forman and Godron, p.11). A landscape can be described in many ways, depending on the context within which it is perceived. Traditionally, for many urban environments, the landscape has “something to do with shrubs around the foundation of a house or building, [or]...something to do with planting flowers and trees in backyards and alongside interstates and city streets...”(Thompson and Steiner, p. 1). In the context of ecological planning and design, the landscape is much more than simply aesthetics; it is an essential component of a healthy, diverse and dynamic environment.

A definition useful in describing landscapes for the purpose of planning and restoration is that of a “landscape as a heterogeneous land area composed of a cluster of interacting ecosystems that is repeated in similar forms throughout”(Forman and Godron, 1986). The repetition and connection of forms throughout landscapes can guide the process of planning for sustainable future development. As well as offering a context within which to plan regions, the above definition offers a starting point for guiding conservation, preservation and restoration plans.

Understanding the principles of landscape ecology, and the patterns and functions of landscape features allows planners to make informed decisions about where and how to develop, and how to best preserve or create natural areas for the continuation of natural processes and functioning. From this definition, and an understanding of the mechanisms that shape landscape development, Forman and Godron describe landscape ecology as a science, which focuses on three characteristics of the landscape, namely structure, function and change. The authors conclude their definition of landscape ecology by stating that this science “studies both the principles concerning structure, function, and change, and their application, that is, the use of these principles in the formulation and solving of problems (Forman and Godron, 1984).

The literature on landscape ecology offers many related and complimentary definitions of the subject, which may be synthesized as: The study of spatial relationships and functional interactions over a heterogeneous land area, and how these relationships and interactions affect structure, function and change over time. The discipline focuses on spatial dimension, pattern and function across the landscape. An important distinction between landscape ecology and other ecological sciences, is its coupling of cultural knowledge with knowledge of biological processes in order to understand the interface between ecological form and process and human process and development on a broad regional scale. Landscape ecology applies spatial and temporal analysis to ecological knowledge to address resource management, land-use, and conservation issues. It presents a philosophical approach with applied dimensions. The principles of landscape ecology appreciate landscapes as textured spaces, which are dynamic and evolving, and interacting with complex cultural components. Essentially then, the aim of landscape ecology is to understand the relationship between ecological form and function, to

design landscapes that support rich and productive systems, within the context of human development. As part of this goal, the application of landscape ecology principles seeks to reduce fragmentation of landscapes by reconnecting landscapes to one another in patterns that support greater ecological resilience.

While much of the modelling and analysis that occurs in landscape ecology is still driven by the natural sciences, landscape ecology, as a discipline is interdisciplinary in nature, originating from a meshing of geography, biology and hydrology and sociology, economics, philosophy and aesthetics. The theoretical and analytical approaches to landscape ecology integrate human patterns with natural patterns, examining the influences of each on the other, on species numbers and movement, biodiversity, and change over time and space.

Essentially, then, landscape ecology examines the spatial and temporal heterogeneity of patterns within the landscape. Specifically, the discipline divides the patterns into three distinct components; patches, corridors and the larger matrix, which forms the background, landscape. A patch can be defined as “a nonlinear surface area differing in appearance from its surroundings... Patches vary widely in size, shape, type, heterogeneity, and boundary characteristics”(Forman and Godron, 1986: 83). The size, shape and boundary characteristics of patches influence their edge to area ratio, the movement of species throughout and across the patch and its surrounding matrix. From the perspective of land-use planning or landscape architecture, patch size, location, and its proximity to similar or differing patches should be carefully considered. Ecologically, the protection or enhancement of patches through restoration or other management approaches can be greatly influenced by decision-making related to size, shape and connectivity.

The issues of fragmentation and connectivity of so called ‘natural’ environments, especially in urban and urbanizing contexts, are significant to the processes and functions of these natural environments. Landscape ecology offers insight into how to approach these issues to achieve functioning, self-sustaining natural environments. While patches can support significant natural processes and species, where they are located, and how they are linked to other ecosystems or habitats is significant to their long-term survival and viability.

Urbanization has increasingly led to the fragmentation and isolation of natural environment patches. These patches are often closed off from other existing natural habitat areas by roads, houses, buildings, or even agricultural lands. Without the essential connection, a patch can suffer species loss, and a loss of interior habitat. Fragmentation and isolation reduces species and genetic diversity, and increases the edge habitat of a patch. The smaller the interior, the less capable of supporting interior species, the habitat becomes. A corridor is essentially a linear connection or transportation route. While corridors can vary greatly in appearance, size, location and function, they can essentially be defined as a “narrow strip of land which differs from the matrix on either side”(Forman and Godron, 1986: 123). Depending on their type and function in the landscape, corridors can act either to connect or divide landscape features, or both. While a road serves as a transportation corridor connecting human settlements, it simultaneously can act as a barrier to wildlife movement in surrounding natural areas.

From an ecological perspective, natural area corridors are becoming increasingly important for their contribution to connectivity of isolated habitat patches through corridors and linkages. These connections contribute to the protection and enhancement of ecosystem processes, biodiversity and species movement, all of which are negatively affected by processes of urbanization. This isolation and loss are caused by fragmentation, dissection, perforation shrinkage and attrition. Fragmentation refers to the “breaking up [of] a larger/intact habitat into smaller dispersed patches”(Dramstead et al, 1996). Fragmentation is perhaps the most pronounced impact of urbanizing environments on natural processes.

Dissection and shrinkage are forms of habitat loss relating to the splitting of an intact habitat into two smaller patches, and the general decrease in habitat patch size respectively. Perforation is essentially the practice of creating holes or gaps in an intact habitat, while attrition is the actual

disappearance of one or more habitat patches. Such phenomena seem to now be the steady state in the already intensely developed Greater Toronto Area. With the dawning of the new Official Plan for Greater Toronto, however, the municipality, along with the local Conservation Authority is taking measures to incorporate natural processes and ecosystem functions into the planning process.

Natural heritage planning is now becoming a central focus of conservation land planning and watershed planning processes. Considering the location and size of patches, the presence of interior forests and species of concern, and the appearance of vegetation communities of concern are all part of natural heritage planning, and are firmly rooted in the principles of landscape ecology. As such, when planning on a site-specific level, as is the case with the project used to guide this research, interpreting natural heritage information, and applying landscape ecology principles in the designing of a site concept, will help improve the overall abundance and quality of the ecosystem in question.

While examining the landscape ecology principles and features of the site itself, landscape ecology, like bioregionalism, strongly emphasizes the need to examine surrounding influences and processes. The matrix is essentially the dominant background of a particular landscape. "It covers an extensive area, is highly connected, and controls landscape or regional dynamics..."(Forman 1995: 277). These three prime attributes, area, connectivity and control over dynamics, can be used to identify a matrix in the case where identification is not easily determined. Often the matrix is easily identifiable as the dominant landscape type, a forest for example dominating the area of a particular landscape. If however, there are two or more dominant element types, similar in overall area, connectivity can be used to differentiate them. The third and final assay for determining the matrix is control over dynamics. According to Forman, control over dynamics is difficult to measure directly, but is nonetheless the most important assay (Forman 1995). Forman describes control over dynamics as "an element being the source for: seeds of recolonizing plants, herbivore herds, keystone predators, blowing particulates, gaseous pollutants, vehicles, human masses, flood water and heat"(Forman 1995: 278). In the case of a large urban area, such as the Greater Toronto Bioregion, indicators such as the loss of interior species from the City, the spreading of smog and air pollution throughout the region, and the intense pattern of development are strong indicators of the control of urban processes over the dynamics of the region.

These principles of landscape ecology, and the many other contributions the field makes to understanding landscapes at various scales, from residential to regional, are intended to be applied to real world situations to maintain and improve the quality of environments through landscape-ecological planning and design. The natural heritage system is one example of how planners and ecologists can work together to protect and enhance the quality of the natural environment within urban regions. As will be further discussed in Chapter 2, through the detailed examination of the case study, the Vista Trail Celebration Forest Site – the case study site, is strongly influenced by many of the above-mentioned processes, especially the surrounding urban matrix influences. As a result, the analysis of the study site, and the development of a concept and recommendations for the site will incorporate landscape ecology principles towards the regeneration of the site's ecosystem, and the improvement of ecological structure and function of the site.

1.3.3 ECOLOGICAL RESTORATION

The science and practice of restoring landscapes and ecosystems is essentially the application of the principles of landscape ecology towards the goal of achieving healthier landscapes through active or passive alteration of site conditions, features and functions. Ecological restoration can be examined through many lenses, some scientific, others coming from the social sciences and humanities, and yet others approaching the discipline from the fields of design and art. Ecological restoration can also be a philosophical and controversial topic, wrestling with issues of the 'value' of restored landscapes, and the ethics of creating or inventing natural landscapes.

The Society for Ecological Restoration (SER), an international, interdisciplinary group working to promote and expand the field of restoration, describes the process as “an intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability”(SER 2002: 2). Often, the damage or destruction of ecosystems, which are subsequently restored, is the result of human activities. According to SER, restoration “attempts to return an ecosystem to its historic trajectory... The restored ecosystem will not necessarily recover its former state, since contemporary constraints and conditions may cause it to develop an altered trajectory”(SER 2002: 3).

While ecological restoration does have these implications of returning to a former, or historic state, there are also other options for creating healthy, diverse ecosystems, even on the finest-grained scale. Many avid restorationists would likely argue that a front yard prairie or permaculture garden, or even a restored site with permitted public use should not be considered a true restoration project. In addition to the values of ‘pure’ ecological restoration, however, there are many benefits to making natural processes visible, and there is value in sites providing access for awareness, reflection, interaction education and play. Restoring the human spirit, and its connection to these processes is essential for changing perspectives and perceptions of nature in the urban context, and gaining support for larger scale restoration, protection and conservation initiatives.

Restoration can take on many forms, and has its own distinct terminology to identify these forms, including: naturalization, regeneration, remediation, and enhancement, to name a few. But restoration principles often also support the process, as well as the product of a restoration initiative. Public participation, consensus building, responsibility and ownership, partnerships and long-term monitoring (the ‘Friends Of...’ movements), have become central to the success of many urban ecological restoration initiatives:

“With a sustainable design process, team members interact as equally empowered partners... Most importantly, the land, the people living and working on it, and those who will be using the project are full participants. And to ensure sustainability, ‘the unseen users, who are the other players at the table, are the future generations [and the land itself]’”(Franklin 1997: 265).

Inclusion of citizens can successfully move beyond the initial planning and design of restoration projects, and even beyond the implementation and monitoring phases of restoration projects, to lifelong interaction with and absorption of the ‘manufactured’ natural surroundings.

Additionally, ecological restoration principles can be injected into more creative or anthropocentric processes, creating spaces which are ‘invented’ or even symbolic, but which still enhance the ecological quality of the site, increase biodiversity and create natural cycles. In other words, ecological restoration can move beyond its strict restoration ecology dogma into more creative and inventive spaces and contexts.

BENEFITS OF ECOLOGICAL RESTORATION

The benefits of restoring natural landscapes, functions, structures and processes include, but are not limited to the most obvious, ecological, benefits. Among the ecological returns offered by restoration projects are increases in biodiversity, slope stabilization, improvements in water and air quality, improved permeability of surfaces and subsequent percolation and absorption of water, and increased habitat for wildlife. Biodiversity is of particular importance and a clear understanding of the definition of and implications of increased biological diversity is important. Biodiversity, while often thought of as referring to the diversity of species in a particular location, has a more accurate and complex meaning. Biological diversity (biodiversity) refers to diversity at many scales, from the ecosystem level to the species and genetic level. All levels are considered equally important in conservation biology, which strives to increase biodiversity (Towle 1996). Of course, in any restoration project, the designers and planners must also prioritize and analyze opportunities for biodiversity enhancement, but must also be careful to recognize the potential

detrimental effects of unwanted increases in particular invasive species. Therefore, sustaining biodiversity through ecological restoration must be a well planned and executed goal.

In addition to the biological and ecological benefits of restoration or naturalization, such projects also produce social and economic benefits. The social benefits associated with naturalization or community-based restoration projects in particular include:

- Enhanced recreational and educational opportunities through naturally enriched local environments;
- Increased potential for human/nature connections which leads to a heightened awareness of local species and ecosystems (ecological literacy);
- Enhanced sense of physical, spiritual and emotional well being through increased opportunities for reflection, contemplation and play in natural and ecologically diverse surroundings (Daigle and Havinga 1996).

From an economic perspective, ecological restoration projects can offer many benefits to the local and regional communities within which they are undertaken. A somewhat indirect, but critical, benefit is the linkage between human health and ecosystem health. A healthy local and regional ecosystem improves the physical, mental and social health of its human inhabitants. Having a healthy human population means a healthy work force, which works more effectively, and is less prone to sickness and environmentally related diseases. A healthy workforce, in turn, drives the economy of that city or region. A healthier population also means reduced health costs (prevention verses treatment). Restoration then, can be seen as preventative or proactive health care. Another, more direct positive impact of restoration is the reduction of landscape maintenance costs through naturalization of formerly manicured public and private spaces. Additionally, increased opportunities for ecotourism, recreation and education can lead to economic spin-offs (Daigle and Havinga 1996).

THE PROCESS OF ECOLOGICAL RESTORATION

The process of undertaking a restoration project can range in complexity from the relatively straightforward activity of planting trees on an old field, to the extremely complex task of remediating contaminated sites, or planning a large-scale, successional restoration planting. A series of guidelines and procedures for planning and implementing ecological restoration projects is helpful in ensuring the appropriate use of plant materials and species, the potential for long-term success, and garnering community support for the project.

The guidelines for ecological restoration projects compliment and often resemble the principle components of ecological design. For example, restoration projects aim to respect and reflect the natural and cultural character of a region. In other words, landscape restoration aims to reintroduce "features indigenous to the local and regional landscape"(Hough et al 1995: 3), which help distinguish one place from another. Additionally, restoration, as a practice, recognizes the unique ecological character of each site, protects significant natural features, establishes priorities for restoration efforts and seeks to create low-maintenance, ecologically self-sustaining solutions (Hough 1995, Hough et al 1995, Sauer 1998).

At the site-level, the level of inquiry of this research and case study analysis, the restoration planning process can be undertaken following nine essential steps as follows:

1. Define the local site context;
2. Conduct a site inventory and analysis;
3. Articulate project goals and objectives;
4. Prepare a site plan;
5. Identify a plant community model(s);
6. Develop a restoration and management strategy;
7. Develop plant lists and identify plant sources;

8. Develop a project monitoring program;
9. Prepare an action plan (Clewett et al 2000, Daigle and Havinga 1996, Hough et al 1995, Sauer 1998)

The restoration planning process often includes stakeholder or citizen participation, and in this regard, closely meshes with the ecological design approach. Where the two differ most notably is in the application of design theory and principles of aesthetics and creativity in the ecological design process, and the stricter adherence to natural system functioning and structure in the restoration process. While the field of ecological restoration certainly acknowledges and relies on landscape architecture for design and construction detailing, the element of creativity and art is often absent in what restoration experts would consider 'true' restoration. Restoration, then, is seen as recreating natural habitats and ecosystems, or ameliorating existing ones using the principles of both site and landscape ecology to achieve the desired results. A creative community garden, reflecting ecological design principles such as making nature visible and designing with nature, may not qualify as restoration in the eyes and minds of these 'true' restoration experts.

It is the intent of this research paper, however, to explore the possibility of restoring creativity, imagination and art, and the incorporation of symbolic and educational landscapes for public use into the more ecologically rigorous restoration approach.

CHAPTER 2: THE VISTA TRAIL CELEBRATION FOREST SITE- PROJECT DESCRIPTION

2.1 INTRODUCTION

The practices of ecological planning, design and restoration occur at various spatial and temporal scales, from the macro regional or landscape scale to the micro, site-specific or even finer-grained level of inquiry. While the approaches, issues and implications for implementation and adaptation will vary significantly at these differing scales, the general principles explored in the theoretical, philosophical and practical streams of ecological planning and design most often apply across these varying scales. As a result, examining a particular site, as it exists within a host of differing scales and contexts serves as a useful tool for investigation and analysis.

Additionally, while the site level of investigation may initially appear easier to plan and design, due to its finer scale, the level of detail required for thorough analysis and well-researched decision-making makes the site-specific case a complex and creative challenge. The Vista Trail Celebration Forest site, a site located within the boundaries of a large urban wilderness park in the Greater Toronto Area (GTA), will serve as a site-specific example of the opportunities and challenges associated with the application of the theories and principles of ecological planning, design and restoration. The concept plan and report prepared for the development and design of this site were created as part of a project for the Toronto and Region Conservation Authority, and in consultation and partnership with the Rouge Park.

2.2 THE BIOREGIONAL CONTEXT

2.2.1 BIOREGIONALISM AND ECOSYSTEM PROTECTION

Bioregionalism as a concept is more than simply a set of ideas, or even a philosophy; it can be called a movement in that it is an approach to thinking about the natural world and a way of living within the limits of that natural world. Bioregionalism “calls for human society to be more closely related to nature (hence, bio), and to be more conscious of its locale, or region, or life-place (therefore, region)”(MacDonald and Mulvihill 2002: 2). Essentially then, bioregionalism seeks to reconnect people to their natural surroundings, and their ‘place’.

The movement has as its foundation, two closely connected principles. The first being a proposal to root human culture within natural systems, connecting the two and forming an intimate knowledge of natural cycles and limitations on nature’s resources. The second builds on the first premise, acknowledging that human cultures, especially in North American society, are increasingly alienated from place. A transient society often leaves little room for true connection and intimate knowledge and care for place, whether built or natural. Bioregionalism then, encourages societies to “get to know one’s place intimately in order to fit human communities to the Earth, not distort the Earth to our demands”(Macdonald and Mulvihill 2002: 2).

Considering the bioregional movement, and the need to provide spaces where people and nature can interact, are critical components of the ecological planning and design process. Specifically, ecosystems and habitats do not conform to the many political and jurisdictional boundaries within which they are situated, but rather to the larger natural and built environments within which they are integrated, and whose functions and processes impact on them. Bioregional planning and design apply the principles of bioregionalism to create concepts that consider the bigger picture, or regional context, and seek to create solutions that strengthen and build human/nature connections. “Bioregional planning is a way of understanding the complexities of ecosystems as they relate to regional culture; it is an integrated approach to resource management as defined by the ecosystem’s characteristics”(Reiniger 1997: 186). While the focus of bioregional planning may be on the ecology of regions, the philosophy and practical approach to this type of planning also emphasizes the human realm, and our place in the whole system. The approach underlines

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the importance of human health and economies, and ties them directly to the health of ecosystems. In other words, the “quality of human life depends on the health of all life; [and states] that we are, in actuality, one immune system”(Reiniger, 1997). Human health and the health of the ecosystems we live in, mirror one another.

The first step in approaching the development of a concept for the Vista Trail Celebration Forest Site was to research and inventory the bioregional features, natural and cultural, existing and past, on the site and within its larger watershed. It was essential to understand the larger functions of, and impacts on the Rouge River Watershed, the implications of the Rouge Park, and its management plan, and other local and regional impacts such as urbanization, adjacent land uses, and site-specific land use patterns.

2.2.2 THE SITE IN THE BIOREGIONAL CONTEXT

The Vista Trail Celebration Forest site is located on the popular Vista Trail, which is situated in the southern portion of the Rouge Park, in the Greater Toronto Area. The Rouge Watershed is one of nine watersheds flowing from the Oak Ridges Moraine through the Greater Toronto Area, and draining into Lake Ontario. As an urban/rural watershed it faces many challenges including widespread recreational use, air and water pollution, runoff and erosion problems, fragmentation and loss of natural habitat, and a lack of connectivity to other natural areas. The site itself runs along the length of the Little Rouge Creek, a tributary of the Rouge River. Examination of aerial photography places the site between the Rouge River and the Little Rouge River, with a former landfill site located opposite the Little Rouge, and the Toronto Zoo situated nearby. In fact, a large open area adjacent to the site, serves as overflow parking for the zoo, and nearby there is also a zoo animal waste composting area. There is also evidence of former aggregate extraction on the floor of the Little Rouge at the site. All of these factors have implications for the current site conditions.

When considering the planning and design of the site in question, it is important to consider the ecology of the region, and to create an area in keeping with its local and regional surroundings and natural character. The Greater Toronto Bioregion occurs between the Oak Ridges Moraine in the north, the Lake Ontario shoreline in the south, and the Niagara Escarpment in the West. These three defining natural features greatly influence microclimatic conditions, patterns of water and air movement, drainage and urban development. This area consists primarily of urban and suburban development, with the maximum density occurring in and around the City of Toronto, and rural/agricultural practices in the northern areas.

The Toronto and Region Conservation Authority, along with various municipalities and the Ministry of Natural Resources own and manage much of the greenspace connected to the nine urban watersheds in the Greater Toronto area and surrounding municipal regions. These watersheds, along with the Oak Ridges Moraine, the Escarpment and the Lake Ontario shoreline form the main network of protected areas. Surrounding these watersheds is an urban and suburban matrix in the southern portion, and an urbanizing matrix encroaching in the previously agricultural matrix in the more northerly areas. The Vista Trail Celebration Forest Site is nestled within this urban setting, along the valley wall of the Little Rouge Creek.

Natural Heritage

The Greater Toronto Bioregion has a rich natural heritage, with a variety of plant and animal species, habitats, and ecosystem types. With urbanization, however, much of this ecological diversity has been lost or degraded. Thus there are many opportunities for improving the quality of the GTA's ecological features and functions through continued awareness, protection and creation of ecologically vibrant landscapes.

The area along the Lake Ontario shoreline, now largely post-industrial, industrial, brown fields, landfill, developed or concrete was once a vast area of wetlands and marshes. When the first settlers arrived from Europe, they found a rich and dense wilderness, stretching from these marshes north into thick forests, to the sand and gravel deposits of the Moraine (Heidenreich and Burgar, 1996). Much of the marshes were filled in, eventually the shoreline itself was extended outward into the Lake, using landfill, to create more space for the city to grow and expand. The once vast forests were harvested for timber, and cleared for agriculture and later industrial and urban development.

What now remains are remnants of southern Tallgrass prairies, Oak Savannas, successional meadows, fragmented marsh and wetland areas, and remnant patches of Carolinian and Great Lakes/St. Lawrence forests. While many of these remaining natural areas continue to boast a variety of flora and fauna species and microclimates, the overall abundance and diversity of healthy, functioning ecosystems and their connectedness to one another, as well as the diversity of flora and fauna species have been greatly reduced to a fragment of their original state. Additionally, what does remain as 'natural environment' is continually facing increasing impacts and pressures from the surrounding urban matrix within which it is embedded. The landscapes and vegetation found within the Rouge Park setting, and the Rouge Watershed overall, fall into eight community types as follows:

- Open water and river communities (3%);
- Open and forested wetland communities (5%);
- Forested slope communities (11%);
- Forested bottomland communities (9%);
- Forested tableland communities (8%);
- Primary communities such as river bars, shores, and bluffs (1%);
- Anthropogenic (human influenced) communities such as old fields, road and railsides, plantations, and ponds (31%);
- Developed lands such as orchards, residences, institutions and recreational areas (31%) (Geomatics International 1996).

The Vista Trail Celebration Forest Site encapsulates several of the above-mentioned communities, including Anthropogenic, Forested slope and Forested tableland communities. As its historic community, the area was likely forested in the tableland portion, with a forested slope community meeting the Little Rouge Creek at the base of the steep valley wall. Due to a variety of both natural and anthropogenic factors, the character and ecological features on this site have been noticeably altered from their historic condition. Now surrounded primarily by developed and anthropogenic landscapes, including plantation forests and hydro corridors, this site is now faced with a variety of design and use challenges.

According to the principles of ecological restoration, restoration initiatives should have, as their primary focus, the objective of returning a site to its former trajectory. Trajectory implies here that planners, designers or restorationists must consider how the site would have changed and evolved over time, in the absence of intense anthropogenic influences. In other words, the restoration of the Celebration Forest site may not simply involve returning the tablelands and the slope lands to forested environments, particularly considering the potential influence of intense surrounding urban land-uses, active trail use and fluvial processes altering the river course. Consequently, a concept plan for this site will involve allowing the adaptive processes of natural cycles to influence the site's future functioning and appearance, as well as predicting the long-term effects of both natural and anthropogenic processes.

The ability of various natural patches to adapt to urbanized surroundings and increased levels of use often depends on factors such as the size, shape and connectedness of the patch, along with an area's level of sensitivity to development, and varying degrees of matrix influence from the surrounding urban fabric. The Vista Trail Celebration Forest site is a clear example of both the

direct and indirect impacts of human encroachment on natural systems. The various problems associated with the site, from both an ecological and public use perspective will be detailed later in this chapter.

Cultural Heritage

Prior to European settlement, the area now known as the Greater Toronto Area was home to First Nations peoples who used the many waterways as transportation routes to get from more northerly destinations to the Toronto shoreline for trading of goods. The Rouge River was one such canoe route. The human and cultural heritage persists in the Rouge watershed in a variety of ways, including known and not yet discovered archaeological sites, remnant patches of meadows and prairies – a result of controlled burning by native people), and by the river valley itself, as it evokes our imaginations of centuries past.

European settlement dramatically altered the region's appearance and function, converting the landscape into an agricultural and then industrial centre, with a constantly increasing population. Today the Greater Toronto region is a culturally diverse urban area. The Toronto region is an area in which some families immigrated many generations ago, others are only second generation Canadians, and still others are newcomers to the region and the country. Such diversity provides an opportunity to introduce Torontonians, new and old, to the wealth of ecological diversity and natural beauty present within the Bioregion, and thus foster a sense of stewardship among the region's citizens.

At the site scale, the cultural landscape is shaped by a variety of features and activities, which have taken place over centuries. In addition to the pre-historic and historical changes to the landscape through the presence of First Nations and early European cultures, the site is subject to more recent cultural impacts and features. As mentioned earlier, the proximity of the Toronto Zoo to the site certainly influences the numbers and types of visitors to the Vista Trail, and the site in question. Zoo visitors seeking a short walk or nature experience can easily access the Vista Trail, and hence the site from the zoo. A hydro corridor forms the southern edge of the site, creating a rather distinct and intrusive view.

On the opposite side of the Little Rouge Creek, the former Beare Road landfill site and its associated buildings are clearly visible. Bear Road is interesting and significant as a local stewardship group restored a large portion of the former landfill in an attempt to return ecological form and function to the site. Finally, the site itself was likely used as a staging area for past aggregate extraction on the creek bottom. This would account for the high degree of erosion present along the slope gradient, and for the compacted soils and regenerative vegetation appearing on the site.

As mentioned earlier, the Celebration Forest site is situated within the boundaries of the Rouge Park, a unique, watershed-based park with a focus on urban wilderness and environmental protection. To create a concept and address the site in a manner that meshes with the Park's Vision and goal, it is helpful to first explore the Park's background and Management Plan.

2.3 THE ROUGE PARK – BACKGROUND INFORMATION

The Rouge Park was officially established in 1995 as a 4800-hectare urban wilderness. The Park stretches from its headwaters in the Oak Ridges Moraine, to the Rouge Marshes where the river drains into Lake Ontario. The park follows the ebb and flow of the Rouge Watershed within which it is situated, but it is important to note that the park does not incorporate the entire watershed. The Rouge Park has a unique management structure. Rouge Park Alliance is the advising body on the development of park programs, while much of the parkland base is owned by the Toronto and Region Conservation Authority, and actively managed by the City of Toronto and other partnering municipalities.

As part of the Park's establishment, two management plans were created to guide any overall management decisions for the Park, one for the area of the park north of Steeles Avenue, and the other for the remaining parkland south of Steeles Avenue. This management plan set out a vision for the Park, and established goals, objectives and planning principles to direct future planning.

2.3.1 PARK VISION

The Park Vision sets a definite direction for what the Park should become, as follows:

"The Rouge Park will be a special place of outstanding natural features and diverse cultural heritage in an urban-rural setting, protected and flourishing as an ecosystem in perpetuity. Human activities will exist in harmony with the natural values of the park. The Park will be a sanctuary for nature and the human spirit"(OMNR 1994: 7).

It is clear from the Park's vision that protecting and enhancing the quality of the natural environment is of prime importance to the management of this 'wild' place. The management plan for the Rouge stresses the focus of ecological health, biodiversity and natural and cultural heritage with a long-term goal of creating the largest park within an urban area in North America. The Park's management plan distinguishes itself from traditional urban park management objectives with an emphasis on wild, and an absence of the highly manicured and structured park aesthetics often common to urban centres. Instead, the management plan stresses land uses in keeping with natural environment protection and enhancement, and corridors and connectivity for wildlife.

The sections of the plan relevant to the Vista Trail Celebration Forest site project are included below.

2.3.2 PARK GOAL AND OBJECTIVES

In addition to the park vision, the **Rouge Park Management Plan** establishes a series of goals and objectives to guide future actions within the park and its environs. The goal and objectives read as follows:

Goal: "To protect, restore and enhance the natural, scenic and cultural values of the Park in an ecosystem context, and to promote public responsibility, understanding, appreciation and enjoyment of this heritage"(OMNR 1994: 7).

Objectives:

Natural Heritage Objective

"To protect, restore and enhance the natural ecosystem of the park by ensuring the health and diversity of its native species, habitats, landscapes, and ecological processes"(Ibid: 7).

Cultural Heritage Objective

"To identify, protect and conserve the cultural heritage features of the park for their inherent value and depiction of the long term human use and occupancy of the area"(Ibid 7).

Land Use Objective

"To ensure protection of the ecological integrity and cultural values of the park through innovative planning, management, and land use in the park and its environs"(Ibid 8).

Management Objective

"To manage the park to ensure the achievement of all park objectives and to provide for ongoing public involvement in park planning and management"(Ibid 8).

Interpretation Objective

"To promote knowledge and understanding of the natural and cultural values of the park, their protection and management requirements, and their significance, sensitivities and interrelationships"(Ibid 8).

Recreation Objective

"To provide opportunities for appropriate recreational enjoyment consistent with all other park objectives"(Ibid 8).

2.3.3 PARK PLANNING PRINCIPLES

Natural Heritage

Biodiversity: Sustain, and where appropriate, restore and enhance the biodiversity of the park. The diversity of the park's natural landscapes, native species and biological communities will be maintained, restored and enhanced in concert with maintaining the physical conditions (i.e. water, soils, geology) and ecological processes of change (i.e. succession, species migration, water and nutrient cycles) of the area.

Sustainable Functions: Sustain the biological and physical function of the park, which are important to the long-term integrity of the park ecosystem. Some of the biological functions of the park depend on maintaining large tracts of forest cover and special plant communities, as well as linked natural systems. Important physical functions in the park include water storage and buffering to protect sensitive species.

Restoration: Enhance the natural heritage of the park through the restoration and reconnection of natural communities, and the reintroduction of native species, if appropriate. Terrestrial habitats, for instance, should be restored by reconnecting plant communities located on naturally forested uplands, valley slopes and bottomlands. Aquatic habitat should be restored through such means as river corridor revegetation and upstream water management programs.

Land Use

Holistic View: key component in the planning and management of the park is the understanding of the behavior of the river and watershed as a whole. The impact on the watershed in terms of water quality, plants, animals, natural history and history of human use must be addressed in the preparation of preservation, restoration and land use policies and implementation strategies. The Rouge ecosystem is within a mosaic of natural, rural and urban areas. This area in turn is one part of a larger system: The Greater Toronto bioregion. The interrelationship of the Rouge Valley System, the Oak Ridges Moraine, and other natural and cultural features must always be recognized. The park cannot be viewed in isolation; an integrated approach to land use planning must be adopted.

Integrity of the Park Environment: Uses and/pr activities occurring in or beyond the park must be viewed in the context of the park and must ensure that the park's ecological integrity, scenic and cultural values are protected, restored and enhanced. The cumulative effect of land use and activities upon the park environment must be monitored assessed and managed to protect, restore and enhance the Rouge ecosystem to meet park objectives.

Respect for Natural and Cultural Heritage: Land uses/activities/facilities within the park and its environs must protect ecosystem integrity and contribute to the restoration and enhancement of its natural, scenic, historic and cultural values, where needed.

Linkages and Natural Systems: Protection and enhancement of natural systems within the urban-rural fabric of the park must form a fundamental basis of community planning. The linkages and connections to, and within, the Rouge Valley System must be maintained and enhanced and, where possible, linked with other parks, greenways and natural features.

Environmental Standards: All park related land use and development deemed appropriate to achieving park objectives, must demonstrate high environmental standards.

Innovation, Demonstration and a View to the Future: The land use and resource management approach adopted for the park should encourage a level of scientific research compatible with attaining the park goals and objectives. These research and demonstration efforts should contribute to an increased understanding of the park to ensure ecological health and longevity.

Interpretation and Education

Comprehensive and Integrated: A comprehensive and integrated approach to interpretation of the park's natural values, ecological processes, and the relationship over time between its inhabitants and nature, should be adopted. This includes promotion of natural heritage education to foster an understanding and appreciation of nature and our environmental responsibility.

Evolutionary in Focus: Park management and interpretation should include a strong emphasis on evolving cultural landscapes, including the "layers" of change in landscapes, sites, and structures, and the influencing forces in their evolution. The relationship of people and the natural environment within the Rouge Valley System (inclusive of Aboriginal, Euro-Canadian, and more contemporary inhabitation), and the influences and dependencies of one on the other, should be reinforced in all interpretive efforts.

Understanding and Protection : All site-specific interpretive/educational proposals for the park must consider the sensitivity of sites to human intrusion.

Community Involvement: The design of the interpretative, educational and monitoring programs for the park should encourage the participation of individuals, groups and institutions.

Recreation

Respect for Natural and Cultural Heritage Values: No recreation activity will be allowed which adversely impacts the health of the park ecosystem and its special habitats and cultural features (OMNR 1994: 8-11).

2.3.4 PARK ZONING

The management plan designates parklands into various zones according to their natural and cultural heritage values, and their specific management requirements. The park zones are key determinants in the location of trails within the park.

The two zones that directly affect the Vista Trail Celebration Forest site are:

Nature Reserve Zone (NR)

These lands include all lands within the park, which have been identified as Areas of Natural and Scientific Interest (Ecological Survey of the Rouge Valley Park (1991) and Earth Sciences Survey of the Rouge Valley Park (1991)) as well as other primary natural areas within the park. River and stream corridors are included in this designation. These lands are of greatest ecological sensitivity, and require the highest degree of protection.

Relevant general policies of the Nature Reserve Zone are:

Limit development to a system of restricted walking/hiking trails. Limited interpretive facilities, and scenic or wildlife viewing locations may be provided in selected locations (OMNR 1994: 23).

Special Management Zones

The purpose of the Special Management zones is to ensure that specific management policies are implemented on those lands within the park that either need special remedial/enhancement attention or require altered management/operation practices (OMNR 1994). Special management zone here, refers to the special operational allowances allocated to the Toronto Zoo. The Zoo uses lands adjacent to the site as overflow parking and for other storage uses.

Much in the same way easements allow hydro corridors through public lands, the special management designation allows these operations within the Rouge Park.

2.4 THE VISTA TRAIL CELEBRATION FOREST SITE DESCRIPTION AND ANALYSIS

2.4.1 THE SITE AND THE VISTA TRAIL

The Celebration Forest Site is slated to become part of a Rouge Park program developed to honour members of the Rouge Park community, volunteers and citizens who have made valuable contributions to the Park's development and the restoration of habitats. As such, the site will be a public place, a place where people will congregate to honour those groups and individuals previously mentioned, and to celebrate their contribution through tree planting events. As a public space, situated along a popular urban hiking trail however, it will also be visited and enjoyed by any trail user who wishes to visit the site.

The Vista trail, which provides access to the site, and which continues past the site, is a 1.5 km hiking trail located between Twyn Rivers Drive and the Rouge Valley Conservation Centre. The moderately intense hiking trail follows the valley ridge for a ways, passing through upland forested areas, including oak and maple woods. The trail also has a rich cultural history - used for centuries by aboriginal peoples who portaged from the forks of the Rouge River, north to Lake Simcoe.

The site is located a short distance from Meadowvale Road in Scarborough, and a short walk from the Vista Trail's access point. The trail that currently runs through the site is well used and compacted, and winds along very close to the edge of a steep eroding ridge overlooking the river. Currently, the site is a combination of forested areas along the edges, and primarily meadow and grassland areas in the centre. The meadow is dotted with trees, many in poor condition, which have been planted by the Rouge Park.

The Rouge Park would like the area to return to a more natural setting, in keeping with the Park Vision, goals and objectives. Additionally, the existing trail within the site will need to be rerouted to eliminate erosion and safety issues created by its current location along the slope's edge. Furthermore, the creation of a 'Celebration Forest' program, involving planting events will affect the design and concept for the site.

As the Vista trail is one of the main hiking trails in the southern portion of the park, and it has easy access from Pearce House at Meadowvale Road, and the Toronto Zoo, the site has potential for signage and interpretation detailing the importance of the cultural processes, including the celebration forest, as well as the natural processes, including river functions, erosional processes, and the processes of succession and disturbance.

The Little Rouge Valley is quite dramatic in this location, with a steep valley slope and an impressive Vista. The slope, a main feature of the site has a variety of hardwoods, as well as juniper growing along the top of the bank. The exception to this is the dramatically eroded bare slope, which is one of the focal points of this project. While the exact cause of the intense erosion is unknown, several speculations and inferences can be made regarding contributing factors. The first potential contributor, as discussed earlier may be the proximity of the hiking trail to the edge of slope along the length of the site. Due to the dramatic vista, the site draws people closer to the edge in search of the most desirable lookout. Over time, and with continued, persistent use, this sensitive slope edge could easily have become compacted and eroded, encouraging the loss of edge vegetation.

A second possibility exists with the belief that the site was used as a staging area for river bottom aggregate extraction. Accessing the river from this location would have involved the movement

of heavy machinery up and down the sensitive slope, and the presence of such machinery would have easily compacted the site, further contributing to erosion and soil exposure.

On a much broader scale, increasing urbanization has certainly impacted the amount of water absorption and runoff, as well as water quality and velocity, all of which contribute to the current site conditions. Among the plethora of impacts arising from urbanization, a few of the most directly applicable to the Celebration Forest site include the increase in impervious surfaces (concrete, asphalt, etc) and subsequent decrease in natural cover, which affect the permeability of the land, increasing runoff and decreasing absorption of water during precipitation events. The alteration or complete elimination or burial of watercourses would also affect the watershed's ability to move and hold water on its progression southward.

The final possibility has little to do with the processes of urbanization. Instead, this possibility focuses on fluvial processes as a cause of erosion. Aerial photography taken approximately forty years apart reveals changes in the shape of the Little Rouge Creek at the site. Due to a large meander at the site, it is probable that the watercourse is exerting pressure on the slope bottom, undercutting the slope in this location, and resulting in slope instability. Such instability would result in loss of soil and vegetation further up the slope, creating the current barren slope landscape.

In reality, it is most likely a combination of these various natural and anthropogenic factors, which has directly and indirectly affected the condition, and appearance of this site. The cumulative impacts of use and overuse, human and natural processes, have resulted in several problems associated with the site, which must be considered and addressed as part of the concept plan and recommendations for the site.

2.4.2 PROBLEMS ASSOCIATED WITH THE SITE

Several problems have been identified at the Celebration Forest site. Issues of public safety, ecological structure and function, and adherence to Rouge Park Management Plan goals and objectives must all be considered in evaluating this site. As noted in the site description, the impacts of both natural and anthropogenic influences have created several problems on or adjacent to the site. While some of the problems resulting from larger scale urban matrix influences may be difficult to address at the site level of design, they must still be carefully considered to ensure the long-term success of any design solutions.

The main problems to be addressed by this research are as follows:

POTENTIAL FOR INCREASED BIODIVERSITY:

Although the site contains a regenerating meadow, and some tree species, there is greater potential for increased Biodiversity – especially at the habitat and species level. By creating the proper conditions for forest succession and regeneration, as well as enhancing the meadow through planting additional species, the site can become a diverse patch, building on existing forest cover and offering habitat to a variety of plant and animal species.

LACK OF ORGANIZED PLANNING AND 'CELEBRATION' PROGRAMS:

Although several trees have been planted on the site, and a park bench has been donated to the site, the area lacks an organized and well planned planting and 'Celebration' program. As a result, many of the plantings have occurred in a haphazard fashion, resulting in an unappealing aesthetic, as well as in plant mortality (discussed further below). Additionally, this planting method does little to improve the ecological quality of the area, since the various challenges associated with the site have not been considered in these random plantings. Finally, the presence of plaques and the park bench create a more formal 'grove' feel, which is not in keeping with the ideals and values of the Rouge Park management plan. The site also currently fails to

address the public use aspect, having no designated area for congregation, or areas for visitors to meander or find a quiet spot for reflection.

THE PROXIMITY OF THE TRAIL TO A STEEP ERODING SLOPE:

The portion of the Vista Trail passing through the planning area (Celebration Forest Site) runs adjacent to a steep, eroding slope. As the trail is well used, this intense use in such a sensitive area may contribute to the slope's erosion, and prevent the establishment of plants whose root systems could actually help secure the slope and slow erosional processes. Interpretation of aerial photographs of the site taken in 1967 and 1999 demonstrates that erosion at this site is still occurring, and thus the site is still active.

In addition to contributing to slope erosion, the trail's proximity to the edge of the slope poses a safety risk for trail users, and a potential liability for the Rouge Park. One likely reason for the location of the trail along this portion of the Little Rouge Creek is the dramatic vista trail users enjoy from this site. While the Vista at this particular location is an important draw to the trail, it must be designed and constructed to ensure the safety of trail users while improving the condition of the already significantly eroded slope.

COMPACTED, ERODED AND SANDY SOIL CONDITIONS :

Due to the many possible-contributing factors outlined in Sections 2.3 and 2.4, soil conditions on the site have been altered from their historic state. The soil on the site is compacted in areas, particularly adjacent to the Vista Trail, and has a high sand component throughout. Soil compaction and soil quality can make tree planting and species selection difficult. Appropriate species and planting methods should be considered in tandem with the current sandy and compacted soil conditions on the site. Failure to do so will result in soil erosion and depletion of soil quality, as well as in plant mortality.

Several options exist for remediating soil conditions on the site, including loosening soil, planting hardy pioneer species, supplementing soil with compost, or simply letting nature take its course. Examining the goals of the project, the Celebration Forest program and the Rouge Park overall will assist in determining which method is most appropriate for this site.

PLAND MORTALITY:

Some of the trees that have been planted on the site in the past are now in poor condition, or dead. This poses several problems, the first of which is the fact that these trees were planted in honour of Park volunteers and stewards. Secondly, tree mortality suggests that future tree plantings may also be unsuccessful if care is not taken to assess which species will tolerate and thrive on the site. Although the trees planted were all native species, some were obviously intolerant of soil and climatic conditions of the site.

PARK BENCH:

In the past, a formal park bench and supporting concrete pad structure were placed on the site, to honour local citizens. This bench, and its accompanying concrete pad, pose potential problems for the site. This type of feature is out of context with the site, as well as with the Rouge Park Management Plan Goals and Objectives, which focus on a wilderness setting, and an emphasis on natural features. Furthermore, as the bench was intended to honour an individual's contribution to the park, it should be secure in the long term, and unfortunately, due to its current proximity to the active slope, it is at risk of being damaged or destroyed due to slope erosion.

Hydro Corridor:

Upon entering the site, from the direction of the Pearce House access point, the hydro corridor is easily visible, and distracts from the 'wilderness' feel. This is also in part due to the semi-open meadow located within the site, as well as a lack of screen plantings along the corridor's edge.

LOSS OF MEADOW:

The meadow within the site is successional and will regenerate over time, especially with Celebration Forest tree plantings. There remains potential, however, to incorporate some meadow and shrub species for greater biodiversity and aesthetic interest. The issue of maintaining meadows, versus allowing forest cover to become the dominant vegetation type is sometimes controversial and questionable. As will be discussed in Chapter 3, there are opposing views on whether to maintain a portion of the site as meadow, or to allow the entire site to regenerate, through the planting program, into a forest habitat. While both have value and merit, closer examination is necessary to determine the most appropriate and beneficial option.

SIGNAGE:

There is no signage on the site. Signage could provide educational information to trail users about the Celebration Forest Program, trail realignment, the trail user's code, slope erosion and the natural history of the site. Signage would also designate a focal point for the site entrance, helping to define the site as distinct from, but integrated with, the surroundings.

2.5 VISION, GOAL AND OBJECTIVES OF THE PROJECT – AN OVERVIEW

The vision for the 'Celebration Forest' is to create an ecologically diverse and vibrant site, which improves the environmental, social, public use and safety features of the site through the application of ecologically sensitive and aware design principles. This site will provide habitat for native plants and animals, while also offering meandering trails and rustic seating for site visitors. Additionally, the site will serve as a focal point for the Rouge Park's 'Celebration Forest' program, which will honour and celebrate valued volunteers and citizens who have contributed to the enhancement of the Rouge Park ecosystem. The Celebration Forest program will help in the enhancement and restoration of the site's ecology, its public use usability and its overall appeal.

Goal: The goal of the Celebration Forest Concept Plan is to create an ecologically vibrant and viable ecosystem, while providing opportunities for programming and tree planting events. Additionally, the Vista Trail will be incorporated into the site, along with a short network of side trails to provide safe, meaningful and enjoyable opportunities for visitors.

This research and project will aim to enhance the existing site conditions in the following ways:

1. Improvement of the conditions of the wooded areas by:
 - Planting additional, appropriate forest species
 - Planting edge species to buffer the forested areas
 - Adding to the overall forest cover of the Park
2. Reduction in erosion of the ridge by:
 - Re-routing trail away from edge of ridge
 - Planting appropriate vegetation to secure slope
 - Creating a designated point of access from which to view the river
3. Increase in biodiversity through:
 - Planting a variety of appropriate native species
 - Increasing forest cover and improving the diversity of meadow species
 - Establishing conditions to encourage natural regeneration
4. Provision of an aesthetically and educationally enjoyable passive recreation opportunity by:
 - Designing a trail route which passes through a variety of habitat types
 - Removing the hazard of having the trail run along the edge of an unstable slope
 - Providing interpretive signage
 - Creating a visual screen to hydro corridor
 - Providing a desirable viewing opportunity of the Little Rouge valley

INTEGRATING PEOPLE AND NATURE IN URBAN WILDERNESS

- Creating quiet and secluded spaces for reflection and contemplation
- Incorporating local art and bringing local artists into the design process

This project will allow the sensitive slope area to return to a more natural state, while allowing continued use and enjoyment of the area. The project works within the principles and guidelines established by the 1994 ***Rouge Park Management Plan*** and the subsequent ***Trail Development and Management Plan***. The concept plan also draws on the background information provided in the ***Rouge Park Vegetation Management Study*** for guidance regarding vegetation communities and plant species.

CHAPTER 3: CONCEPTUALIZATION AND CONSIDERATIONS

3.1 INTRODUCTION

The goal of ecological restoration projects is to return ecological integrity, or if possible, the historical trajectory of a site's ecology to the restoration area. In ecological design and planning projects, the focus is on integrating, protecting or enhancing ecological processes through the design and planning processes. The distinction lies in a project's ultimate output. While the processes and values of these disciplines are analogous in their ecological and social emphasis, the fields of design and planning differ from ecological restoration in their focus. Design or planning refer to creating spaces and places that value and respect ecology, including in built form and urban development processes. Ecological restoration, on the other hand, focuses specifically on the natural environment and ecosystem processes.

The Vista Trail Celebration Forest project incorporates elements of ecological restoration with the more creative, and anthropogenic processes of design and planning. Also, public use and sense of place will become important components of this project, as people will visit the site for a variety of reasons and for differing activities and lengths of time, including through-hikers and participants of celebration events. Since this site presents a host of unique possibilities and challenges, the development of a concept for the site requires the consideration of many variables, including the ecology of the site, its public use mandate, and its potential for creative expression and education. Exploring these ideas and concepts, along with the realities of on-the-ground limitations, including financial restrictions and multi-stakeholder objectives and mandates will yield two streams of conceptualization – practical and theoretical.

Among the elements considered in the development of recommendations for the Celebration Forest Site are: ecological considerations, social and place-making considerations, and design considerations.

3.2 ECOLOGICAL CONSIDERATIONS

3.2.1 BIODIVERSITY AND LANDSCAPE ECOLOGY

As discussed earlier in this paper, biodiversity as a scientific concept has come to the forefront of conservation and environmental planning. Biodiversity can refer to diversity at the genetic, species or habitat scale, and has many positive implications for environmental health. Considering biodiversity in the planning of the Celebration Forest site requires examining the scale of the project, the overall size of the area and its potential for biodiversity enhancement, challenges to this enhancement, and the site's suitability to various potential species and habitats. Additionally, biodiversity and landscape ecology can work symbiotically, with landscape ecology providing the practical tools for creating spaces that encourage and support biodiversity. As a result, landscape ecology will be considered in tandem with the concept of biodiversity for the purposes of planning for the Celebration Forest site.

In developing a plan, which encourages biodiversity and ecological health, a primary objective must be the maintenance or creation of suitable habitat for a range of spatial scales. Habitat here refers to conditions that favour a species rate of reproduction high enough to "maintain long-term positive population growth" (Lindenmayer and Franklin 2002: 42). Maintaining habitat at multiple spatial scales is critical for ecological health because

Different species have different spatial and other requirements: Essentially, suitable habitat varies widely for different species, from the requirement of large tracts of intact forest interior for area-sensitive species, to a single decaying log for certain invertebrates;
Individual taxa respond to factors at multiple scales: In other words, a particular species may be affected or influenced by factors occurring at both a broad landscape scale, as well as at a finer-

grained scale, such as the condition of a woodlot or forest patch (Lindenmayer and Franklin 2002: 42).

Applying this concept to the Celebration Forest site, it becomes clear that the site will have many scales of influence. Firstly, conditions created on the site, whether forested or meadow will likely influence the presence or absence of various floral and faunal species over time. Additionally, the presence of significant public use activities will affect the species content, regardless of what the site may be planted to represent. Various faunal species, area-sensitive or specialist species in particular, will probably be absent on this site, except in cases where the site may be used as a stepping stone to larger intact forest areas or areas of natural cover. In the broader context of the Rouge River watershed for example, the site may help to expand the overall amount of forest cover, or create more interior forest over time, by buffering the edges of the surrounding plantation forests.

Finally, the potential future repair of riparian vegetation along the slope of the little Rouge Creek may influence fluvial processes below, including the amount of sedimentation within the creek as a result of erosion control, the provision of habitat to riparian species, the amount and type of nutrient and mineral composition of the creek, and the provision of leaf litter and other decaying matter to the water system. All of these factors may influence the thermal and habitat conditions of the creek, both at the site and downstream, and would thus affect biodiversity, and the presence of various flora and fauna species.

At the scale of the Celebration Forest site, several guidelines of multiscaled habitat conservation can apply. These include 1) considering the site as a means for improving overall connectivity within the watershed, as well as across the landscape, 2) maintaining heterogeneity on the site itself, which will contribute to overall heterogeneity of the landscape, or alternatively, using the site as a means for improving landscape level heterogeneity by determining what type of site design could best contribute to an overall heterogeneous landscape, 3) creating structural complexity and plant species diversity within the site, and 4) maintaining, and enhancing the integrity of the aquatic ecosystem of the Little Rouge Creek, including its hydrological and geomorphologic processes. Questions to consider in addressing the above-mentioned criteria on the site include:

1. How is the site currently functioning?
2. How will it best contribute to the improvement of the overall landscape?
3. What features and habitats should we strive for on this site?
4. What will survive and thrive here?

Landscape ecology offers principles and guidelines for design, which can aid in achieving biodiversity conservation or enhancement on the site. Analysis of the site reveals opportunities for application of several principles and ideas from landscape ecology, including patch dynamics, connectivity, edge and boundary concepts, and matrix influence. Of particular interest is the idea of patch size and shape, connectivity of the site to other natural areas, edge effects and buffer opportunities and how the larger urban matrix influence can be mediated on the site. Two critical elements to consider in this type of planning are the influence of natural or human induced disturbance regimes on the site, and the continued ecological processes – slope erosion and fluvial geomorphologic processes in particular.

Examination of the surrounding landscape, through in the field investigation and the analysis of aerial photography and other relevant background information (Geomatics International 1996, OMNR 1994) depicts a varied and human dominated mosaic pattern. Road networks, parking areas, hydro corridors and urban and suburban developments, fragment the surrounding forest patches. The result is a series of small, isolated patches of forests and woodlots, some of which are cultural forests or plantations. From this perspective, creating a self-sustaining forested patch on the site, with structural complexity and species diversity, including a regenerating understorey and eventual canopy, would enlarge the overall size of adjacent forest patches, act as a buffer,

reducing edge effects on the adjacent patches, and provide more connectivity to nearby forest patches for species mobility.

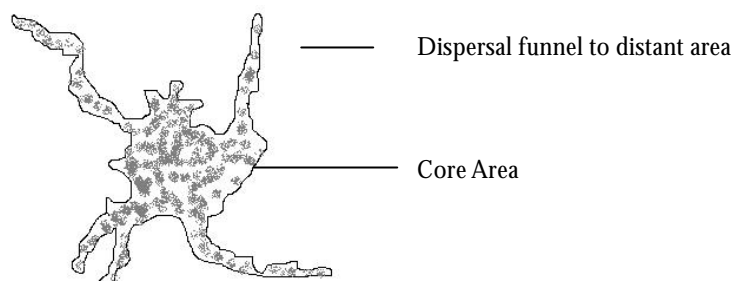


FIGURE 2: Ecologically Optimum Patch Size (adapted from *Dramstad et al 1996: p.32*).

In addition to the overall size of the patch, shape and configuration of the natural areas on the site will influence ecological functioning. An ecologically optimum shape for the site's regenerating forest areas would be one which is "generally 'spaceship shaped,'" with a rounded core for protection of resources, plus some curvilinear boundaries and a few fingers for species dispersal"(Dramstad et al 1996: 32) (see Figure 2). This shape is an attainable one, with the so-called 'spaceship shaped' core forming the central forest area, and the 'fingers' extending outward towards the hydro corridor to the east, and the plantation and forested areas to the south and west. This central patch would be interjected with the narrow footpaths, which will serve as access to the forest and planting areas. Initially, the paths will fragment the developing forest, but once a canopy develops, the impacts of these paths on patch functioning will be minimal.

The location of the Celebration Forest Site along the Little Rouge Creek also provides opportunity for enhancement of corridor quality and connectivity. The Little Rouge Creek meanders from the Oak Ridges Moraine through the Greater Toronto Area into Lake Ontario, and forms part of the Rouge River watershed. Much of this natural corridor is bounded by urban development, suburban development or rural and agricultural land uses. Enhancing natural cover along the length of the creek will protect and buffer the creek from matrix influences, such as air and water pollution. Additionally, as discussed in Chapter 1 corridors and connectivity of natural areas to one another are crucial for species mobility and maintenance of diversity in the system. Creating a healthy, functioning forest patch at the site would provide for an overall increase in connectivity of the Little Rouge subwatershed's terrestrial and riparian corridor.

The Vista trail, part of the overall Rouge Park trail system, will provide connectivity for park visitors and hikers. The trail brings visitors to the site, and a series of smaller on-site loop trails will provide opportunities for visitors to meander through Celebration Forest plantings. It should be noted that while the trail system provides connectivity for human movement, and possible movement of some faunal species, it can also act as a barrier to species movement by intersecting forested areas, compacting and eroding soil conditions, and allowing more visitors into the site, which can disturb the site's ecology.

Also of note with respect to corridors and connectivity is the presence of the hydro corridor on the site, which provides movement of electricity throughout the urban matrix, but acts as a barrier to species movement along the Little Rouge Creek. This hydro corridor contains meadow species, but cannot be forested due to vegetation height limitations imposed as a result of the power lines running overhead. Enhancement of the corridor meadow is currently being undertaken by local non-government and volunteer organizations in the area, through meadow species plantings. The meadow can act as a connection for meadow species, including various birds and insects, as well as providing landscape heterogeneity beneficial to multi-habitat species. This corridor marks a definite boundary for the site, limiting the extent to which forested areas can be planned for and

implemented on the site. As a sharp, straight edge, this hydro corridor boundary imposes an unnatural and limited edge for the site. One design solution for this straight edge is to plant the edge of the site along the corridor with an un-even forest planting to provide a visual screen. This screen planting will serve multiple purposes. The screen planting will distract the eye from the overwhelming presence of the power lines. Planting in a manner that resembles a more natural edge, with varied horizontal and vertical structure also provides an area richer in edge animal species (Dramstad et al, 1996).

Most natural edges are “curvilinear, complex and soft, whereas humans tend to make straight, simple, and hard edges”(Dramstad et al, 1996: 29). Curvilinear verses straight boundaries have a host of implications for the site. Reducing the abruptness of this corridor’s edge through the creation of an uneven boundary of forest species plantings should favour movement across, rather than simply along the edge. Additionally, compared with a straight boundary between the hydro corridor and the Celebration Forest Site, a curvilinear boundary consisting of a series of tiny patches may provide a number of ecological benefits, including less soil erosion and greater wildlife usage (Dramstad et al 1996, Forman and Godron 1986, Forman 1995). This hydro corridor edge would also benefit by the planting of a windbreak, which would shelter the site from the open edge. Again, while many traditional cultural windbreaks are linear, as typically found on open agricultural lands, windbreak development on the Celebration Forest site should adopt a more natural, irregular shape to provide both visual interest and greater ecological functioning. Details in this regard are provided in Chapter 4, Section 4.2.

With these considerations in mind, the development of a concept plan and accompanying recommendations for the Celebration Forest Site should consider how to maximize the site’s landscape ecological benefits. In so doing, the plan and recommendations (Section 4.2) will address issues of patch size and shape, the shape and structure of edges and boundaries, and the site’s opportunity to increase connectivity of the overall natural network of the Little Rouge Creek watershed and other nearby natural areas.

3.2.2 SITE ECOLOGY

As discussed in earlier sections of this paper, the ecology of the Celebration Forest site is representative of the larger bioregional context within which it exists. As part of the larger Great lakes/St. Lawrence ecosystem, and as the northern edge of the increasingly rare Carolinian Zone, this site design has the creative challenge of restoring some of these features to the site, if and where the conditions allow. The site conditions, described in Chapter 2, are best suited to either forest or meadow/prairie vegetation community types. Both ecosystems would face a variety of microclimatic challenges, including impoverished and compacted soils, harsh edge effects and high levels of public use. Each ecosystem would also offer benefits to the site and the overall natural area cover for the watershed and broader region. Which then should we apply as the dominant vegetation community for the site?

Using the adjacent landscape features as a reference point, the site could either enhance the meadow community along the adjacent hydro corridor, or could enhance the overall size of forest cover by complementing the adjacent small forest patches. Both vegetation community types would be appropriate to the bioregion of the GTA and the vegetation structure of the Rouge Park watershed. Certainly, the value of enhancing a meadow, or even striving for a prairie community on the site would be beneficial to the enhancement of Carolinian ecosystems, which are increasingly rare in the area. The Rouge watershed, in fact, is one of the only areas within Greater Toronto, which still contains remnants of these native Carolinian communities (Geomatics International 1996). Additionally, the sandy and depleted soil conditions on the site would be favourable to prairie species, which often require sandy soils. Other local climatic and landscape features that would render this site appropriate for prairie or meadow communities include abundant sun exposure on the site, and its relatively flat topography. Furthermore, the addition of prairie or meadow species would assist in the development of the soil, as the plants,

with their deep penetrating roots help to loosen compacted soils (Daigle and Havinga 1996, Rodger 1998, Sauer 1998).

Creating a large, maintained meadow would initially require substantially less resource use, financial costs and construction on the site, as much of the area is already a regenerating meadow community. In the longer term, however, if the ultimate goal of the site is to maintain meadow habitat, regular disturbance and human intervention will have to be built in to the long-term plan. While fire disturbance is the traditional disturbance method for meadow and prairie maintenance, it would obviously conflict with the high level of public use experienced on the site as a result of Vista Trail users. Additionally, the small scale of the site would make controlled burning difficult to contain, and a potential risk to surrounding uses and vegetation communities. An alternative method of creating disturbance would be to mow the site seasonally, a labour intensive and environmentally destructive task. As well as the challenges of introducing regular disturbance on the site, this type of long-term maintenance of a site can be cost and labour intensive, and is contradictory to the economy of means principle often put forth as a benefit of enhancing natural processes in urban centres (Hough 1995).

Another challenge to the implementation of a prairie or meadow rehabilitation project on the site is the desired public use intent of the site as a Celebration Forest for the Rouge Park. A site-scale maintained meadow or prairie does not conform to this type of public use programming, especially since the intent of the program is to plant forest species. Consequently, a site scale meadow or prairie regeneration project, while beneficial to the overall ecosystem, does not fit the context for this project. There is still value however, in maintaining a symbolic meadow community on the site. The potential benefits of a meadow community on the site include: 1) adding visual interest and diversity to the site, 2) mimicking forest edge conditions, 3) creating a small scale habitat for bird, butterfly and insect species, and 4) creating opportunities for nature appreciation and education.

While a meadow community would benefit the ecology and aesthetics of the site, establishing a forest community would better serve the programming function of the Celebration Forest, along with providing a variety of other ecological and social benefits. From an ecological perspective, Forest communities provide the necessary interior habitats for many species of concern in the Greater Toronto Area. They are also critical for maintaining nutrient-rich soils, preventing loss of soil to erosion, maintaining adequate levels of water absorption and percolation and preventing sedimentation of streams and watercourses. Additionally, mature forests provide the biological diversity necessary for ecological health and functioning. From a human perspective, forests help regulate temperatures, absorb air pollutants, produce oxygen, provide refuge from solar radiation and provide us with beauty and enjoyment. Of course, the benefits of forest ecosystems are extensive and many of these, such as their contribution to groundwater recharge, enhance both ecosystem and human health.

When considering forest regeneration, it is essential to consider the immediate site conditions, select appropriate plant species, and select planting methods that will be both financially feasible, and encourage success of the plantings. In the case of the Celebration Forest, the depleted and compacted soil conditions suggest that initial plantings should focus on rebuilding soil conditions, securing soils, establishing canopy cover and creating more favourable site conditions overall. This planting approach requires a long term, incremental plan, with a focus on ameliorating conditions for the purposes of supporting and enhancing natural regeneration of the site. In other words, planting techniques will mimic the processes of succession, creating the conditions for the future development of a mature forest ecosystem.

Deciding on an appropriate vegetation community model for a site is dependent on many variables. Certainly, according to the guidelines for ecological restoration, such decisions should be based primarily on the original (pre-settlement) conditions of the site, and secondly on the site conditions (soils, microclimate, slope, sun exposure, etc) (Clewett et al. 2000, Daigle and Havinga 1996, Hough et al 1995, SER 2002). The reality in many urban spaces, however, is that current

site conditions have been so drastically altered, that historic vegetation communities can no longer thrive. But beyond this challenge to landscape regeneration is the 'value' often associated with different ecosystem types.

The anthropogenic act of defining the value of vegetation communities is based on the human defined ecological value of a vegetation type. Ecologists, restorationists and natural heritage planners often favour interior forest habitat, habitat for vulnerable or endangered species, rare or endangered habitat types and wetlands. In fact, the emerging field of natural heritage planning assigns values to these various community types, with interior forest receiving some of the highest values. While ecological function and processes are certainly important factors to consider when developing site or landscape plans for regeneration or restoration, land managers developing these plans should take care not to impose human value systems on ecological systems.

For example, the Celebration Forest site, according to current trends in natural heritage planning, would be most valuable if it contributed to the creation or enhancement of interior forest. The site has value for many other reasons as well, which are not necessarily recognized in quantifiable terms. The fluvial attributes of the site, in particular the slope erosion indicating larger-scale changes in the morphology of the Little Rouge Creek, offers a unique glimpse into the power and variability of water as it flows over and through the landscape.

Also, the site has the value of offering citizens the opportunity to view and partake in ecological change and improvement through the regeneration process. This leads into another so-called value of the site, which is its provision of space for reflection, contemplation and renewal of the human spirit. Finally, delving into the philosophies of Deep Ecology, the site, and its processes, species and other features, has intrinsic value; value for its own sake. Thus, defining the value of whatever ecological community eventually establishes and thrives on the site is something that cannot be done simply by examining statistical data; it is a complex and subjective task.

3.2.3 ECOLOGICAL RESTORATION OR REGENERATION?

Assigning value to a site or landscape follows a path similar to assigning a 'correct' terminology to the processes we employ in attempting to improve ecological conditions of a place. The discipline of restoration ecology, and the practice of ecological restoration offer strict guidelines for the development and implementation of restoration plans, and for the naming of such activities. According to definitions of ecological restoration (chapter 1), the Vista Trail Celebration Forest does not qualify as a true restoration project. The "mission of every ecological restoration project is to re-establish a functional ecosystem of a designated type that contains sufficient biodiversity to continue its maturation by natural processes and to evolve over longer time spans in response to changing environmental conditions"(Clewell et al., 2000: 1). According to this explanation of restoration, the Celebration Forest site falls short of true restoration, as its maturation and evolution will likely be strongly influenced by the public program portion of the site's development. This, combined with the fact that the site plan does not attempt to re-create a historic trajectory, categorizes the concept plan for the Celebration Forest as more of a rehabilitation or regeneration project.

Clewell et al define rehabilitation as "any ecologically beneficial treatment short of full restoration"(Clewell et al., 2000: 1). How is the line drawn between a project that qualifies as restoration, and one which 'falls short' of this designation, being referred to instead as rehabilitation? The authors stress that the distinction is important to maintain the integrity of ecological restoration as a creditable conservation strategy. While it is true that projects that sacrifice ecological function in favour of economic objectives, or even to accomplish single-species management discredit the fundamental values associated with ecological restoration, perhaps the definition should allow for greater variability. Projects like the Vista Trail Celebration Forest Plan, which seek to integrate humans and the natural environment in positive ways, and

re-connect people to their local natural environments have much to offer the field of ecological restoration, and environmental conservation in general.

3.3 PLACE-MAKING CONSIDERATIONS – PLANNING FOR HUMAN HEALTH, SAFETY AND COMFORT, AND THE HUMAN SPIRIT

3.3.1 CREATING A SENSE OF PLACE AND A SUCCESSFUL PUBLIC SPACE

Throughout the development of the concept plan and recommendations for the Celebration Forest Site, it was central to the success of the plan to remember and consider that the site will be a place, not simply a design or concept, or untouchable space. This is to be a place where humans and nature will actively and regularly interact. As a result, it is helpful to first understand why place is important and how to create a successful place.

Public places add to the overall liveability and health of communities and cities. They are places that encourage interaction and sociability, foster a sense of community and civic pride, and stimulate learning and ecological and social literacy. *When cities and neighbourhoods have thriving public spaces, residents have a strong sense of community; conversely, when they are lacking, they may feel less connected to each other*”(Project for Public Space (PPS) 2002: 14). Places have many benefits including: 1) nurturing and defining community identity, 2) supporting local economy, 3) fostering more frequent and meaningful interaction, 4) creating a greater sense of comfort and 5) creating improved accessibility (PPS 2002).

Considering the Celebration Forest site in this context – as a public place – there are many potential windfalls, which can result from careful planning and consideration to this end. For example, the space can improve accessibility to a natural area for people with special needs or accessibility issues by providing appropriate linkage to access points. Furthermore, the space can act as a destination or resting stop for long-range hikers. The space will also provide opportunities for sociability through planting events and celebratory gatherings.

Although many of these perceived benefits to public spaces appear to focus heavily on the human and social component, allowing people into natural areas can benefit the natural environment as well. Especially in urban areas, where natural spaces are at a premium, and many remnant fragments of natural spaces are degraded or destroyed, the occasion exists to bring people into these spaces, and reconnect them with natural processes through experiential activities. Experiential can refer here to the active planting or weeding of a space, or simply to moments of quiet reflection spent under the shelter of the forest canopy.

Creating these beneficial and successful places requires considering a number of factors. The Project for Public Space, a non-profit organization whose mission is to “create and sustain public places that build communities”(Project for Public Space 2002: 11), offers 11 principles of creating successful and great public places:

The community is the expert;	Develop a vision;
You are creating a place – not a design;	Form supports function;
You can't do it alone;	Triangulate;
They always say it can't be done;	Start with the petunias;
You can see a lot just by observing;	Money is not the issue;
	You are never finished

Many of these guiding principles mirror the concepts from ecological planning and design, which emphasize the importance of participatory and inclusive processes (the community is the expert – everyone is a designer), as well as the need to create a place which functions on many levels; something more than simply a design. The ideas behind these guidelines are to create spaces,

which encourage people to interact with one another and their surroundings, and to use a place in a manner positive for both the user and the space itself. Certainly there are many similarities between planning spaces that are successful in human terms and those successful in ecological terms. It should follow then that integrating these two elements – humans and ecology – requires many similar planning and design strategies.

Unfortunately, in many cases, the presence of human activity and programming results in negative impacts on natural areas, especially where the density of visitors is high relative to the overall size of the space. The expression ‘loved to death’ is a clear example of what can happen when a public place exceeds its carrying capacity for public uses. This consideration is particularly significant in an instance where the concept plan for a space integrates human use with ecological rehabilitation. Reconciling celebratory events and public programs with a vision to enhance the ecological quality of the site will involve integrating the two and tying the success of each on the other. If this site is designed to honour citizen involvement, then this can become a focal point for ensuring the quality of ecological form and function. No one wants to celebrate an event, or honour an individual, in a degraded, unhealthy space. Similarly, the process of honouring someone’s contribution through the creation of a place will likely encourage people to honour the place itself.

3.3.2 CULTURE AND NATURE IN PLACE

Creating spaces, which appeal to cultural perceptions of health and beauty, will be just as important as creating ecologically sound spaces. Human culture and perception have long since affected the way landscapes and natural areas are seen and appreciated. Landscapes perceived as beautiful and picturesque are often idyllic, utopian perceptions of nature. These landscapes, with their rolling hills, lush green lawns and brilliant exotic blooms may have little to do with the regional or local natural identity or ecosystem, but yet they have traditionally been the sought after landscapes.

Furthermore, while the environmental movement has resulted in shifting values and perceptions towards the environment, there still remains a strong propensity for urban open spaces to be far removed from natural form and function: “The notions of humanity and nature have long been understood to be separate issues. Such a dichotomy has had profound influences on the way people have thought about themselves: the cities where people live and the non-urban regions beyond the city where nature lives”(Hough 1995: 10). This separation from, and perception of nature and its processes as removed from the urban landscape has resulted in urban regions with reduced overall ecological, and subsequently human health. Issues of poor air and water quality are now common occurrences, and have long-term implications for the health and well being of urban residents - both human and non-human.

Addressing the need to re-integrate the natural world into the urban fabric requires, as its foundation, a paradigm shift among urban residents and their governments. Unless nature is perceived by the masses as a crucial component of urban form, it will continue to remain largely extirpated from our cities. But changing the paradigm, and the desire for manicured open spaces is a daunting task, which requires reintroducing people to natural processes, and changing engrained behaviours. At the broad landscape scale, natural processes can sometimes become unperceivable to the common urban resident (Eaton 1997), making this reintroduction to nature difficult, if not impossible. Thus, while landscape scale environmental protection and planning is essential for regional ecological health, reaching people at perceivable scales of nature is vital to reintegrating these two components.

The site scale, or local place, which serves a public function such as the provision of open space, can bring nature to people and vice versa at perceivable scales. In such a setting, however, it will be important to appeal to the cultural perception of beauty and aesthetic, and equally important to shift paradigms about what is ‘beautiful’ and aesthetically appealing. It is the belief of this writer

that humans are instinctively attracted to and drawn to nature; it is our evolutionary instinct. This is reflected in the human passion for gardens and outdoor landscapes, the pull towards the vast natural areas outside the city limits, the cottage and country retreats and the desire for urban green space. Providing people with an open space which they can actively help shape, regenerate, tend and visit, can act as a catalyst for changing ideas about beauty, and appealing to cultural perceptions about the form and function of beautiful places.

"We are deeply attracted to beautiful landscapes, and we have strong cultural conventions for how an attractive landscape should look. Landscapes that we describe as beautiful tend to conform to aesthetic conventions for the scenic, but they are relatively rare. Landscapes that we describe as attractive tend to conform to aesthetic conventions for the display of care, which can be exhibited in virtually any landscape. The display of care creates a cultural necessity about even the most ordinary places"(Nassauer 1997: 67).

The display of care, as in the tending of a lawn or weeding of a carefully planted flowerbed may distinguish a landscape as attractive to the urban dweller, but again does little to improve the ecological quality of that landscape. In fact, many of these examples of 'care' for the landscape can actually result in ecological damage through the use of toxic chemicals and the removal of natural cycles from a site. Consequently, what is necessary for a paradigm shift towards a healthier perception of landscapes and beauty is an understanding of the distinction between perceived 'care' and care which results in improvements to the form and function of natural processes and cycles in the urban landscape.

The challenge for the Vista Trail Celebration Forest site will be to integrate perceptions of care and attractiveness with ecological function and improved ecosystem health. Several options and possibilities exist for achieving this goal. Certainly creating a space for learning about the natural environment, and its link to human health and well-being will be an important first step. Additionally, however, the creation of components of the site which appeal to the prevailing cultural aesthetic, while still maintaining or improving ecological function may be helpful in drawing attention to the 'beauty' which exists in natural processes. Furthermore, realizing the diverse cultures and hence the variety of cultural perceptions of landscapes, and making efforts to incorporate this diversity into elements of the site may also help appeal to the diverse urban population.

3.3.3 DESIGN FOR HUMAN COMFORT AND SAFETY

Since the goal of the Vista Trail Celebration Forest site concept plan is to integrate humans with nature in an urban wilderness setting, the public use component of this site requires that human health, safety and comfort be considered and planned for. In keeping with the above-mentioned idea that the concept for this site should focus on the goal of creating a 'place', not simply a 'design', the concept must integrate the elements of human comfort necessary to create a sense of place. The location of the trail, its proximity or distance from hazards such as eroding valley walls, and exposure to climatic conditions are among the issues that must be considered.

In order to understand the potential risks or hazards a site may present to its users, it is first necessary to conceptualize how the site will be used. The Celebration Forest will have a variety of public uses, including serving through-hikers as a vista and rest stop, and hosting participants of celebratory events and plantings. It follows then that safely designed trails, and rest areas, a well-constructed lookout platform, staging area and congregation area are necessary to accommodate shorter as well as longer-term site visitors. Additionally, taking microclimatic conditions into consideration, including prevailing winds and exposure to ultraviolet radiation will be helpful in creating an enjoyable, useable and safe environment.

Ensuring visitor safety along the Vista trail will require careful examination of the current pattern and rate of slope erosion to ensure that trail alignment does not pose a safety risk for users. In its

current location, as described in chapter 2, the trail's route adjacent to the eroding slope is inappropriate and unsafe from a human use perspective. Consequently, developing this site will require the relocation or decommissioning of this portion of the Vista trail. Determining an appropriate alternate route should be based on several factors: 1) a route which is safe from the erosional hazards of the slope, 2) a path which provides visual interest and diversity, 3) a route which has the least amount of negative ecological impact; i.e. does not require the removal of established trees and 4) a route which allows through-hiking while still providing access to the programmed areas of the site.

In addition to the safety issues posed by slope erosion, less obvious but equally important concerns include visitor exposure to harsh microclimatic conditions. This factor will be especially important in the planning of the celebration forest and its accompanying staging area, as these portions of the site will host longer-term visitors. Microclimate is the "result of interaction between prevailing climate and objects in the landscape"(Brown and Gillespie 1995: 7). The goal of modifying microclimatic conditions through design, or modifying designs to suit local microclimates is to create human thermal comfort. In other words, microclimatic landscape design focuses on creating spaces that are comfortable in terms of temperature and humidity, and moderate wind, solar radiation and precipitation.

The challenge in achieving this level of human thermal comfort on the Celebration forest site will be to do so in a manner that maintains the 'natural' or ecological features and character of the site. Thus, while human comfort will be a key component in the success and use of the space, all attempts should be made to incorporate natural materials and ecological features into the design for microclimatic comfort. While it is possible and effective to create built wind barriers and shade structures, a high percentage of built components are contradictory to the ultimate goal of regeneration on this site. Instead, the provision of thermal comfort should be achieved through natural elements such as tree cover and shrub plantings, as well as combined built/natural elements, such as trellises or arbours covered in native vine species. The benefits of combining the built structures with natural materials are three fold: 1) The natural materials will maintain the desired natural character of the site, while providing shelter in areas difficult to shelter using only natural materials (trees, vines, etc), 2) These integrated structures are well suited to the integrated human/nature character of the site, 3) These structures, being both functional and aesthetically pleasing offer an educational opportunity to visitors on possibilities for integrating human needs with ecological function in home landscape designs.

Important considerations for microclimatic landscape design include the direction of prevailing winds, orientation of the site, or site features towards or away from prevailing sun exposures, the seasons and times of day in which the site will be used, and the type of activities occurring on site (Brown and Gillespie 1995). The Celebration forest site will be exposed to prevailing winds through the open hydroelectric corridor along the eastern edge of the site and the open north-facing edge of the site running parallel to the Little Rouge Creek. Additionally, the flat topography and open character of the site result in direct exposure to solar radiation.

From a public use perspective, the programmed component of site use – Celebration Forest events – will likely occur spring through fall, thus requiring the consideration of three season microclimatic conditions. Additionally, the congregation area and platform lookout, as well as the main Vista trail passing through the site, will be the most exposed areas. Initially, much of the site will be open and exposed to wind and sun, but the active planting program associated with the Celebration forest will mitigate these conditions through increased natural cover.

There are several challenges associated with attempting to mitigate microclimatic factors on this site. One of the biggest challenges is properly locating the proposed platform lookout and staging area, which will host celebratory events. Currently, one of the site's main features is the dramatic vista it provides to the steep valley of the Little Rouge Creek. Observation of site uses and conditions clearly demonstrates that visitors perch themselves close to the slope's edge in order to get the best view of the valley. Providing this view from a structurally sound lookout platform

would deal with safety issues surrounding slope erosion, but will also create other microclimatic issues. Determining a location for the platform, which serves the lookout function, the celebration staging area function, and is most appropriate from a microclimatic perspective, is irreconcilable. As a result, some mitigation structures and plantings will have to occur to provide shelter and sun protection for visitors. Alternatively, the lookout could be eliminated altogether, but this poses a new set of public use problems.

Specific design considerations for the platform and congregation area will require longer-term on-site investigation and analysis of sun and wind conditions. In general, however, the south-facing portion of the area could be planted with deciduous trees to protect users from summer solar radiation and heat, while providing warmth through sun exposure in the cooler seasons (spring and fall). Additionally, consideration may be given to erecting a roof or roof-like structure to the platform, to provide shelter and comfort, in particular to participants of celebration events who will be directly facing a southern exposure. These and other considerations will create a site that provides for human comfort, safety and enjoyment, increasing the potential for positive use of the site.

3.4 INTEGRATING ECOLOGY WITH DESIGN - CONSIDERATIONS

3.4.1 DESIGN WITH NATURE

Design with nature can refer to a broad scale approach to land-use planning, or as it is intended here, to define a philosophy and guidelines for site design. As part of the Rouge Park, the Celebration Forest plan strives to incorporate and enhance the ecological features and functions of the site and the larger watershed. Applying the principles of ecological design is essentially an attempt to integrate the design with the site conditions "in a way that respects the health of the place. The design works when it articulates new relationships within a context that preserves the relevant ecological structure"(Van Der Ryn and Cowan 1996: 72). While the Celebration Forest concept plan strives to regenerate and improve the ecological function of the site, it also works to encourage human interaction with the natural components of the site. In this way, the plan requires a design element. It is more than simply developing a planting plan for the area. The plan seeks to integrate the built and human components of the area in a manner that enhances the ecological quality and the human experience of the site.

In the ecological design process, the goal is to design the site through careful observation and attention to the land's natural tendency and character. In other words, although the development of a wetland on the Celebration Forest site would create valuable habitat and ecological functions, it is far removed from the natural character of the site, and would therefore require extensive resource use and manipulation of the site conditions in order to achieve the desired results. The Celebration Forest plan should build on the ecological character and potential of the landscape.

Designing with nature also acknowledges that "in the long run, the most ecologically benign solutions make the most active use of life's own patterns of health"(Van Der Ryn and Cowan 1996: 104). Thus, in designing the built components of the Celebration Forest, consideration must be given to minimizing the need for intensive resource use and alteration of the site's features. This also implies that the site should emerge and change over time, evolving into a self-designing system, as much as possible. It follows then, that the planting areas, which will develop into forest habitats, will be allowed to do so without human actions interfering in the evolving forest ecosystem. The exception here will be the removal of safety hazards, or the improvement of the site through additional plantings or removal of invasive species.

3.4.2 CREATIVITY AND DESIGN

Do we introduce design elements here? Since this is not a 'true' restoration, and there will be a significant public program presence on the site, there is potential to introduce some creative

design elements that mimic the local natural processes. For example, the Little Rouge Creek, a central element of the site, could be integrated into the designed aspects of the space. This site is a perfect example of the interrelationship between aquatic and terrestrial ecosystems, and the influence each can have on the other. Although the program component of the site will focus on the terrestrial ecosystem, the 'forest' per se, the dramatic vista, which is also a focal point of the site, results directly from the fluvial processes of the Little Rouge. As a result, bringing elements from the creek below to the site is a creative way to mesh the aquatic and terrestrial components into the design of this space.

Symbolism and reference can be powerful ways to integrate the natural elements into the 'designed' aspect of the space – the congregation area and platform in particular. These spaces could reflect the shape and pattern of the creek and use materials which closely resemble the materials found along the creek bottom; stones, gravel boulders, etc. In other words, the congregation area itself would become a metaphor for the creek in its design – representing in form and material, a creek bed.

In a more elaborate design, variations in height could also be created in the congregation area, mimicking sand bars and other fluvial features. The variations in height could become useful features of the public programming, serving as escalated seating for participants of celebratory events. The edges of the meandering congregation area – or dry creek bed - could then be planted with vegetation to provide shading and thermal comfort. An additional benefit would be the symbolic representation of a riparian area along these planted edges. Any built structures, such as the platform or trellises would then be representative of the steep valley walls, having a subtle but creative and meaningful effect overall.

Incorporating this type of design element may be controversial in the case of the Celebration forest, where the goal is to regenerate and maintain the 'natural' character of the site. Introducing design and human creativity is also generally not encouraged in ecological rehabilitation or regeneration projects. Nonetheless, there is definitely room for flexibility and creativity on this site, especially with the presence of an active public program. Specific designs and ideas should also be encouraged from the local community. Harnessing local talent, in the form of artists, sculptors, architects or others would integrate people into the design and construction process, enhancing the sense of place and community.

CHAPTER 4: RECOMMENDATIONS

4.1 GENERAL RECOMMENDATIONS

4.1.1 ADOPT AN ECOLOGICAL MINDSET: LIVING WITH UNCERTAINTY

While planning, design and restoration projects and concepts provide general guidelines, recommendations and design solutions for sites and regions, ecological planning requires living with a degree of uncertainty and adaptability. Although the goal of the Celebration Forest Site concept plan is to create an ecologically vibrant and diverse space to integrate both natural and cultural processes, it is impossible to “know enough at any one point about a site to accurately predict the future or to fully specify what actions are appropriate to take”(Sauer 1998: 93). Even though this concept plan and park program do not qualify as true ecological restoration projects according to definitions from that field (see chapter 1), the goal and objectives of this plan, and of the Rouge Park in general, strive for the creation and enhancement of urban wilderness. As such, adopting the philosophies and approaches taken by restorationists would benefit the overall project and program.

The term ‘wilderness’ implies allowing ecological processes, adaptation and change over time. An ecosystem can be monitored and managed, in a sense, but natural systems evolve and change over the long term. Forest regeneration, such as that intended by the development of the Celebration Forest program, is no exception. Park program developers, managers and users must realize the need for patience and flexibility in such a project. Additionally, it is the process, as well as the product, which should be key. If ecology is to be a priority at this site, and throughout the park ecosystem, then implementation should be incremental and combined with long term monitoring and adaptation to the successional processes, which occur.

This approach to landscape design and regeneration differs from a traditional landscape project, which defines a final product and sets timelines accordingly. Timelines for ecological planning projects will be substantially longer, and dominated less by human management and more by the forces and cycles of natural processes. The Celebration Forest project should adhere to the far less rigid timelines and implementation processes associated with ecological restoration theory and practice. An ecological approach would involve learning how to recognize and optimize the natural regenerative processes of the site; in order “to learn from nature, not to change it”(Sauer, 1998: 92).

This is not to imply in any way that human presence or intervention should be eliminated from the design and implementation process. On the contrary, monitoring will be critical (see site-specific recommendations below) to the long-term success of plantings and the development of the forest as a whole. Additionally, human intervention can help prevent the loss of diversity from invasive exotics, which can dominate a site, especially in the early regeneration phases.

4.1.2 MINIMIZE NEGATIVE IMPACTS

Ironically, in attempts to design creative and ecologically vibrant spaces, projects often call for large-scale alterations of sites and landscapes. In so doing, many existing ecological features can be negatively impacted in favour of the larger vision (or final product). The Celebration Forest site will require some alterations to the landscape to address programming, public use, safety and environmental quality issues. It is important, however, not to lose sight of the overall vision of such projects, which is to improve the quality of the local environment. As such, negative impacts to the site, or to any ecological features of the site should be minimized (Franklin, 1997). If plant species are to be removed for the purposes of construction or trail re-location, all efforts should be made to salvage these species for re-planting in nearby areas. This may be especially appropriate to the Celebration Forest plan, as some for the existing meadow species will likely be removed for trail re-alignment, platform construction and forest plantings.

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These species could be replanted on nearby sites, located west of the Celebration Forest, which are currently regenerating fields.

4.1.3 CREATE A POWERFUL PLACE

Creating a sense of place, and encouraging deep connections to place are elements, which are difficult to incorporate into a project plan or design. Nonetheless, the value of connection to place, and the powerful nature of some spaces can inspire, calm, and impassion the human spirit. Fostering a sense of place among trail users and site visitors has a plethora of benefits from the perspective of stewardship, volunteerism and the overall success of the site and its programming, use and management. The Vista Trail Celebration Forest site has the potential and opportunity to foster this sense of place and to inspire and educate visitors.

Making changes to an established trail system, or to a 'natural' area can often result in negative reaction from trail users, local citizens and community groups. This type of public disapproval for a project can seriously inhibit the likelihood of success and implementation, and can result in vandalism, misuse and a general lack of respect and care for a site. In contrast to these potential negative reactions, a truly open and participatory public process can result in greater 'buy-in' or support for the proposed project and programming.

Although sometimes wrought with conflict and avoided by planners, the public process has much to offer for a variety of reasons. Local expertise, knowledge and resources often come to light in these situations, aiding the implementation of the project. Additionally, involving members of the public from the onset results in a space that reflects public values and ideas. This can then lead to a greater sense of place among user groups and community members.

Creating a sense of place at the Celebration Forest Site will involve incorporating many of the elements discussed in the site-specific recommendations listed below. Bringing sociability to the site can be accomplished through the encouragement of volunteerism and stewardship, cooperation with various user and interest groups and providing an interactive and friendly process. Creating a sense of comfort and a positive image will involve creating an attractive, indigenous and 'green' place (Project for Public Space 2002). It will also involve establishing a place, which is perceived as safe, fun and clean, among other things. This means having a presence on the site, both from park staff and members of the public. Promoting the site and encouraging use and visitation will enhance this sense of comfort.

In addition to encouraging public use of this public space, it is the belief of this researcher that to be truly successful, the community and stakeholders should be involved in the planning process, and their ideas should be listened to and incorporated. Additionally, it is important to remember that what is being created at the Vista Trail Celebration Forest site is a place; much more than simply a design (See Chapter 3 for more details). This space must be created with the best interest of people and nature in mind, not simply as a means of delivering a park program.

4.1.4 CREATE OPPORTUNITIES FOR ECOLOGICAL LITERACY AND LEARNING

As a public space, the Celebration Forest site has the opportunity of reaching a variety of visitors, from celebration event participants to through-hikers, from children to the elderly. This is particularly true seeing as the site is located close to an access point, and to other amenities, like the Toronto Zoo. Also, as a public park with a focus on the protection and regeneration of ecological form and function, the Rouge Park has a responsibility and an obligation to promote ecological literacy. Ecological literacy refers here to an intimate understanding of one's local ecology or natural surroundings, their form and function, and the interconnectedness between humans and the natural environment.

Creating opportunities for ecological literacy and learning involves creating spaces in which people can interact with their natural surroundings and see natural processes and cycles. Of course, many of these spaces exist inconsequentially; people move through spaces taking no notice of the natural cycles and processes surrounding them. The challenge here, is to capture the attention and imagination of site visitors, and make the processes and cycles visible and readily available.

The Celebration Forest is perfectly poised to serve this crucial environmental function. Enabling people to intimately interact with the space through planting and celebration events, interpretive signage, seating and trails will strongly encourage learning about the processes and functions of species, habitats and the larger bioregion. Additionally, the celebration program will encourage visitors and honourees to visit the site repeatedly and over time to return to the place of their honouring, to monitor the progress of their planting efforts, and to revisit the positive experience. This too, lends itself to further understanding the site's ecology and functioning, and will hopefully inspire visitors to pursue further knowledge.

One final point worth mentioning is the intense fluvial processes occurring on the site, and their influence on the character and appearance of the site's landscape. Such processes, through interpretation, would provide a focal point for visitors, capturing their attention with the dramatic and visible effects. The park, in developing the site and accompanying program, should take care to maximize these opportunities for learning.

4.2 SITE SPECIFIC RECOMMENDATIONS

4.2.1 MONITOR SLOPE CONDITIONS

Due to the significant erosion occurring along the slope at the site, it is recommended that a long term monitoring program be established to monitor and report on the extent of slope erosion. This monitoring will provide valuable information on the rate of erosion, and will assist in determining when the slope reaches its angle of repose. This information is important for future trail alignment or modifications, as well as for determining when to begin planting tree and shrub species along the eroded and compacted top of slope.

Prior to initiating planting on the slope, or at the edge, the changes to the toe of slope due to fluvial processes, or to the slope itself should be noted over a period of several years. It may be necessary to wait until the slope has reached its angle of repose to conduct planting both on the slope gradient and at the top of slope. If not, such efforts could fail due to continued erosion. Additionally, monitoring of slope conditions may reveal ongoing erosion due to fluvial processes occurring at the base of the slope. In this instance, it will be inappropriate to undertake plantings along the slope gradient, or at the top of the slope since the instability will continue to undermine any planting initiatives.

Once the slope has reached its angle of repose, the slope area, including the top of slope and the area currently occupied by the park bench (see recommendation 8) should be replanted with an aggressive and deep-rooted native ground cover. Planting a ground cover will help re-vegetate and stabilize the slope, while maintaining the 'Vista' or view over the Little Rouge Creek. In the longer term, this ground cover will also assist in returning nutrients to the soil. If slope conditions allow, this area may regenerate naturally over time, through successional processes and the surrounding seed sources. Supplemental plantings would also assist in this regeneration, but based on the current public use programming, any plantings on the slope edge should maintain a maximum height of 1 to 1.5 metres to maintain the lookout opportunity.

As described in chapter 2, the current fluvial processes of the Little Rouge Creek appear to be directly influencing the slope conditions at this site. The significant meander at this location suggests that the creek may alter its course over time. Already, the aerial photography indicates that in the past 32 years, the creek has moved closer to the base of the eroding slope, and the

slope itself has become significantly more eroded. Long-term monitoring will provide insight into the creek's movement and route through the site, and hence offer guidance on how best to administer naturalized slope stabilization, if at all.

4.2.2 DECOMMISSION EXISTING TRAIL

It is recommended that the portion of the trail currently running along the edge of the slope be formally closed to discourage continued use. The trail is currently narrow, but quite compacted as a result of prolonged use. In its current location, the trail poses a safety hazard to users, as well as contributing to the erosion of an already unstable slope. Since this is currently a popular route for a variety of trail user types, including walkers and cyclists, physically restricting access to the decommissioned trail is recommended to discourage users. Natural barriers, such as a collection of logs would provide an effective and inexpensive barrier, and would, over time, begin to decompose, providing nutrients to the soil. Additionally, planting fast-growing pioneer species, which will make passage difficult, may serve several functions, including slowing the process of erosion, and creating a visual and physical barrier to the old trail route. These closure areas should be accompanied by signage explaining the reasons for closure of the trail. Public education in the form of signage and outreach to users will likely play a significant role in the success of this trail closure.

The former use of the site as an area of aggregate extraction also suggests that the soil may be considerably compacted and degraded due to the use of heavy machinery during the extraction process. As a result the severe compaction will make it difficult for any future plantings to establish. One method used to break up compacted soils and reduce weed competition is disking (Geomatix International, 1996). While this technique may be an aggressive approach to undertake in a sensitive area such as the slope's edge, it would likely be the most effective for the highly compacted soil conditions on the decommissioned trail.

4.2.3 REALIGN TRAIL

The current trail location through the site poses a number of ecological, geomorphologic and public use problems. The trail, which currently runs along the slope's edge, must be re-routed at the site to allow for slope erosion, improve user safety, reduce user impacts close to a sensitive slope, and reduce liability. The most appropriate location for the trail would be through the existing regenerating meadow, reconnecting with the existing Vista Trail at the hydro corridors. The exact distance away from the slope's final angle of repose will require monitoring and making adjustments according to the erosion process occurring at the site (as per recommendation 1). A preliminary minimum distance of 20 metres is required to ensure that the trail is a safe distance from the slope, while allowing for the continuance of erosional processes.

The trail re-alignment should follow the guidelines outlined in Appendix A, "Trail Design Standards". This information, adapted from the Rouge Park Trail Management Plan and the TRCA Trail Planning and Design Guidelines, describes the Vista Trail as a secondary trail, and as such defines the specification for trail width, surface, etc. A concept for the trail is provided in Figure 1 but as part of this recommendation, exact trail routing should be determined through detailed, on-site investigation.

4.2.4 CREATE CELEBRATION FOREST LOOP TRAIL I

In addition to re-aligning the existing portion of the Vista Trail at the Celebration Forest site, a series of loop trails, which incorporate rustic wood benches, should pass through the current and future celebration planting sites. These trails would provide an area for reflection and quiet contemplation, as well as providing access to the Celebration Forest planting areas. This loop trail system, as outlined in the concept plan map, consists of two loops, which meander through the current semi open field area, passing through the Celebration Forest Planting areas.

The main loop trail will begin and end at the Vista Trail, while the secondary loop will begin and end at the main loop (See Figure 1). Additionally, two side trails will be created linking the main loop trail to the platform lookout (See Recommendation 5, and the accompanying Concept Plan drawing). This type of well-connected trail system will allow flow and circulation of visitors, which will become especially important during celebration events and programming.

It should be noted that the intention of this trail network is to enhance the public experience, and provide access to the celebration forest ecosystem. These trails should be considered entrance into an evolving ecosystem, rather than a high-speed cycling loop opportunity. The trails must, as much as possible, minimize any negative impacts on the surrounding habitats. As such, they should be narrow footpaths with natural surfacing and be designated walking only. In the long-term the vision for these side loop trails will be for a meandering micro-trail system enveloped by the maturing forest, and its emerging canopy.

4.2.5 CREATE PLATFORM AND STAGING AREA

As per the desired public use programming, and the current use of the slope's edge as a viewing area on the site, it is recommended that a platform area be constructed to allow for public events. A platform here refers to a structure that provides standing room to visitors. This platform would serve double duty as a lookout and vista opportunity, by being strategically placed to offer a clear view to the valley. Due to the continued erosion on the site, the placement of the platform will be a critical component to consider.

The platform should be constructed a safe distance from the eroding slope and should be slightly raised to serve as a staging area for Celebration Forest Program activities. Additionally, the raised platform could provide a wonderful view and lookout towards Little Rouge Creek. The platform could incorporate signage, to provide users with information about the natural history, and formation of the Little Rouge Valley.

The design of the platform should remain subtle, and materials used should be natural, and blend in with the surroundings. The structure should accommodate approximately 8-10 people, have handrails, and be accessible from two sides to facilitate flow and movement of people (as depicted in the concept plan drawing). This would be particularly important during Celebration Forest events in which people will move onto and off the platform to make presentations and then proceed to planting areas. Additionally, the structure should be constructed in a way that will facilitate relocation, if needed, to accommodate slope erosion and instability.

Since this section of the Vista Trail is accessible to people with special needs, these needs should also be considered in the design and construction of the platform and its access points. Meeting these needs would include constructing a minimum of one ramp to and from the platform, and ensuring that the platform shape and size accommodate easy wheelchair access and movement.

It is also recommended that a group congregation area be provided adjacent to the platform. This area will allow people to gather for Celebration Forest events and have a clear view of the speakers or presenters. It is also suggested that some rustic seating (log benches) be provided for attendees of these events. Once again, in keeping with the objectives of the park to maintain as natural a setting as possible, natural, permeable materials are recommended for the congregation area surface. To lower maintenance costs and requirements, which will also minimize the need for potential disturbances to the site from heavy equipment, a secure permeable surface is recommended, such as permeable interlocking stones.

Another consideration for this congregation area is the fact that much of the area will likely be open and exposed to the elements. For human comfort and safety, in particular from sun exposure, it is recommended that some form of shade provision be incorporated into the design of the congregation area. One method to reduce direct and indirect solar radiation here would be

to plant native tree species along the perimeter of the area to generate shade. It should be noted that different trees generate different amounts of canopy shade, and in this location, it would be prudent to favour trees with dense canopies such as broad-leaved deciduous trees (ex. sugar maple). The location of these trees should be considered based on shadow patterns and sun movement over the course of the day, and through the spring to fall seasons. This will require more detailed analysis of site conditions. The shape of the congregation area will affect the ability of surrounding trees to provide such shade, and thus it is recommended that the shape of the area be irregular and lobed to allow tree plantings within the lobes.

In addition to the planting of trees, it would be beneficial to incorporate some built structures to provide shade protection and comfort. Such structures could be temporary in nature, and thus removed at the end of the programming season (late fall). Another suggestion would be to construct some strategically placed trellises, and then plant the trellises with native vine species to provide protection against indirect ultraviolet radiation along the sides of the congregation area. For the platform structure, a rustic roofing structure with appropriate overhangs to block UVR at various times of day would offer the most appropriate shade protection. This type of structure will allow clear visibility from the congregation area to the platform, and from the platform to the Little Rouge Creek, whilst still providing shade to platform users. Since the pattern of daily sun movement will occur from east to west, the location of plantings and structures should be emphasized along the entire perimeter of the area and platform.

4.2.6 CREATE A CENTRALIZED SIGNAGE AREA

Currently, the site contains a variety of trees planted in honour of people who have made valuable contributions to the Rouge Park. These trees are identified with plaques, which create a very 'formal' environment. Additionally, there is a park bench located on the site, which also serves to honour a member of the Rouge Park community. The bench is located adjacent to the actively eroding slope, and over time, it will be at risk of being destroyed due to erosional processes. Therefore, neither the plaques, nor the bench are ideally located on the site. Such recognition for outstanding contributions to the park should be honoured and respected, and can be built into signage, which would be centrally located on the site, close to the platform lookout. This will centralize the formal structures on the site, leaving the other areas open to a more naturalized aesthetic. The park bench should also be relocated to this area, where it would be a valuable addition to the celebratory platform and signage, and where it would not be prone to damage from slope erosion.

As the Celebration Forest Site, and its accompanying program seek to honour individuals who have made valuable contributions to the area, an opportunity exists to incorporate local talent and creativity to the site. In particular, the program sign could become much more than a traditional park sign through local creative expression and art. Recruiting local artists to assist in the design of the sign could result in a real focal point for the site, and would further reinforce the concepts of local contribution, public art and the nature/culture connection inherent in this site. As part of the signage construction, and any other accent artistic elements, all efforts should be made to use environmentally responsible products and materials. A first choice would be to incorporate the reuse of materials (i.e. previously used and salvaged materials). Other options would include the use of recycled materials, sustainably harvested wood products and resources purchased from 'green' businesses. See recommendation 10 for more details on private/public partnership opportunities.

4.2.7 DEVELOP AN APPROPRIATE PLANTING APPROACH AND PLANT LIST

The concept plan depicts several areas dedicated to the planting of native species as part of the Celebration Forest Program. These areas should be planted in ways that maximize opportunities for natural succession processes while allowing human appreciation of the area and the

celebration program. It is strongly recommended that the areas be allowed to maintain a natural feel; in other words, avoiding row plantings or manicuring the areas between the trees. In fact, the plantings should contain a variety of forest species, not simply tree species.

As the name of the program implies, the goal of this program should be to create forest areas, thus they should display the characteristics and functions of forests. This implies, among other things, creating vertical and horizontal complexity, incorporating a variety of forest species, allowing for forest floor development and encouraging varied ages of trees. In so doing, planting programs should encourage the eventual diversity of the forest layers into the various strata: canopy, sub-canopy, shrub and seedling layer and herb layer (Daigle and Havinga, 1996). These various layers may be achieved using a variety of planting methods, including managed succession or nucleation plantings (See Daigle and Havinga 1996, Hough et al, 1995). As part of the long-term development and implementation of a planting plan, consideration should be taken to undertake shrub and herb layer plantings once a forest canopy is established.

Also, while natural disturbances may be limited due to a strong human presence, small-scale disturbance, such as tree fall due to wind, are necessary elements of forest succession and should be allowed in the Celebration Forest. Tree falls and snags (standing dead trees), unless posing a safety or circulation issue should not be removed. These, and the many other processes occurring in naturally regenerating and functioning forests must all be considered as part of this regeneration plan. Educating visitors to the site through clear, interpretive signage will assist in mediating these types of regeneration processes.

As part of the development of the Celebration Forest site, and the accompanying program, it is necessary to develop a plant list appropriate to the site conditions, and broader natural heritage features of the Rouge Park, the Rouge River Watershed, its surrounding area and even broader scale bioregion. Plants chosen for this site should be native, locally-occurring plants, in particular, species which are locally significant, rare or extirpated. A variety of species should be chosen to provide maximum species biodiversity, and enhance the chances for survival. The purchase of plant materials is also important. All plants should be purchased from reputable local growers, both in an effort to support local economies, and to ensure that plants are appropriately grown, and come from local seed sources. The Rouge Park, along with community members and local organizations or individuals with intimate knowledge of the area, and of native plant materials, should develop an appropriate plant list by examining biological inventories and ecological surveys of the site, the park, and the Greater Toronto Bioregion.

Additionally, it is important to consider the conditions of the site: climate, existing vegetation, wind and microclimatic factors, sunlight, soil and moisture conditions. Upon preliminary observation and analysis, it was noted that the site is located on relatively level terrain, with the less forested areas receiving abundant exposure to sunlight. Relatively open exposure to the east could result in harsher conditions along this edge. This is also true for the exposed slope edge, which is north-facing. The soil conditions are sandy, and compacted, making them inhospitable for certain more sensitive hardwood species.

Currently, there are difficulties with some of the tree species planted on the site. Some of the trees are dying, possibly due to soil compaction, inappropriate plant selection, or harsh site conditions. Careful examination of the soil may yield information in this regard. It may be that the soil needs to be supplemented with compost or mulch.

Another option would be to allow the more natural processes of soil enhancement to occur by using native plants that are adapted to these harsher, more nutrient deficient conditions. For example, beginning the regeneration process with the planting of hardy, sun-tolerant pioneer woodland species (poplar, birch, aspen, etc.), along with hardy shrubs can aid in breaking up compacted soil, and over time, reintroducing nutrients to the soil. Planting these hardy, tolerant species may help prepare the soil for less tolerant species.

Another option may be to begin by planting coniferous trees, which tend to fare better in harsher, sandier soil environments. It is important to note, however, that such species will also tend to acidify soils, and so should be selected carefully. Furthermore, many conifers and evergreens are locally occurring, such as red and white pine, eastern hemlock and eastern white cedar. Any conifers planted on site should be representative of the local ecosystem. Determining planting techniques should also be undertaken, according to the guidelines of the **Rouge Park Vegetation Management Study**, and further analysis of the site conditions. Furthermore, additional and detailed planting methods and species selection should be included as part of a detailed planting plan.

It is recommended that the community groups and volunteers, who work locally, and within the Park, be consulted on the development of a plant list for the site. These groups and individuals are closely connected to the site, and have detailed knowledge of plants occurring in the area, as well as experience with past planting, successes and failures. Also, this is another way to involve members of the public in the development of this site, and a way of encouraging stewardship.

4.2.8 CREATE A NATIVE SHRUB AND MEADOW SPECIES PLANTING AREA

Since this plan recommends a platform, which is set back from the current slope edge and can provide a vista over the Little Rouge Creek, it follows that the area in front of the platform remain relatively unobstructed. This is not to say that this part of the site cannot be both aesthetically pleasing and ecologically functioning. Planting a variety of native shrub and meadow species appropriate to the site conditions would maintain the view while bringing definition to the site and providing plant species valuable to local wildlife. As depicted on the concept plan drawing, two clusters of plantings are recommended. The one directly in front of the platform (#2 on site drawing) would be planted with species ranging in size from 1-2 metres while the area slightly to the east (#11) would consist of plants ranging in height from approximately 2-4 metres. This would nicely frame the platform without inhibiting the view, and provide variety and interest to the site.

Creating a meadow and shrub planting area would also serve as a symbolic meadow or successional ecosystem and provide an opportunity for interpretation and learning. One suggestion is to promote this area as an alternative to traditional home lawns and horticultural gardens. Since this is a site which will see a variety of programmed and un-programmed public use, it would be beneficial for the Rouge Park to take this opportunity to enhance ecological literacy and promote sustainable practices through interpretation of this meadow as a possible home landscape. Signage for this need not be extensive, but could provide a brief name and description, and sources of additional information. Finally, the meadow and shrub planting will act in much the same way as a true forest edge, even if primarily symbolically, representing the various layers and species types found along forest edges, between forest ecosystems and other landscape or cultural features.

4.2.9 CREATE A VISUAL SCREEN TO HYDRO CORRIDOR

Due to the scale of the hydro corridor, creating a visual barrier effective from a distance will be difficult, but creating one that visually screens the area at a smaller scale, while benefiting the ecology of the site is desirable. The hydro corridor creates a greater edge effect on the site, reducing forest cover, and increasing vulnerability to wind disturbance. Planting the edge of the site along the corridor line with edge species tolerant of harsher conditions would benefit the site, both ecologically and visually.

Since the corridor's edge will be exposed to harsher climatic conditions, such as wind, the environment along this edge may not initially be suited to some of the more common hardwood species of the area. Instead, planting fast growing, wind tolerant species will buffer some of the edge effects, creating a more hospitable environment for slower growing, more sensitive tree

species. It is recommended that managed succession be applied to the screen planting along the hydro corridor (Geomatix International 1996: 21). This approach involves “acceleration of the natural successional processes through deliberate planting of early successional (pioneer) and late successional species. ...This may involve planting pioneer species first and letting them establish over a period of years and then underplanting with late successional species”(Ibid, p.21). Because of the particular exposure of this edge, it is also recommended that the planting be several trees deep to better the chances of survival.

According to the Vegetation Management Study, typical early successional trees that could be used in managed succession include: large-toothed aspen and trembling aspen. Sumac, white birch, white cedar, spruce and poplar may also be appropriate. Over time, when the early successional trees establish, they will create shade and temperature conditions appropriate for planting the slower growing hardwoods, including maples and oaks. This forest corridor will then act as a seed source to increase the overall forest cover in the area.

4.2.10 COLLABORATE, PARTNER AND IMPLEMENT

Consultation and partnership will be important elements in the redevelopment and implementation processes of this project. It is recommended that the concept plan and process be reviewed and discussed with a working group, which will include representatives from a variety of interest groups. These consultations will allow for the sharing of ideas and feedback on the concept plan, the development of the Celebration Forest program and the implementation process.

Additionally, it is recommended that the Rouge Park partner with the Toronto and Region Conservation Authority and the City of Toronto towards implementation of the plan. These partners could provide the resources and expertise to successfully implement the plan. Other partner groups, which should be represented in the consultative process, include local citizens and residents, community groups and non-government organizations, trail groups, naturalist clubs and organizations (volunteer or otherwise) associated with the Rouge Park. Including these various stakeholder and interest groups will ensure that local knowledge and ideas are reflected in the plan and its implementation. Additionally, public involvement, and the planning process, are central to ecological design and planning approaches because they create momentum, build a sense of pride and stewardship and encourage citizenship. The ultimate goal is to work towards consensus; that is, adapting a plan until all parties can accept the outcome. Consensus building is a complex and detailed process that should be evaluated as a possible option for moving forward with the concept plan.

4.2.11 MONITOR, MAINTAIN AND ADAPT

Following the implementation of this concept, in part or in its entirety, it is important to continue to monitor the site over the short and long term. As part of this monitoring, the evaluation of planted areas and the de-commissioned trail, successional processes in the hydro corridor screen zone and the success of meadow and especially Celebration Forest plantings must all be considered. There are a variety of community organizations and volunteers who work actively and locally in the Rouge Park. Enlisting these groups in the monitoring process would be an effective way to involve citizens while monitoring progress.

Additionally, maintenance of the site will be important for the success of planting projects. The replanted areas may need to be weeded to allow tree saplings, forbs and grasses to establish. Also, herbivory, parasitism, invasive exotics and vandalism are all factors that could have a negative impact on the success of implementation processes. Regular monitoring and maintenance can help detect such problems and will create a regular presence on the site to discourage misuse and address problems.

Finally, as mentioned in recommendation 1, the active slope will need to be monitored to gauge erosion and activity. It is recommended that the Rouge Park partner with the University of Toronto, or other local academic institutions, to allow students of Geomorphology to monitor the slope processes. These field studies could be conducted each year by a new group of students, with data being recorded and accumulated. This partnership would provide an area close to the University for field studies, while accomplishing a much needed function for the Celebration Forest Site.

CHAPTER 5: CONCLUSIONS

The Vista Trail Celebration Forest Site provides an excellent example of the challenges and opportunities associated with planning and designing with both ecology and people in mind. Developing a concept for the site, which aims to incorporate site and landscape ecological features, public use and programming objectives, aesthetics and safety, creativity and spirituality, requires careful examination of each of these elements, but also a realization of the practical limitations of each. Despite attempts to develop a plan that is comprehensive, ecologically based, creative and exploratory, a plan is truly only an introduction to the development of this space. No plan can truly encompass all elements of ecology or design, nor should it attempt to do so. Ecological processes evolve and change over time, and thus, so too should any plan for this site evolve and change.

5.1 CHALLENGES AND LIMITATIONS

One of the most obvious challenges to the development of the concept plan and Celebration Forest program is the physical condition of the site, and its suitability to regeneration and development. Although the plan attempts, through design and regeneration, to improve the ecological quality of the site, the reality is that the site remains variable and changing, especially along the top of slope. The erosional processes on the site are most likely a combination of natural and anthropogenic factors, but that should not supersede the fact that these processes are occurring in the first place. Regardless of their cause, they are currently not posing a real safety risk to humans, except where trail use is inappropriately located close to the slope's edge. Developing an active public program and planting scheme for the site may be inappropriate and ultimately unsuccessful if the erosion continues indefinitely. For this reason, it is the belief of the author that any plans to develop the Celebration Forest Program be dependent on intensive monitoring of slope conditions, and possibly on predictive models, which may forecast the slope's future behaviour, and its ultimate angle of repose. Otherwise, the efforts of Park staff and their partners may be in vain.

Additionally, to this point, public involvement in the planning process, for both the site concept and its accompanying public program have been essentially non-existent. The Rouge Park has stated that they would like to involve local community groups in some aspects of the plan, such as the development of plant lists, but that for the most part, this program and site concept will remain the domain of Park Staff and the Rouge Park Alliance. While the program will be implemented by The Rouge Park, public participation from the onset would ultimately benefit the site, and improve chances for public support and 'buy-in', especially when trail re-alignment is part of the overall plan. Regular users of the site and the trail would benefit by being offered an opportunity to participate, or at least by knowing that the process is taking place. Even a gesture as simple as erecting a notification sign on the site early on in the plan development process would help inform trail users and mitigate negative reactions. Planning for the public should be a public process.

To this end, the development of this concept plan is ultimately lacking in public participation and consultation. There are several reasons for this absence of public process. The first is the desire of the Rouge Park staff to have this plan created as an introduction and starting point for the development of the program. As the eventual implementers of the plan, the Rouge Park has the final word on how the process proceeds. The second reason has more to do with the limitations of time and opportunity. Undertaking a participatory planning process would have involved gaining the approval of the Rouge Park staff and the Rouge Alliance, a political process that would have likely taken a significant amount of time. From there, supposing that approval was granted to involve local citizens and community groups, the process of outreaching to these groups and undertaking consensus-building activities would have also required significant amounts of time and availability of resources (materials, finances, etc). Since the goal of the research paper and the development of the concept plan was, in the researcher's view, to gain an

understanding of ecological planning, design and restoration, and to apply and integrate this knowledge in practice, it seemed most appropriate to focus on these aspects of the plan, rather than on the public process per se. Undertaking a public process as part of the research would have essentially required that the participatory process be the focus of the research. It was the author's intent here, to present an initial idea – a concept – that then could then form a starting point for public participation and discussion. Consequently, this plan and accompanying recommendations are designed to serve as a framework for thinking about ways to appropriately develop the site and program. The public process should certainly be part of this development.

Another possible drawback to the development of the Celebration Forest program, and the site concept, is the fact that program demands could undermine the ecological processes and the natural regeneration potential of the site. With a program such as a Celebratory Planting program, there is often pressure to plant those species that are desirable from the point of view of aesthetics or longevity. In other words, many people being honoured with a tree planting will want a maple or oak tree, rather than a poplar, planted in their honour. Since the vision of the Rouge Park, and of this site's concept plan is to enhance the ecological functions of the site, and the watershed overall, maple and oak trees may be inappropriate, especially in the early stages. For this reason, it will be crucial to avoid the temptation to plant a 'tree' in someone's honour, but rather to honour him or her through the creation of a healthy, locally appropriate and significant ecosystem. For example, a celebratory planting event could involve the planting of a series of pioneer woodland species, representative of the first stage of forest development, with subsequent celebratory plantings consisting of shade-tolerant understorey species planted beneath the emerging canopy. In this way, the desired effect of regenerating forest habitats is achieved. The more formal aspect of recognition, as mentioned in section 4.2, Site-Specific Recommendations, would occur through the addition of the honouree's name to the site sign.

From a design perspective, incorporating the various features associated with the public use portion of the site (trails, platform, congregation area) rendered it difficult to adequately represent the requirements for forest habitats. Such things as optimum patch size and shape, provision for forest edge and interior, among other things were limited as a result of the overall size of the site, the eroding slope, and the public use, as mentioned above. As a result, the site was considered from a broader perspective, and how it could contribute to the overall improvement of natural cover in the area. Most of the site will be edge habitat, but it can be an effective symbolic representation of the larger scale processes of regeneration, succession and change.

5.2 OPPORTUNITIES AND POTENTIAL

While any plan, design or concept will face challenges and limitations, the Vista Trail Celebration Forest site concept and accompanying program has the potential to provide a host of ecological and social benefits, both at the site and beyond site boundaries. Among the benefits of the plan are: 1) the positive connections it provides between people and the natural environment, 2) the opportunities it provides to foster community-based landscape regeneration, 3) the positive effects it will have on the appearance and ecological functioning of the site, and, perhaps most importantly, 4) the potential of the plan to foster ecological literacy and sustainable behaviours. The public program aspect of the plan, the Celebration Forest, and the space itself, celebrate people and the natural environment, and their positive interaction and connection to one another. The program will recognize community contributions to the Park in a manner that enhances the ecological quality of the Park ecosystem. This is truly a win-win situation. Ecological regeneration becomes a celebratory event, and the public partakes in celebrating nature/human connections.

In addition to this immediate and active celebratory event, the potential here is for the creation of longer-term stewardship and civic pride (Daigle and Havinga, 1996). Developing these positive partnerships and initiatives can inspire commitment and attachment to place. This dedication results in stewardship and positive use of a space, increasing the chance for long-term success

and decreasing the possibility of misuse or vandalism. Also, because the emerging ecosystem will directly honour individuals and groups, there will be a public investment of sorts, and a desire on the part of those celebrated to ensure the health and survival of the ecosystem and the overall place.

With respect to sociability, the space is designed to encourage movement through and within the site with the creation of a micro-trail system. Other features include:

Linkages to adjacent trail system and access points;

Areas for congregation and for quiet reflection;

Comfort – seating, shade and wind provision, open and private spaces;

Programmed and un-programmed public use opportunities, and;

Visual and ecological diversity.

The trails and other built elements on this site are all designed to serve a public use purpose while maximizing the ecological potential of the site. The concept attempts to offer a destination to visitors, either a stopping point on a longer hike, or a focal point for a visit to the Rouge Park. With all public use spaces, there is the potential for negative impacts to the natural systems due to overuse. Care has been taken to separate the more sensitive features from the more intense public use areas in an effort to minimize these negative impacts.

Finally, and perhaps most importantly, the Celebration Forest site concept offers an innovative approach to providing open space opportunities for urban residents, and in so doing, has the potential of affecting positive environmental thought and action at the broader scale. The provision of 'green' and open space in urban regions has traditionally been the provision of heavily manicured parks and greenways. Furthermore, park programming and facilities in these areas most often consists of traditional recreational opportunities, such as tennis courts, soccer fields, etc. The Celebration Forest site offers instead either a passive or active nature experience. Whether visitors are gathering for a celebration and planting event, meandering through the regeneration area, sitting contemplatively in the emerging forest, or admiring the dramatic view of the Little Rouge Creek, the experience is one surrounded by natural processes at work. This is the type of experience, which should be readily available to all urban dwellers, and it is exactly this type of experience that can foster a land ethic.

Many of us learn best by doing. This is a perfect opportunity to 'do' something, which ameliorates the conditions of our local environment, while gaining ecological knowledge and literacy. If, as advocates and stewards of the environment, our goal is to foster a land ethic and move environmental thinking to its critical mass, we must start by providing experiences for interaction, immersion and participation because "to hear is to remember, to see is to know, to do is to understand"(Source Unknown).

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APPENDIX A: VISTA TRAIL CELEBRATION FOREST SITE CONCEPT

APPENDIX B: STANDARDS AND GUIDELINES FOR TRAIL DESIGN

Both the *Rouge Park Vegetation Management Study* and the *Trail Planning and Design Guidelines* of the TRCA outline objectives for trail construction and specifications.

TRAIL DESIGN STANDARDS

The Vista Trail has been designated as a Secondary Hiking/Walking Trail within the Rouge Park. The general design standards for such a trail as indicated within the Rouge Park Trail Development and Management Plan are as follows:

Clearing Width:	.5 metres
Clearing Height:	.5 metres
Tread Width:	0.5-0.1 metres
Tread Surface:	native soil
Minimum Length:	1 kilometre
Optimum Length:	1-5 kilometres with no real maximum
Desirable Grades:	0-20% with a maximum sustained grade of 25%
Desirable Duration:	-2 hours
Form:	loop or satellite loop

All values are maximum values unless otherwise indicated.

As part of the concept plan for the Celebration Forest site, a series of spur loop trails are proposed to take visitors through the celebration forest. The design standards for these spur trails will differ from the main trail design standards as follows:

Clearing Width:	1 metre
Clearing Height:	2 metres
Tread Width:	0.75 metres

APPENDIX C: BACKGROUND INFORMATION – INVENTORY AND ANALYSIS

VEGETATION MANAGEMENT PLAN

The information provided in this section is adapted from the 1994 Rouge Park Vegetation Management Plan

Physical Setting

The Southern portion of the Rouge Park Watershed consists of streambeds, flood plains and slopes of the Rouge River and the Little Rouge Creek valleys (Geomatics International 1991). The Lake Iroquois shoreline passes through the Toronto Zoo and just north of the Celebration Forest site.

Vegetation

The Rouge Park is located between the northern range of the Carolinian zone and the southern edge of the Great-Lakes St. Lawrence forest region. The most common tree species within the park include sugar maple, white elm, red oak, and american beech. Southern species typical of the deciduous forest region such as black walnut and sycamore typically occur only as minor elements within the Park.

Native non-forest habitats within the Park include: marshes, thickets, tall-grass prairie remnants, Great Lakes shorelines and erosional bluffs, all of which support a large number of significant plants and animals.

The Rouge Park Vegetation Management Study divides the parks community types into eight categories as follows:

1. Open water and river communities (3%)
2. Open and forested wetland communities (5%)
3. Forested slope communities (11%)
4. Forested bottomland communities (9%)
5. Forested tableland communities (8%)
6. Primary communities such as river bars, shores, and bluffs (1%)
7. Anthropogenic (human influenced) communities such as old fields, road and railsides, plantations, and ponds (31%)
8. Developed lands such as orchards, residences, institutions and recreational areas (31%)

Flora

The Rouge Park has a diversity of plant species, including 6 documented nationally rare species and 92 regionally rare species.

Existing Land Uses

Land use activities which have significantly altered and impacted the natural vegetation of the lower Rouge Valley include: aggregate extraction, urban development, recreational development, service and transportation corridors, agriculture and water control structures. Additionally, two

main Hydro corridors and a branch line from the north west are found within the Park, one of which crosses the Little Rouge at the eastern edge of the Celebration Forest site.

Ecological stresses due to Urban Development

While there are many obvious and significant impacts of urbanization of natural systems, such as loss of habitat to development, increases in paved surfaces, changes in water flows, pollution, etc., there are also a host of more subtle impacts which can result from increased uses of natural areas, and their proximity to development. Some the major factors impacting ecological processes within the Rouge include:

1. Non-Native Species
2. Domestic Animals
3. Elimination of Predators
4. Effects of Fragmentation
5. Degradation of Woodland Habitat
5. Impacts from buried services and sod lawns
7. Degradation of lakeshore marsh habitat

TRAIL DEVELOPMENT AND MANAGEMENT PLAN

Theme Area 3

According to the Rouge Park Trail Development and Management Plan, the Site is located within Theme Area 3 of the Park. This theme area contains the Little Rouge Creek and valley north of the hydro corridor to the CPR line. "A good diversity of forest types are supported in this theme area including some of the largest and best examples in the park"(EDA Collaborative 1997: 17). Regionally and locally rare species are found in many of the habitats in this area. Additionally, the entire theme area is located within the recommended boundaries of the Rouge Valley life science ANSI.

Portions of the theme area are designated as ESA and Carolinian Canada Sites. The Trail Development and Management Plan states that trail corridors within this theme area should be carefully considered and require careful siting to avoid sensitive vegetation areas and poorly drained soils.

The Trail Development and Management Plan also describes the valley corridor as highly sensitive to development, with the tablelands adjacent to the valley as having a low sensitivity to trail development. As a result, the current location of the Vista Trail running through the Celebration Forest site is inappropriately placed close to the valley edge, in the more sensitive area.

Theme Area Evaluation, Issues and Opportunities

1. Physical Limitations:

Extensive Area of Steep Slope
Riverbank valley slope and trail erosion
Poor visual quality created by hydro corridor

2. Ecosystem Limitations:

Upland field communities serve as important wildlife corridors
Hydro corridors provide nesting sites for swallows along cliffs
Rare meadow types (unique in GTA)
Eleven regionally and one locally rare plant species

Fifty-five breeding bird species

Relatively undisturbed fields, streams, mixed woodlots coniferous and pine stands

3. Opportunities for Trail Development:

Existing partial East-West links along hydro corridor

Existing North-South Valley lands

4. Trail Management Issues:

Over-use in sensitive areas

Uncontrolled motorized access along hydro corridor

Trail erosion south of hydro corridor

Trail use along slope's edge