CROSSING TOGETHER

TOWARDS IMPLEMENTING LANDSCAPE CONNECTIVITY BEST PRACTICES ALONG THE MEADOWAY

A section of the Meadoway converted as part of the Scarborough Butterfly Trail project
Toronto - November 3, 2018

CROSSING TOGETHER: TOWARDS IMPLEMENTING LANDSCAPE CONNECTIVITY
BEST PRACTICES ALONG THE MEADOWAY

by

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Master of Planning in Urban Development
Ryerson University

ABSTRACT

Urban development represents a fundamental threat to the viability of the functional ecological networks from which humans derive ecosystem services. As urbanized areas continue to grow and intensify, they fragment landscapes removing the connective green tissue capable of supporting a healthy and biodiverse ecosystem. Yet in many cities across North America and beyond, linear adaptive re-use parkland projects are transforming the landscapes of cities by reintroducing functional green spaces through the conversion of abandoned or underutilized utility corridors into greenways for the restoration of habitat, recreation, public transit, and art. In Toronto, the recently announced development of the Meadoway in Scarborough represents one of such opportunities to [re]connect human and wildlife habitat to and within each other along its 16-kilometre length.

Planning for a new linear adaptive re-use parkland represents a 'wicked problem' with no clear solution, only better or worse responses learned through the continued re-evaluation of these responses and by grounding them in their place-specific conditions. This project integrates lessons learned from case examples of linear adaptive re-use parkland projects from across North America to consider the impacts these new amenities have generated on surrounding land uses and the communities that inhabit them. Applying these key lessons to the policy and physical landscape of the Meadoway provides an opportunity to unpack the various strengths, weaknesses, opportunities, and threats associated the redevelopment of this landscape, articulated through three study areas. Using a mixed-methodological approach of case study and policy analysis paired with site observation, this study provides recommendations to the Toronto and Region Conservation Authority, the Weston Foundation, and the City of Toronto, all key development stakeholders of the Meadoway, to inform the implementation of the project's goals and highlight key areas that should be considered given precedents from similar projects.

Overarching recommendations highlight the need to consider: the various physical, temporal, and social understandings of connectivity; the land use changes associated with the introduction of a new greenspace amenity; and the imperative to meaningfully consult and collaborate with communities along the Meadoway to understand how this space can support their growth and vitality. Ultimately, learning from these key areas may provide useful context to future development of other hydro corridors in the Greater Toronto Area.

KEY WORDS
LANDSCAPE CONNECTIVITY, GREEN INFRASTRUCTURE, ADAPTIVE RE-USE, PARKLAND

Sparrows feeding along the Meadoway
Toronto - November 3, 2018

ACKNOWLEDGMENTS

LAND

Landscapes discussed in this Major Research Project (MRP) are the traditional territory of numerous Indigenous Nations and peoples including the Haudenosaunee, Anishinaabe, Wendat, and most recently the Mississaugas of the New Credit and the Chippewa, signatories of Treaty 13 and the Williams Treaties covering what is now known as Toronto (derived from the Haudenosaunee word Tkaronto) and Scarborough. This territory remains home to many Indigenous Nations and peoples from across Turtle Island who, along with settlers, have been welcomed into the Dish With One Spoon treaty in the spirit of peace, friendship, respect, and an agreement to share this territory and protect the land. Beyond acknowledging territory, the Meadoway represents an opportunity to practice these values, and meaningfully collaborate with local Indigenous Nations and peoples through the constant process of reconciliation. I am grateful for the opportunity to work in the community on this territory.

MRP SUPPORT

I want to thank Professor Nina-Marie Lister for her support in guiding and refining this work, and for the opportunity to develop this project through learning and working as a research assistant on her SSHRC project "Safe Passage: Towards an Integrative Planning Approach to Landscape Connectivity". I want to thank Sheila Boudreau of the Toronto and Region Conservation Authority for her insight into the Meadoway project, for her time in helping to refine this project's finished product, and expanding my knowledge of green infrastructure as a means towards reconciliation. I want to thank Aaron Hernandez of the University of Toronto's Daniels Faculty of Architecture, Landscape, and Design for graciously letting me use visuals developed for our work in the Ecological Design Lab to visualize the landscape of the Meadoway. Lastly, I want to thank my colleagues at Ryerson, my friends, and my family for their support throughout this project and over the past two years in working towards my Masters.

A red-winged blackbird perches on a TRCA restoration notice sign
Toronto - March 27, 2019

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An undeveloped section of the Meadoway near Morningside Avenue and Highway 401
Toronto - November 3, 2018

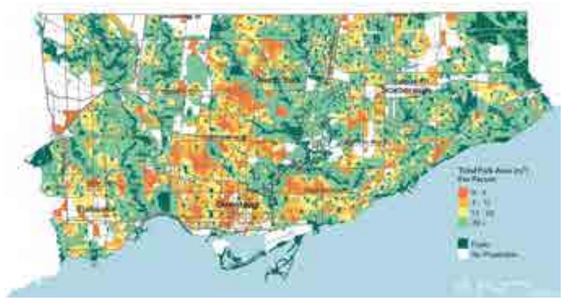
CHAPTER 1
CONTEXTUALIZING THE MEADOWAY

1.1 PLANNING FOR NEW CONNECTED PARKLANDS

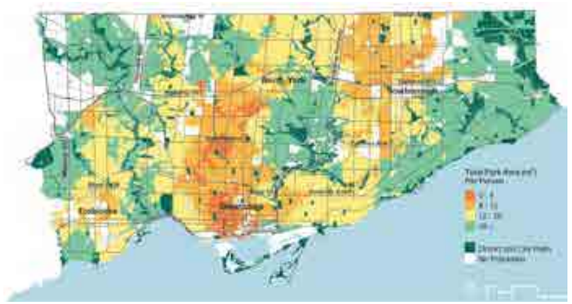
In 2017, Toronto Parks Forestry and Recreation released Phase 1 of their Parkland Strategy providing an overview of the current and projected demand for parks across the City. Toronto is fortunate to possess 77 km^2 of parks and open spaces as well as another 178 km^2 of ravine and naturalized areas, together accounting for approximately 40% of the city's land area (see Figure 1.1.1). Projecting out to 2032 with an expected population growth of more than 500,000 people, the Parkland Strategy outlines the anticipated continuing decline of parkland provision per capita across the city in terms of both overall parkland supply as well as the supply of larger district and city parks (City of Toronto - PFR, 2017). These larger district and city parks provide greater opportunities for the provision of amenities and infrastructure capitalizing on different parkland functions including: ecology, sport and play, community, and health and well-being (City of Toronto - PFR, 2017). While the bulk of this strategy's focus centres on rapidly declining per capita parkland provision in downtown Toronto, North York, and Northwest Scarborough, other significant pockets of priority parkland areas (areas where per capita parkland provision is declining) are anticipated to grow in tandem with land use intensification (see Figure 1.1.2).

Toronto is a city whose land is "all built up and no place to go" (Lorinc, 2015) particularly when it comes to the City's desire to secure more parkland. In a situation such as this where pressure to develop land places development in competition with the acquisition of parkland to complement these areas, cities must think creatively about how to secure parkland and naturalized areas that meet the needs of their users. This challenge is being met by cities across the globe that have turned to the adaptive re-use or the layering of landscape uses to secure new parkland amid pressure from nearby intensifying land uses. Adopting this strategy of parkland expansion alongside traditional parkland acquisition tools provided through the City's planning framework presents the opportunity to capitalize on existing assets to continue building out the parkland network.

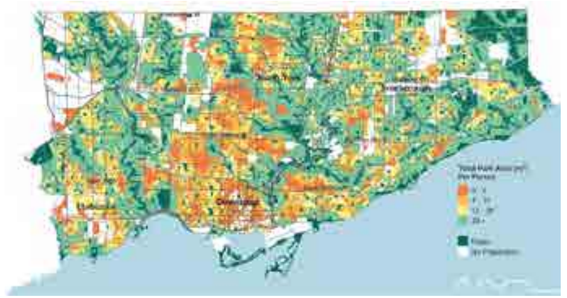
FIGURE 1.1.1 TORONTO'S GREENSPACE NETWORK



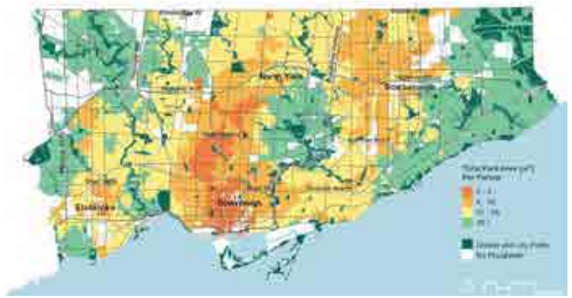
Toronto Parkland Supply (2016)
City of Toronto Parks Forestry & Recreation, 2017 (p. 29)



Parkland Supply of District and City Parks (2016)
City of Toronto Parks Forestry & Recreation, 2017 (p. 30)



Toronto Parkland Supply (2032)
City of Toronto Parks Forestry & Recreation, 2017 (p. 31)



Parkland Supply of District and City Parks (2032)
City of Toronto Parks Forestry & Recreation, 2017 (p. 32)

Figure 1.1.2
Toronto's existing and projected parkland supply
City of Toronto Parks Forestry & Recreation, 2017 (p. 29-32)

THE PARKLAND STRATEGY

Assessing growth and demand for the City's parkland

The City of Toronto's Parkland Strategy (2017) assesses parkland provision through per capita parkland provision, a metric that identifies the amount of public park space (in m^2) that each resident of a specified area has access to if this parkland were shared equally. To determine this, the Parkland Strategy identifies catchment areas for each of the five parkland typologies based on a reasonable walking distance to access a particular park type. Based on these catchment areas, dissemination area population statistics were compiled to determine how many residents live within the park's catchment area to provide a metric of park area per person. Using these methods, Parks, Forestry and Recreation can project the anticipated supply of parkland out to 2032 by using population projections for these dissemination areas. Their report identifies that without significant increases in parkland supply (new parks), every city district would see a decrease in per person parkland supply of 4-5m^2 given that more demand will be placed on these spaces as population increases, posing serious pressure on the parkland assets of numerous areas of the City.

Parkland Classification System
The Parkland Strategy outlines five park typologies that can be found across Toronto. These typologies were developed to differentiate the range of functions parks perform including their ecological properties, recreational opportunities through sport & play, community/ civic activities, and health & wellbeing.

Table 1a. Toronto Parkland Strategy Park Typologies

Park Type	Size (ha)	Catchment Area (km / mins)	Primary users	Activity/Event Types
Parkette	<0.5	0.5 / 5	Local residents	• Passive non-programmed uses
Neighbourhood Parks	0.5-3.0	1.0 / 10	Local residents	• Neighbourhood focal point for passive enjoyment • Limited organized active recreation and special events
Community Parks	3.0-5.0	1.5 / 15	Several neighbourhoods	• Provides specialized features, functions, and programming for multiple neighbourhoods • Programmed and non-programmed recreational activities • Local passive use
District Parks	5.0-15.0	3.0 / 30	Several communities	• Acts as a recreational hub with specialized functions and programs • Programmed and non-programmed recreational activities
City Parks	>15.0	No limit	Users from across the city	• Destination providing natural environment connections, specialized functions, features, and programming • Specialized passive and active recreation opportunities

1.2 CONTEXTUALIZING THE MEADOWAY

One of such opportunities can be found in Scarborough along an active hydro corridor that has seized the attention of the Toronto Region Conservation Authority [TRCA], the Weston Foundation, and the City of Toronto. The Meadoway is a 16-kilometre-long stretch of green space transecting the former Toronto borough of Scarborough in the City's east end (see Figure 1.2.2. The planned parkland corridor utilizes an existing utility corridor provided by the Gatineau Hydro Corridor encompassing over 200 hectares of land. The Meadoway is intended to link 34 neighbourhoods, including six Neighbourhood Improvement Areas (NIAs), 15 existing parks and green spaces, 4 ravines, and 5 watercourses between the Don Valley and the Rouge National Urban Park (TRCA, 2018).

Since its construction in the 1920s, the Gatineau Hydro Corridor has provided Toronto with electricity transmitted along the longest 220,000-volt line in Canada, from its point of generation at Chaudière Falls on the Ottawa River to the heart of downtown Toronto (TRCA,2018). The establishment of this corridor preceded Scarborough's development into the inner suburban borough it currently is today. Beginning in the early 20th century, landowners in Scarborough began to subdivide and sell their farms to accommodate growth pressure stemming from the nearby City of Toronto (Bonis, 1968). Aided by technological advances such as the electric railway and the automobile, Scarborough began its transformation from a small township into a suburb of Toronto (Bonis, 1968). Following the Second World War, development in Scarborough rapidly accelerated adding vast residential, commercial, and industrial areas to the growing municipality (see Figure 1.2.3) (Bonis, 1968). In the wake of the destruction wrought by Hurricane Hazel in 1954, Metropolitan Toronto and the recently formed Metropolitan Toronto Region Conservation Authority (predecessor of the TRCA) began the dual

NEIGHBOURHOOD IMPROVEMENT AREAS

There are 31 Neighbourhood Improvement Areas (see Figure 1.2.1) identified in the Toronto Strong Neighbourhoods Strategy (TSNS) 2020 that demonstrate inequities across criteria such as: the physical and natural environment, economic opportunities, health and wellness, social development, and opportunities to participate in civic decision-making. Almost all of these neighbourhoods are found in the inner-suburbs of Toronto. Using demographic and health and well-being data, each NIA has an associated profile identifying key areas of social, environmental, and health equity that future action should seek to address. The TSNS is intended as a municipal strategy focused on equitably investing, supporting, and strengthening communities, something the document suggests can be addressed through programming opportunities in public realm areas such as parks.

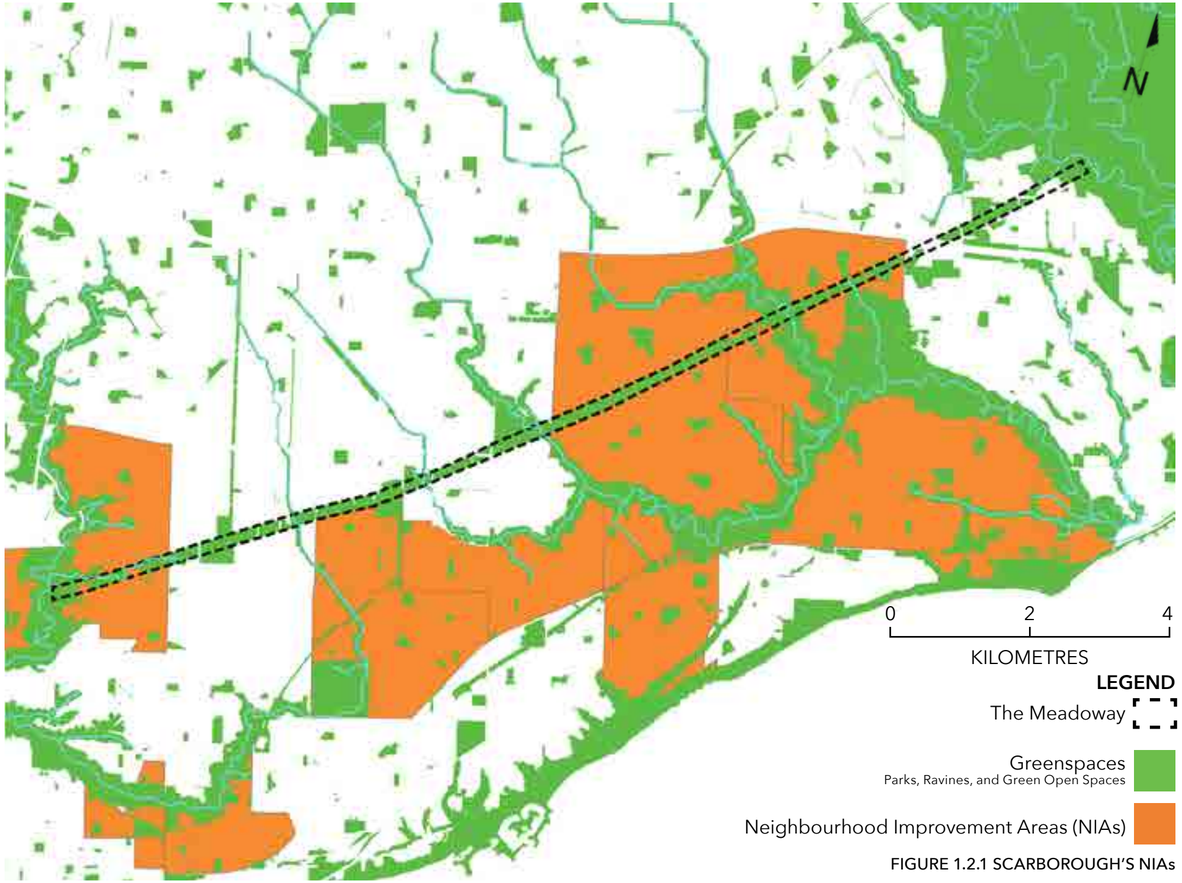


FIGURE 1.2.1 SCARBOROUGH'S NIAs


MEADOW RESTORATION
NO MOW
AREA

Figure 1.2.2 PG 9 & 10
The Meadoway through three seasons

process of acquiring and conserving river valleys lands in response to disastrous flooding that had occurred across the city. Through the acquisition of these lands, new parks emerged to serve the residents of Scarborough, and form the beginnings of conservation efforts that continue today (Bonis, 1968).

With a population of 632,095 and growing, and several prominent land use changes tied to intensifying avenues and centres, Scarborough is positioned to benefit from the expansion of its greenspace network through the development of the Meadoway as a linear corridor linking the borough's parks and naturalized spaces to each other. The Meadoway presents an opportunity to connect these existing parkland areas which range in typologies from neighbourhood to city parks through the establishment of a city park corridor connecting the natural environment and people across the landscape of Scarborough. In order to capitalize on this opportunity, understanding the barriers both in the physical landscape as well as in the organization and governance of this space will be critical in driving future capital investments aimed at connecting this corridor.

In April 2018, the TRCA in partnership with the Weston Foundation and the City of Toronto announced plans to formally develop the Gatineau Hydro Corridor into a linear park branded; the Meadoway. Prior to this announcement, the TRCA, the Weston Foundation,

Figure 1.2.3 The intersection of Eglinton Avenue East at Victoria Park in1949 (left) compared to in 1962 (right)
Hunting Survey Corp Ltd. in Bonis, 1968 (p. 210 & 211)

and the City had already collaborated on several enhancements to the eastern sections of the hydro corridor, restoring 40 hectares of meadowland as part of a community-focused butterfly trail project to protect and encourage pollinator activity (City of Toronto, 2016; TRCA, 2019). This was undertaken following significant advocacy work conducted by the TRCA, the Weston Foundation, and the City of Toronto to persuade Hydro One to revisit its mowing policies (City of Toronto, 2016; TRCA, 2019). Traditionally, Hydro One would regularly mow areas of the hydro corridor to keep the it clear of what was seen as obstructive vegetation with only small meadow patches and trees allowed to develop on sloped or marshy areas (City of Toronto, 2016; TRCA, 2019). Mown grass provides negligible ecological benefit, prompting the TRCA, the Weston Foundation, and the City of Toronto to advocate for the creation of a pilot meadow site on the hydro corridor populated with native plants supportive of local pollinators. The decision to create a space focused on meadow habitat emerged amid a multi-layered set of guidelines developed by Hydro One which dictate what can be placed in hydro corridors and where to ensure the safe transmission of energy. For habitat restoration purposes, these guidelines limit restoration planting to low-level vegetation traditionally found in meadows to provide adequate clearance for the transmission lines (see Figure 1.2.4).

During the lead-up to the Pan Am Games held in 2015, trail improvements including trail repaving and extensions, signalized crossing points at major roads, and new trail-

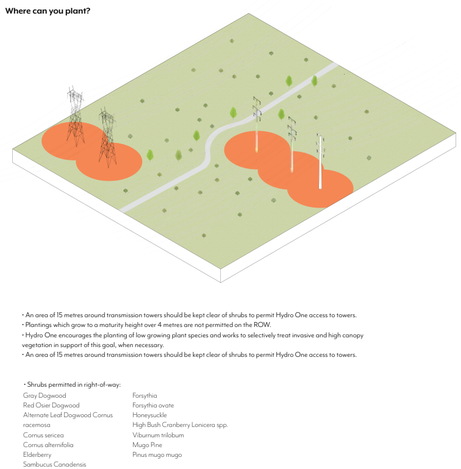


Figure 1.2.4
Hydro One transmission corridor planting restrictions
Hernandez (2018)

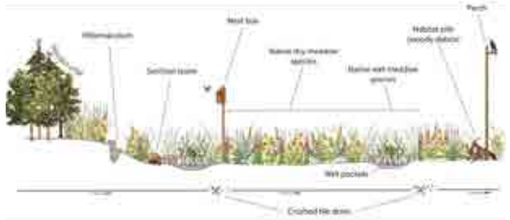


Figure 1.2.4
Schematic cross-section for meadow restoration
Toronto and Region Conservation Authority (2018)

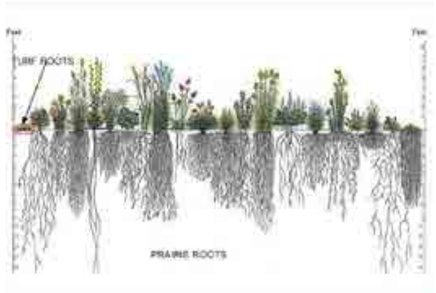


Figure 1.2.5
Meadow vegetation root systems
Holm et al. (2005) (p. 10)

PROTECTING MEADOWS

Meadows represent an important habitat in Southern Ontario that has been significantly disrupted by urban expansion, agriculture, and the suppression of naturally-occurring regenerative processes such as fire (TRCA, 2018). Meadows represent a transitional community of vegetation (see Ecotones in Section 2) dominated primarily by grasses, forbes, and other non-woody plants that when left undisturbed are eventually succeeded by woody plants and trees as part of the landscape's succession (TRCA, 2018). To this effect, disruption through mowing or prescribed burning is an important part of meadow restoration as it removes invasive species and the encroachment of woody plants, and recycles nutrients into the soil (TRCA, 2018). Meadow habitat provides a suite of ecosystem services including habitat for a diverse range of species including several species identified by the *Endangered Species Act 2007* as Species at Risk, while the soil profile of this land classification possesses a deep system of roots capable for reducing soil erosion and increasing water infiltration (see Figure 1.2.4 & 1.2.5) (TRCA, 2018).

PROTECTING POLLINATORS

Toronto is home a range of pollinator species including 360 species of bees and 112 species of butterflies (along with other insects and some birds) which depend on a variety of plant species for habitat providing them with food and shelter (see Figure 1.2.6) (City of Toronto, 2017). Specifically, Toronto's native bee population are most at risk owing to habitat loss (in many cases to invasive species) and pesticides (City of Toronto, 2017). These native pollinators perform a herculean ecosystem service by transferring pollen between plants enabling these plant species to reproduce. These pollinators co-exist as part of an ecosystem that depends on their existence to enable the persistence of a biodiverse mix of species within cities. To support these pollinators, the TRCA with support from the Weston Foundation regularly leads educational and stewardship programming with members of nearby communities, including numerous schools groups, who plant and manage this corridor creating a sense of ownership over this space as well as a deeper understanding of the value these spaces possess as components of a broader ecosystem (City of Toronto, 2017).

road crossing points at collector roads such as Daventry Road and Benshire Drive were implemented to build out the Pan Am Path to Morningside Avenue and the 401 (the location of the Toronto Pan Am Sports Centre).

The Meadoway partnership is now in the preliminary stages of visualizing the design of the Meadoway and seeking to tackle challenges related to the remaining gaps that impede connectivity along the trail corridor between Bermondsey Road in the west and Meadowvale Road to the east. These challenges include but are not limited to the multi-stakeholder ownership and management agreements over this space, layers of regulation and policy shaping change along these corridors, and the particular characteristics of place that define the landscape, many of which create barriers to the effective movement of people and wildlife.

Figure 1.2.6
Pollinator species visiting meadow vegetation
Toronto and Region Conservation Authority (2018)

1.3 PROJECT STRUCTURE

This project examines the structural connectivity associated with a prominent utility corridor that transects the inner-suburban borough of Scarborough in eastern Toronto. Through the examination of structural connectivity associated with the Meadoway this project addresses two principle objectives:

BARRIERS

It examines how landscape barriers are manifested along the Meadoway, and how these barriers differentially impact human groups and animal species, while also highlighting common points of obstruction; and

OPPORTUNITIES

In response to the identification of these barriers, this project explores opportunities for connecting a divided landscape across different landscape typologies exploring the strengths, weaknesses, opportunities, and threats posed by the structural factors that shape these landscapes.

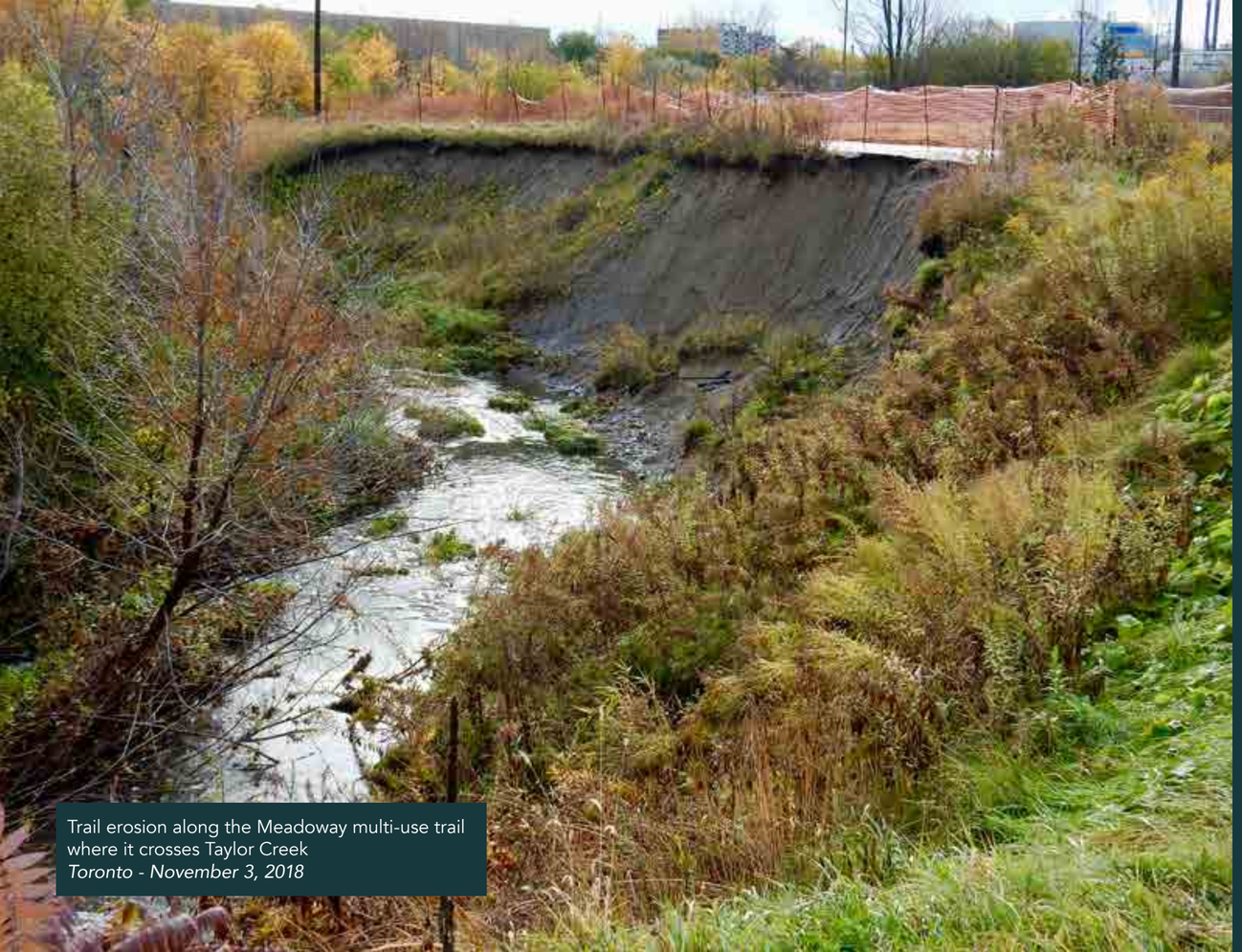
Chapter 2 presents a compilation of several different fields of literature that frame the importance of "leading with landscape" when considering how land uses are managed. Leading with landscape refers to grounding policy, planning, and action in the "nuance of place" (Lister, 2016) understanding how landscapes were and are constantly in a process of formation and development owing to natural, and increasingly human forces. By understanding the genesis and evolutionary path of landscapes, important information can be gathered to inform future directions that capitalize on the ecosystem services provided by nature, by centering their role in the planning and design of these spaces. Drawing on literature focused on landscape ecology, this chapter provides context to the underlying framework informing why regional and local policy refers to the need for landscape connectivity amid an increasingly fragmented landscape in relation to ecosystem services, green infrastructure, and biophilic benefits. Chapter 3 proceeds to outline the methods for analyzing three study sites along the Meadoway, detailing the process of study site selection and subsequent parameters for analyzing how to reconnect a disconnected landscape. Chapter 4 examines these three study sites by first situating the Meadoway within an emerging practice of converting underutilized utility infrastructure into greenspaces through adaptive re-use, and the policy context that guides the Meadoway's development. From there three study sites are examined based on a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis considering how landscape barriers and surrounding development may shape how the Meadoway develops as part of broader response to growth. This analysis concludes in Chapter 5 by offering recommendations for each of the three study sites in response to key learnings from precedents, local policy objectives, and potential paths forward for the TRCA, the Weston Foundation, and the City of Toronto as they develop the Meadoway.

CHAPTER 2
The Challenge of Landscape Connectivity

CHAPTER 3
Project Methods

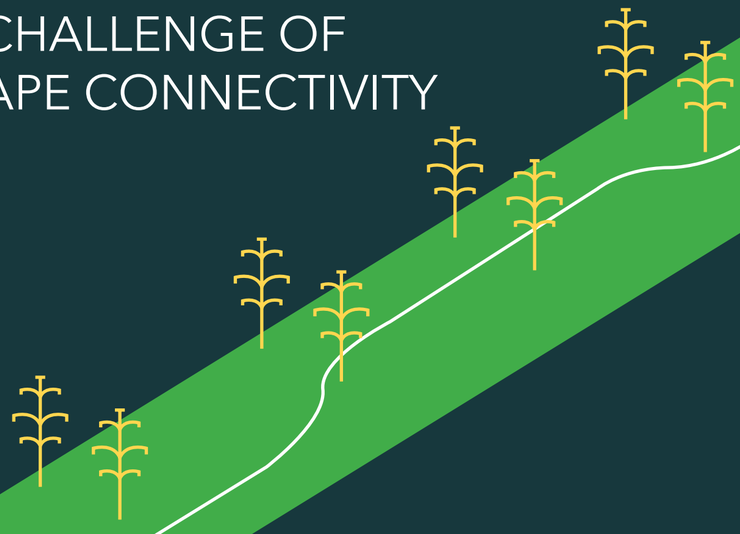
CHAPTER 4
Interpreting Landscape Connectivity

CHAPTER 5
Recommendations & Next Steps



Trail erosion along the Meadoway multi-use trail where it crosses Taylor Creek
Toronto - November 3, 2018

CHAPTER 2
THE CHALLENGE OF LANDSCAPE CONNECTIVITY



2.1 FRAGMENTING LANDSCAPES

Landscape ecologists have been studying the issue of landscape connectivity and fragmentation for several decades and have amassed a substantial body of both theoretical and empirical literature on how landscape barriers impact the ability of species to move across landscapes. As Taylor et al. (1993) discuss, landscape connectivity forms a crucial pillar in conservation practices, one that has come under significant threat from human-driven landscape fragmentation stemming from horizontal development.

Foundational to the study of landscape is the work of MacArthur & Wilson (1963) which introduces the theory of "island biogeography". This theory suggests that the size of a species' habitat and the relative isolation of these habitats influences species composition, with larger patches spaced closer together possessing a greater diversity of species (Figure 2.1.1). Subsequent empirical research has demonstrated that when examining habitat 'islands' or 'patches' that are separated from each other, larger proximate patches experience increased rates of immigration and colonization by species originating from other patches (Fischer & Lindenmayer, 2007) and that the probability of local extinction increases when patch size decreases and/or becomes disconnected for neighbouring patches (Forman, 2003). The ability to move between patches represents a fundamental pillar of discussions surrounding landscape connectivity as it provides the basis for species to fulfill their biological needs (Taylor et al., 1993). Furthermore, as climate change and human activity continue to challenge to the viability of many species, maintaining access to larger areas of connected habitat can improve the resilience of species to environmental disturbances enabling them to adapt or migrate based on these changing conditions (Lister et al., 2015)

Expanding on the theory of island biogeography, the field of metapopulation studies has worked to study how species respond to fragmentation, with the term 'metapopulation' referring to a subset group of a larger population that has been spatially isolated from the larger population (Brown, 1971). Empirical research in this field has investigated the predicted persistence of species in remaining habitat fragments left-over from urban development, consistently demonstrating that fragmented urban environments contributes to species attrition in the landscape, reducing the capacity of many species to exist in these areas (Hanski et al., 1995; Fernández-Juricic, 2001; Williams et al., 2009).

2.1.1 Naturally-Occurring Fragmentation

Barriers exist within the landscape dictating how species will navigate their environment to meet their required biological needs. Within the landscape, features such as topography, watercourses, and land cover type produce barriers impeding movement (Coffin, 2007). The extent to which these barriers influence a species ultimately depends on a variety of factors including foraging patterns, body size, home range size, degree of dietary specialization, mobility, and social behaviour (Harrison, 1992; Lindenmayer & Nix, 1993). Based on these variables, species can be categorized into generalist or specialist species based on their ability to adapt to disruptions. For instance, in urban areas such as Toronto generalist species such as squirrels, raccoons, and sparrows are versatile in their diets, have relatively small home ranges, and are highly mobile within these ranges owing to their size. These generalist species are more adaptive in their habits, and thus are often more resilient than specialist species, even thriving alongside humans. In contrast, specialist species such as monarch butterflies, barn swallows, and Jefferson Salamanders (along with other species the *Endangered Species Act* 2007 considers Species at Risk) have a much lower tolerance for disruption, threatening their existence and risking local extinction.

2.1.2 Human-Driven Fragmentation

Similar to naturally-occurring fragmentation, human-driven fragmentation produces barriers that reduce landscape connectivity. The principle difference between these barriers is that the impacts of human-driven fragmentation pose a serious threat to biodiversity based on the extent and rate of landscape alteration orchestrated by humans (Wilcox & Murphy, 1985). Traditionally humans settled in areas of high biodiversity to take advantage of the ecosystem services necessary to facilitate survival (Luck et al., 2004; Luck, 2007). Humans (as well as wildlife) depend on these ecosystem services through the provisioning, supportive, regulating, and cultural services they provide to overall well-being (Millennium Ecosystem Assessment, 2005). When humans modify the landscape to meet their needs, changing the land use and land cover of an area, they reduce and disconnect existing habitat (see Figure 2.1.2) through the production of barriers (Fischer & Lindenmayer, 2007). As a result this can impede the effective distribution of ecosystem services (Escobedo et al., 2011). These barriers range from linear barriers such as roads (see Section 2.2.1), walls, and fences which transect landscapes, to larger landscape barriers (see Section 2.2.2) created through the changing of land use and land cover (for instance converting a wooded area into farmland or a residential subdivision) (see Figure 2.1.3).

Disruption through the fragmentation of land use and land cover have exacerbated the limiting factors which dictate a species' ability to exist in a landscape. Substantial research has demonstrated that human-driven landscape fragmentation significantly reduces access to resources such as food (Di Gulio et al., 2009), while reductions in the gene pool leads to inbreeding, weakening the genetic diversity of local populations (Hanski & Gilpin, 1991; Hitchings & Beebee, 1997; Keller & Waller, 2002; Fahrig & Rytwinski, 2009; Sawaya et al., 2013). Both of these effects decrease a species' resilience to disruption such as disease or habitat loss. As landscapes continue to be fragmented, many species are driven to local (and in some cases permanent) extinction owing to these processes tied to habitat loss.

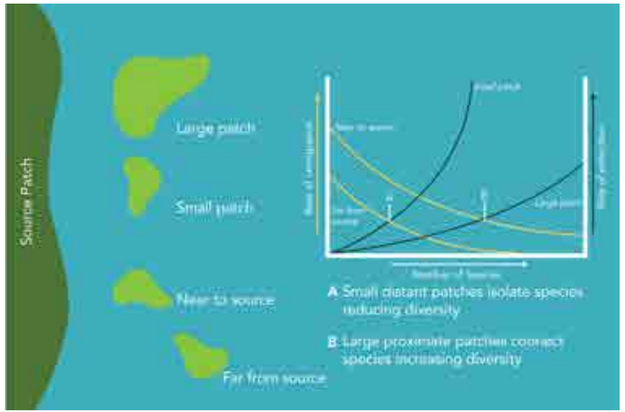


Figure 2.1.1
MacArthur & Wilson's (1963) ecological model of island biodiversity
Redrawn from MacArthur & Wilson, 1963

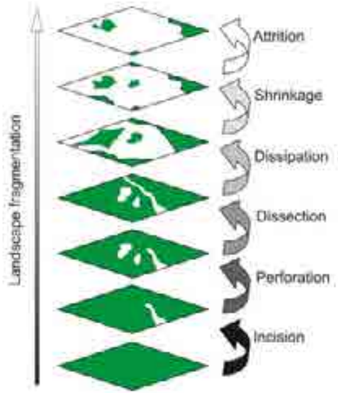
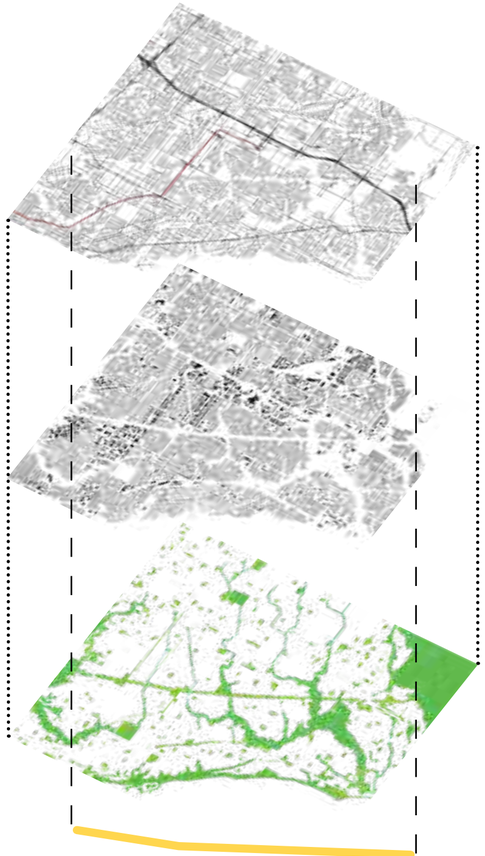


Figure 2.1.2
Stages of landscape fragmentation
Forman (1995)

The effects of landscape fragmentation can be felt by a range of species, for different reasons set out in Section 2.1.1. For some, such as medium and large mammals, who require larger home ranges to satisfy biological needs, landscape fragmentation reduces the amount of habitat available to support the biological needs of these species leading to their disappearance (Benítez-López et al., 2010). For instance, historical research has documented the local extinction of numerous mammalian species in the Toronto region such as moose and elk in the 18th century, as well as black bears, lynx, martens, and others in the early 20th century (City of Toronto, 2012). At a smaller scale, many insects, reptiles, and amphibians are able to support themselves on smaller habitat patches, however increased habitat fragmentation can reduce the ability of these species to diversify their gene pool (Hitchings & Beebee, 1997). As a result of continually urbanizing landscapes, habitat fragmentation poses serious threats to biodiversity in the temperate landscapes of southern Canada, threatening a number of species at risk (MNR, 2008).

Figure 2.1.3
Scarborough's greenspace network represents a patchwork of greenspaces disconnected by roads and urban land cover. The ravine system offers a valuable opportunity to preserve and connect habitat areas.



THE MEADOWAY

represents an opportunity to reconnect and restore continuity between these green spaces, and a chance to build resilience in the communities that surround it.

LINEAR INFRASTRUCTURE

such as roads and rail lines cut across the landscape of Scarborough creating barriers to movement for humans and wildlife. Safe, convenient options for walking and cycling across this landscape are limited.

LANDSCAPE MODIFICATION

is the human-driven process of continually altering the landscapes that they depend upon for a range of ecosystem services. The erosion of these green spaces weakens cities, subjecting its residents to environmental shocks and stressors.

LANDSCAPE REMAINDERS

are the green areas of urban landscapes that offer benefits for humans, while some provide habitat for species that have adapted to urban living. Ravines provide important north-south connections within the Natural Heritage system however opportunities for east-west movement are limited.environmental shocks and stressors.

2.2 THREATS LEADING TO FRAGMENTATION

As outlined in Section 2.1, landscape fragmentation represents a growing phenomenon that has been exacerbated by human-led modification of the environment. The current geological epoch, the Anthropocene, reflects the fact that human activity is now the driving force behind these changes, producing threats to the vitality of all species, including humans. To understand the need for landscape connectivity, it is important to understand two of the most pressing human-driven threats contributing to landscape fragmentation: roads, and the development and intensification of land which neglects or inadequately addresses connectivity through the land use planning process. These overarching human-driven alterations to landscape present a range of exogenous, endogenous, and stochastic threats to the ability of species to adapt and survive in response to human action that perforates, dissects, and subdivides the landscape (Fischer & Lindenmayer, 2007). Furthermore, while environmental scholarship has largely examined the impacts to wildlife posed by fragmentation, the effects of these two threats are also well documented in literature dealing with human mobility and accessibility through active transportation.

2.2.1 Road Ecology

One of the most impactful human-created barriers responsible for landscape fragmentation is the construction of roads. Pioneering road ecologist Richard Forman introduced the concept of "road ecology" (1998) arguing that roads present a disruption to ecosystems with dramatic effects. Scholars have pointed to both the abiotic and biotic impacts road have on ecosystem functions. Abiotically roads present disruptions to local hydrology altering water quality, erosion processes, and sediment transport. They also involve changes in energy (light) available to the surface altering the composition of vegetation (Spellerberg, 2002; Crooks & Sanjayan, 2006; Beckman et al., 2010). Under these micro-climatic conditions, edges are produced which present the opportunity for some select species to thrive at the transition point (commonly referred to as an ecotone) between habitat (Coffin, 2007). Roads also introduce chemical pollutants (such as road salt) altering the landscape as these chemicals are spread to nearby areas (Coffin, 2007). These abiotic factors carry forward changes in the biota, with plant communities and fauna being forced to either adapt or perish based on their ability to satisfy their biological needs from this landscape.

Roads have been shown to produce biotic impacts including changes in plant communities in response to abiotic factors as well as changes in the behaviour of many species. Edges facilitate natural processes associated with landscape succession, however they also expose the landscape to invasion by exotic species capable of outcompeting native vegetation, altering the habitat and producing conditions that may not support the continued existence of certain species (Spellerberg, 2002; Crooks & Sanjayan, 2006; Beckman et al., 2010; Joly et al., 2011). Furthermore, it is well documented that human activity, specifically construction that transports fill significantly increases the ability of exotic species

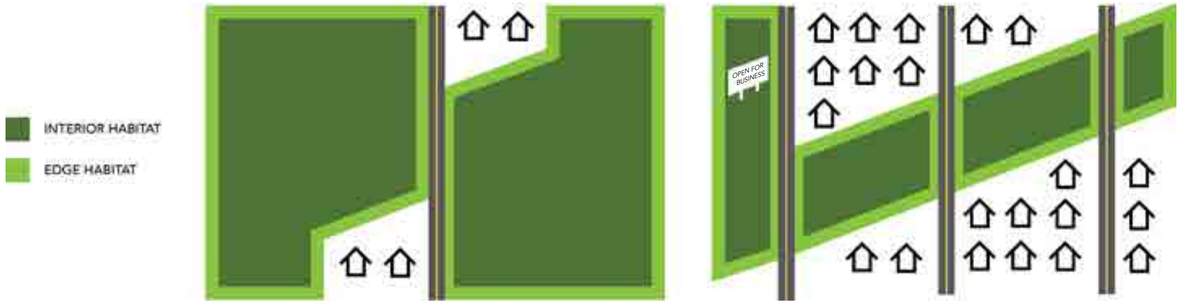


Figure 2.2.1
Conceptual representation of the effects of road construction and intensification on interior and edge habitat. Note the loss of interior habitat and the growth of edge habitat with the dissection and conversion of land cover.

EDGE EFFECTS

To understand the importance of edges on fragmenting landscapes, it is important to understand these spaces as places of transition between different biomes, commonly referred to as ecotones. Similar to barriers, ecotones occur naturally and serve as important sites for a diversity of species and plant communities to flourish where biomes transition (Duelli, 1997; Kumar et al., 2006). Whenever a landscape is modified through the construction of a road or a change in land use more generally, it creates a new set of climactic conditions that differ from the landscape that existed previously creating transition spaces into areas of existing interior habitat. With each disruption in landscape, new ecotones are created, decreasing the area of interior habitat available to species through replacement with greater areas of edge habitat (see Figure 2.2.1) (Saunders et al., 1991, Coffin, 2007).

While ecotones represent an important part of maintaining diverse and vibrant ecosystems, rates of interior habitat loss owing to landscape fragmentation through human-driven development present serious threats to specialist species relying on these interior habitat areas. Furthermore, unlike naturally occurring ecotones, human-generated ecotones are characterized by their linearity and frequent disturbance, posing challenges to the ability of ecotonal species to thrive (Kent et al., 1997; Di Gulio et al., 2009). Over time, shrinking habitat patches will be unable to support local populations. When combined with the inability of many species to cross between habitat patches, this has been shown to dramatically reduce populations sizes and the likelihood of persistence in a landscape (Fahrig, 2003).

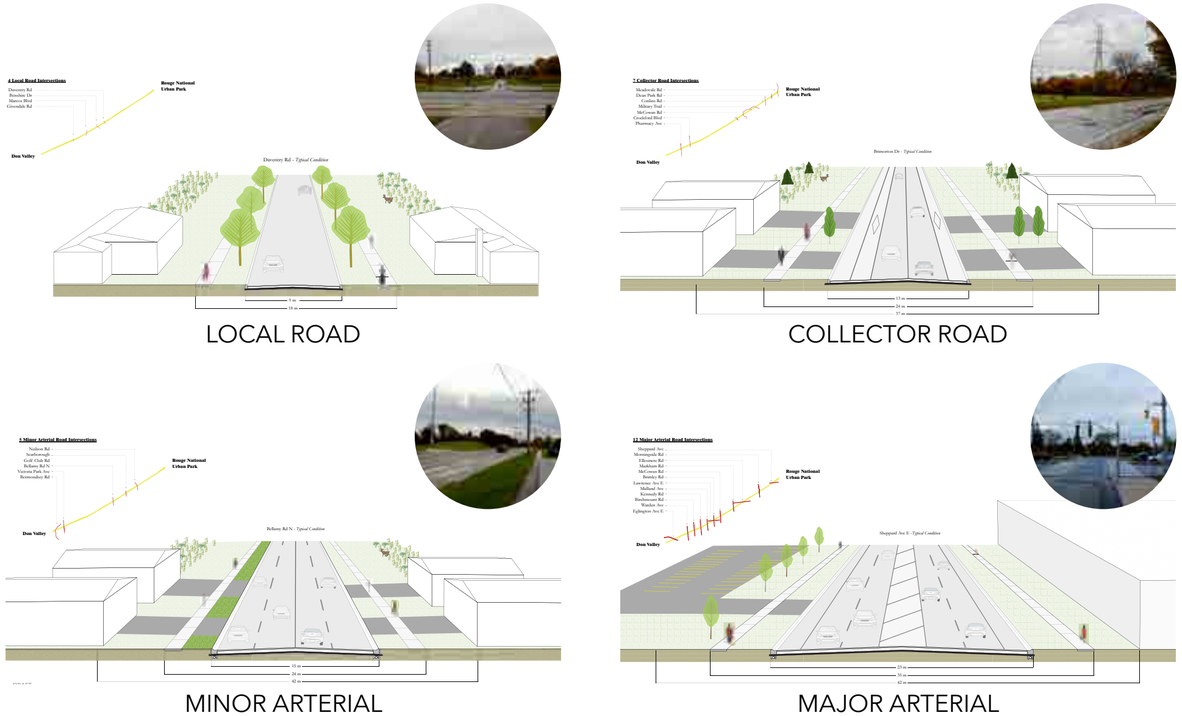


Figure 2.2.2
Typical condition of local, collector, minor arterial, and major arterial roads transecting the Meadoway
Cross-sections - Hernandez (2018)
Images - Toronto - November 3, 2019

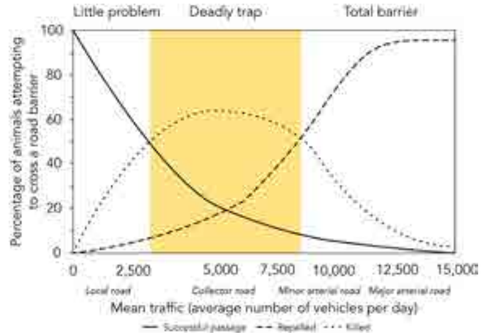


Fig 2.2.3
Conceptual relationship between traffic volume, wildlife road mortality, and the barrier effect
Huijser et al. (2007) - an adapted figure from Seiler (2003)

to propagate (Joly et al., 2011). These changes in vegetation may translate to changes in species behaviour around roads. In some instances, the edges created by roads provide new areas for local foraging, particularly for meadow species such as deer (Coffin, 2007).

These changes produce what is referred to as an "ecological trap" whereby rapid change in the landscape subjects species to settle in lower quality habitats (Hale & Swearer, 2016). In the case of roads, the new habitat created on edges places species at increased risk of wildlife vehicle collisions (WVCs). Wildlife vehicle collisions represent the most common cause of wildlife mortality in the United States (Huijser et al., 2007). With an increase in the pervasiveness of roads within landscapes that dissect habitat patches (leading to the reduction of roadless areas in the world), the issue of WVCs is projected to increase, making roads a direct threat to the survivability of numerous species (see Figure 2.1.3) (Huijser et al., 2007).

2.2.2 Development & Intensification

Whereas roads fragment landscapes by creating barriers and producing edges, human development and intensification of land uses, which inevitably involves the alteration of land cover, represents a more comprehensive fragmentation of landscape, reducing the overall size of habitat patches as well as the connectivity between them. One of the key mechanisms through which this process occurs is urban sprawl.

The Greater Toronto Region is experiencing unprecedented growth with an anticipated 40 percent increase in population by 2041, bringing the region's population close to 10 million people (Ontario Ministry of Finance, 2017). The Growth Plan for the Greater Golden Horseshoe (2017) outlines how this growth will take place, and stipulates that within the Toronto region, twelve Urban Growth Centres and 25 new communities will accommodate the majority of this growth (TRCA, 2018). Pressure to meet these growth targets poses two challenges to landscape connectivity. For one, there remains a limit to the ability of land use policy to preserve

landscape connectivity given that the development of any plot of land inevitably involves removing a substantial portion of pre-existing habitat, replacing it with another land use and land cover (Collinge, 1996). While significant strides have been made in the realm of planning practice through targeted policy and consistent land use regulation that seek to preserve or restore some habitat during the development process, the effect of this has generally produced a series of disconnected small habitat patches and corridors lacking coordination (Munroe et al., 2005).

In order to plan more ecologically functional landscapes, research suggests that the challenge of planning for connectivity must be addressed through transdisciplinary practice which focuses on breaking down silos of professional work (Lister et al., 2015; Aird, 2017; Hack, 2018), and modifying the scale of planning so that there is greater emphasis on ecological functionality defined and managed at the scale of ecologically significant units such as watershed areas (Baschak & Brown, 1995; Logsdon & Chaubey, 2013). At the sub-drainage area level, Southern Ontario is one a few areas in the country with higher proportions of modified landscapes (referring to land cover conversion from natural or naturalized landscapes to urban or agricultural landscapes) compared to natural or naturalized landscapes (Statistics Canada, 2013). Policy responses that prioritize intensification through vertical growth such as the Growth Plan (2017) and the Greenbelt Plan (2017) provide the overarching direction in Ontario towards limiting the removal of habitat patches and agricultural land from the Greater Toronto region.

While the protection of existing habitat patches plays an important role in environmental conservation, in areas where landscapes have already been fragmented by urban development, reconnecting these disconnected habitat patches in a coordinated manner has proven difficult due to challenges surrounding land acquisition in terms of both the availability and the cost of purchasing land to add to the existing greenspace network (Lorinc, 2015; TRCA, 2016). In response to these challenges, local and regional organizations seeking to promote landscape connectivity have been forced to think creatively and allocate resources towards the implementation and evaluation of these projects in order to meet their goals with regard to reconnecting landscapes.

THE HUMAN DIMENSION OF LANDSCAPE CONNECTIVITY

While much of the conversation surrounding landscape connectivity and fragmentation has focused on the impacts experienced by species adapting to co-exist in landscapes shaped by human forces, conversations surrounding reconnecting divided landscapes occupy a growing area of research in the study of active transportation (walking and cycling) in relation to land use planning. Specifically, research documents the challenges posed to mobility and accessibility created through the development of land uses that prioritize vehicular movement over active transportation. Suburban development is particularly guilty of denying residents the ability to access neighbouring areas without the use of a vehicle (Li et al., 2015). Wheeler (2003) discusses through an analysis of Toronto's urban form how the urban fabric typologies of the mid to late 20th century, whose emphasis was on the movement of cars through suburbs, produced a pattern of isolated areas discouraging active transportation. Beyond isolation, research has documented the danger posed by suburban built form to pedestrians and cyclists (Ewing et al., 2003) who are disproportionately represented in collision fatalities. In 2017, 40 vulnerable road users (36 pedestrians and 4 cyclists) were killed as a result of traffic collisions with a driver, compared to 22 vehicle driver or passenger deaths (Toronto Police Services, 2019). Of these deaths nearly half occurred in Scarborough while these individuals were attempting to cross arterial roads, highlighting comparable issues related to safe passage shared by both humans and animals in landscapes dominated by vehicles.

Research into different demographic brackets have further exposed the challenges this disconnected landscape poses to humans. For younger residents, walkable ranges are largely limited by parental perceptions of danger to between 250 metres to 1,600 metres (Villanueva et al., 2012), posing issues for independent mobility through active transportation when there exists a lack of destinations for children to access (Foster et al., 2014). For older residents, poor traffic conditions, a lack of destinations, poor sidewalk quality, and a lack of street lighting pose major barriers to walking in suburban areas (Mitra et al., 2015). As Di Gulio et al (2009) summarize, landscapes that impede movement either through physical or psychological barriers have negative effects on human health and social interaction, impacts that negatively affect vulnerable groups such as children, the elderly, and those without a vehicle most significantly.

2.3 [RE]CONNECTING LANDSCAPES

Reconnecting landscapes falls within an emerging direction in city-building that focuses on supporting the resilience of cities and their communities. Resilience is defined by the capacity of systems to respond to change, adapt, and resume a functional state following disruption (Ahern, 2013; Lister, 2016). Particularly in response to climate change, resilience advocates stress the imperative of designing with nature using green infrastructure as a means of facilitating climate adaptation while also recognizing the multifunctional benefits that can be derived from this infrastructure in the realms of health and well-being, and community engagement.

2.3.1 Development & Intensification

The imperative to expand urban greenspaces stems from a recognition that cities are increasingly at risk relative to uncertainties and potential disruptions to environmental, social, and economic systems. Stewarding existing, and developing new green infrastructure represents an imperative to "design with nature" (McHarg's,1969). As Beatley (2016) documents, cities are increasingly gravitating towards enhancing nature amid concerns over the impact of climate change. In response, many have turned to revisiting their infrastructural systems in an effort to capitalize on ecosystem services through the creation of Low Impact Development (LID) initiatives, commonly referred to under the umbrella term of green infrastructure. Green infrastructure is defined as "a network of green spaces planned and managed as an integrated system to provide synergistic benefits through multifunctionality" (Landscape Institute, 2009), often implemented through the creation and preservation of physically green spaces in order to benefit from the ecosystem services associated with these spaces. In cities, green infrastructure ranges from the macro-scale of naturalized areas such as ravines, and parkland to the micro-scale through the creation of features such as pollinator or rain gardens, bioswales, and a range of permeable surfaces.

ECOSYSTEM SERVICES

Millenium Ecosystem Assessment (2005)

SUPPORTIVE SERVICES
enable the provisioning of resources through natural processes such as nutrient cycling, primary production, soil formation, and pollination.

PROVISIONING SERVICES
provide humans with the resources needed to survive such as food, raw materials, energy, and biogenetic materials.

REGULATING SERVICES
manage environmental processes such as climate regulation, carbon sequestration, air and water purification, and waste decomposition and detoxification.

CULTURAL SERVICES
are those which humans experience through their interaction with ecosystems such as spiritual and cultural benefits, education, therapeutic experiences, and recreational activity.

Green infrastructure is commonly associated with naturalizing water management through the implementation of landscape features such as green roofs, bioswales, permeable pavement, and rain gardens which improve surface permeability, reducing stresses on 'grey infrastructure' by managing water locally rather than diverting it into sewer infrastructure. Traditionally, the implementation of green infrastructure places an overemphasis on these stormwater management characteristics, discounting the multitude of benefits that can be derived from its implementation (Ahern, 2013). For instance, rain gardens offer a good example of how green infrastructure exerts its multifunctionality by addressing all four ecosystem services. Rain gardens are supportive in their composition of native plants supporting pollination, they can provide sources of food depending on the plant communities selected to comprise them, they assist in regulating stormwater and micro-climatic conditions (such as the Urban Heat Island Effect), and they can serve as a source of nature therapy through their maintenance and observation (see Figure 2.3.1). Increasing the amount of green infrastructure in cities also brings a range of cultural services that humans can benefit from through exposure to these green spaces. It is well-documented that humans possess a subconscious attraction to nature and subsequently benefit from exposure to naturalized environments (Wilson, 1986). Research has shown that attractiveness, as defined by the presence of vegetation, walking paths, seating, and lighting is the most important attribute associated with adult recreational walking in Neighbourhood Open Spaces (NOS) (Sugiyama et al., 2010). Furthermore, by increasing rates of walking to NOSs through improvements to aesthetics and connectivity, research has observed increases in the

Figure 2.3.1
Rain gardens provide a range of ecosystem services
Parc Bonaventure, Montréal - October 27, 2018

physical and mental well-being of nearby residents (Maller et al., 2006; Velarde et al., 2007; Barton & Pretty, 2010; Christian et al., 2017).

Yet the value placed on green infrastructure and biophilia can be difficult to quantify and is often overlooked or simply not understood (Beatley, 2016). In 2013, Toronto was hit by an ice storm which ultimately cost the City $106 million in clean-up and emergency services (Lister, 2016). Yet these costs failed to account for the 20% loss in the City's tree canopy and the ecosystem services this green infrastructure provides (Lister, 2016). The following year, a special report on Toronto's urban forestry assessed the value of Toronto's tree canopy at $80 million per year in terms of environmental benefits and cost savings (including wet-weather flow management, air quality improvements, carbon sequestration, and energy savings) (Toronto Dominion Bank, 2014), while still failing to consider other factors such as the physical and mental health benefits of nature (Beatley, 2016). Despite these challenges, measuring the value of high-performance landscapes is improving. The Landscape Architecture Foundation has spent the past decade assembling case studies documenting the environmental, social, and economic benefits of high-performing landscape projects. The products of this research now provide a series of metrics and methods that can be used to assess the performance of landscapes (Landscape Architecture Foundation, 2018). While these metrics and measurements may help to persuade other professionals and politicians to explore these options, one of the key challenges facing the uptake of these new landscape forms is public perception and uptake by local decision-makers including politicians but also professional planners, urban designers, architects, and landscape architects (Beatley, 2016).

Nature has and will always exist in some form in cities, the extent to which this is apparent to residents however relies on both an understanding of how nature is recognized in cities as well as how it is perceived as part of the landscape (Beatley, 2016). Specifically, Beatley (2016) notes that nature in cities is typically devalued in comparison to nature that is viewed as 'wild'. While these 'wilder' places of seemingly pristine nature occupy an important point on the nature pyramid (see Figure 2.3.2), overemphasizing the importance of these experiences which are difficult to regularly achieve in large cities has the effect of skewing public perception on the presence of nature (Beatley, 2016). This combined with challenges associated with the equitable access of city-dwellers to resources that facilitate exposure to nature presents an on-going challenge for cities seeking to advocate on behalf of greenspaces that provide both operational ecology and biophilic benefits (Beatley, 2016). In response to these challenges, reframing how nature is perceived in cities represents one of the key pillars in reconnecting people with nature (Beatley, 2016). Opportunities for developing this nature connection are abundant ranging from the creation of nature-based or representative art (Beatley, 2016) to the creation of designer landscapes highlighting particular ecosystems (Lister, 2007). Yet the most effective opportunity for increasing both understanding and lifelong appreciation of nature lies in experiencing it in an immersive and tactile fashion (Beatley, 2016). Curiosity is at the core of developing this appreciation for a range of nature experiences. Whether through citizen science initiatives, nature walks, planting afternoons, or simply just getting hands dirty, experiencing the awe of nature in its various forms represents an integral part of building and supporting biophilia in cities (Beatley, 2016) one that many nature advocates and doctors are beginning to prescribe as part of treatment regimens (Louv, 2005; Williams, 2017).

Figure 2.3.2
Conceptual diagram of the Nature Pyramid
Denckla-Cobb & Beatley in Beatley (2016)

2.3.2 Designing for Resilience

Prioritizing greenspaces also represents an institutionally recognized strategy for promoting resilience. The American Society of Landscape Architects advocates for the implementation of resilient design by working with nature rather than against it, offering a series of design solutions that seek to address challenges such as biodiversity loss, drought, extreme heat, fire, flooding, and landslides. Designing for resilience contends that change is not an undesirable quality but rather a dynamic approach where humans should seek to adapt to change rather than attempting to resist it. This worldview has disrupted the prevailing ecological paradigm focused on sustainability, removing the notion that humans can foreseeably control or resist natural systems (Dale, 2001).

Shifting to prioritize designing for resilience stresses that designs should be adaptive and possess transformational qualities that allows humans to adaptively manage responses to stressors and challenges that face cities and the people that inhabit them. To do so, Lister (2016) argues that planning and design that promotes resilience must address four key factors in its conceptualization and process.

PLANNING & DESIGN FOR RESILIENCE

LISTER - 2016

1 Resilience must acknowledge that change occurs at different temporal and spatial scales making it sometimes challenging to understand how interlinked and multi-scale processes are unfolding. This is particularly important for slow and large-scale processes which may be difficult to "see" given the temporal and spatial limitations of human experience (see Figure 2.3.3). Working to understand these slow and large-scale processes represents an integral but challenging component of working towards adaptive responses to challenges facing cities.

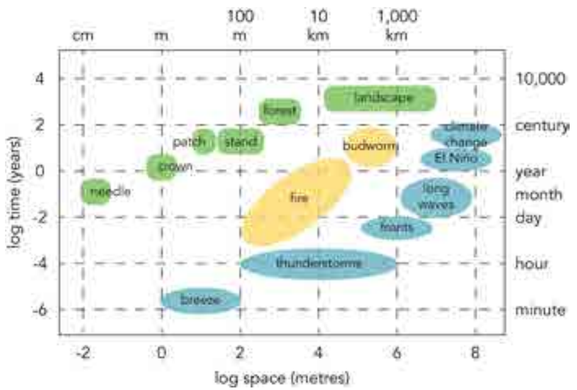
2 Resilience must support connectivity and modularity encouraging both tight and loose feedback loops. These feedback loops are vital to surviving system shocks by both allowing the system to isolate the shock while also providing redundancy and support to recover.

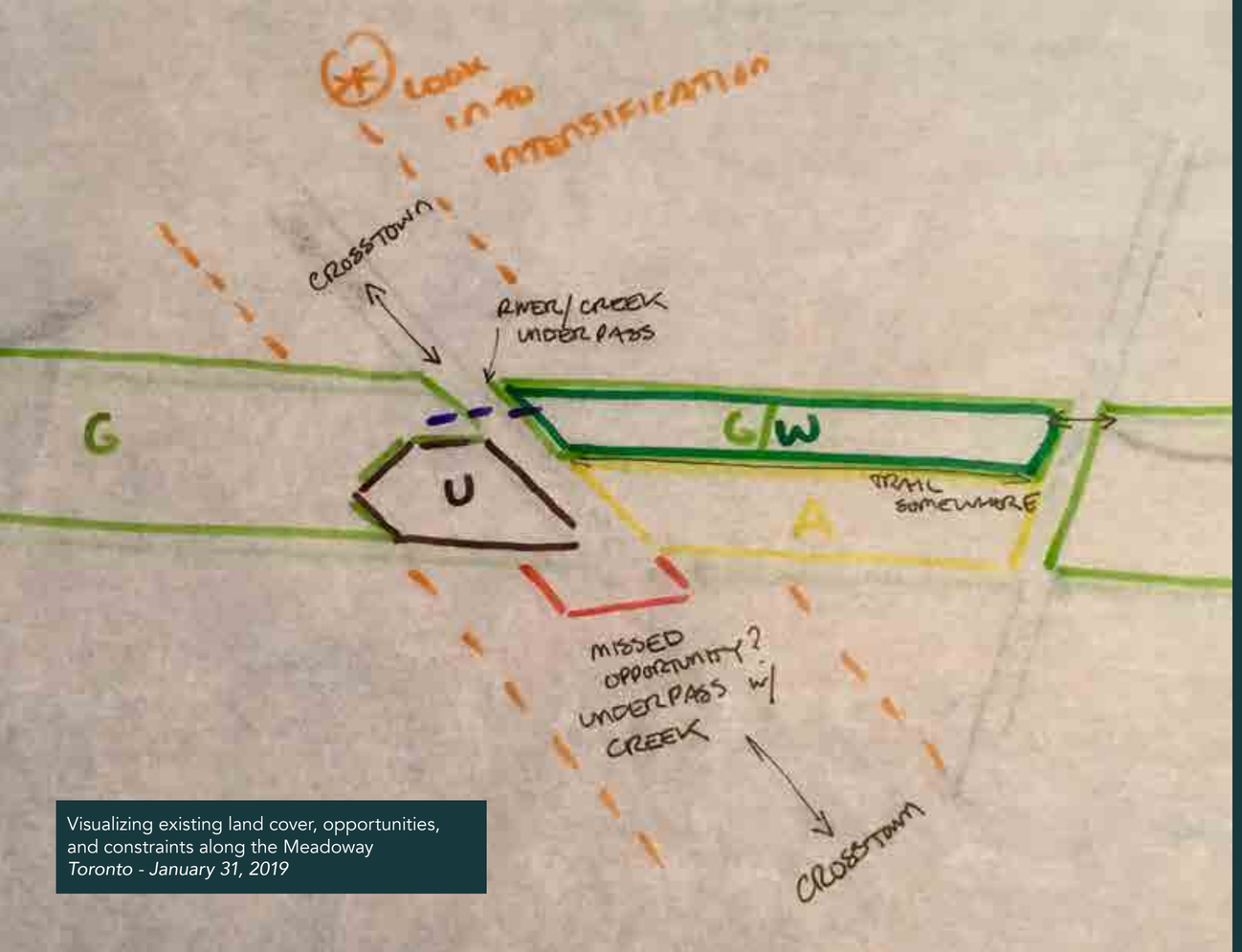
3 Resilience must dispatch the notion of a single 'correct state' embracing a non-linear approach to design that allows for multiple changing states to occur across time in place.

4 Resilience must also support diversity and expect uncertainty. Diversity in this case refers to a variety of place-based responses designed to be safe-to-fail rather than fail-safe. When designing these responses, a safe-to-fail design is one that does not compromise larger systems while allowing its designers to learn and adapt from this new knowledge. One method of doing this is through an emphasis on mimicking ecological structures and their functions, emphasizing the role of green infrastructure in performing these functions and evolving.

Building ecological resilience into the design of cities through an understanding of landscape processes represents an emerging frontier in city-building designed to adaptively manage the challenges cities face regarding growth, inequality, and climate change. By integrating these principles in disciplines such as urban planning and landscape architecture, opportunities exist to improve decision-making processes surrounding the design of infrastructure. This decision-making process can be further enhanced through transdisciplinary collaboration between professions such as urban planners, landscape architects, urban designers, engineers, and ecologists to develop these safe-to-fail designs (Lister, 2016; Aird, 2018).

Figure 2.3.3
Ecosystem dynamics should be understood as possessing different spatial and temporal scales
Lister (2016) - an adapted figure from Holling (2001)





Visualizing existing land cover, opportunities, and constraints along the Meadoway
Toronto - January 31, 2019

CHAPTER 3
PROJECT METHODS

3.1 METHODS

In order to better understand the barriers and opportunities present along the Meadoway, this study employs a multi-methodological approach examining precedents, policy, and landscape observation and interpretation to provide cues towards opportunities for the corridor's redevelopment. Precedents provide the groundwork to understand key learnings from other adaptive re-use parkland projects that highlight important considerations for the project. Layering in local and regional policies creates the structure upon which opportunities can be developed responding to place-based challenges uncovered through site visits.

3.1 Review of Linear Adaptive Re-Use Parkland Projects

To begin, a review of case examples of linear adaptive re-use parklands from across North America, Europe, and Asia was undertaken to contextualize the Meadoway's development alongside other similar projects. Case examples were selected based on a review of fully and partially completed and planned (with opening date) adaptive re-use parkland projects found within the Highline Network's project database. Robert Hammond and Joshua David developed the High Line Network as a means of connecting leaders of adaptive re-use projects from across North America in an attempt to mitigate negative externalities associated many of the adaptive re-use park projects underway across the continent (High Line Network, 2017). To date, 19 projects are members of the Network, connecting regularly to share knowledge related to the design and funding but arguably more importantly, these meetings seek to address "wicked problems" associated with these projects such as integrating local ecology and equity needs into the design and implementation of these projects. Additional adaptive re-use projects were included based on other well-known adaptive re-use parkland projects. Case examples were compiled and compared across variables including:

Adaptive Re-Use Comparison Variables

- Former use
- Development structure
- Construction cost (in USD)
- Key development and operational stakeholders
- Societal Benefit/Goals outlined by the project's creators
- The presence of landscape elements including: multi-use trails, adjacent connection to neighbourhood parkland, public transit, explicit reference to initiatives designed to benefit or mitigate against the displacement of vulnerable populations, explicitly reference to promoting operation ecology, and commissioned art pieces.

The full table detailing these variables can be found in Appendix A.

3.2 Policy Interpretation

The imperative to plan for landscape connectivity is outlined in Ontario's legislated planning framework and is subsequently addressed through a hierarchy of planning policies and strategies enacted at regional and local scales. These documents provide the basis upon which the Meadoway is legitimized as an opportunity to connect areas of Natural Heritage. Interpreting this hierarchy of planning establishes the framework for subsequent analysis sections examining how these policy and strategic directions can be implemented according to local conditions found within the landscape. Of particular importance in this section is the identification of how broader regional growth policies are being implemented at sites within 1-kilometre of the Meadoway crossing points, and the demand this places on the City of Toronto to acquire and develop parkland to support of these developments.

3.3 Identifying and classifying landscape barriers

Ryerson's Ecological Design Lab researches the impact landscape barriers have on the connectivity. To date this research has focused primarily on the planning and design of a new generation of wildlife crossing infrastructure in Alberta, Montana, and California capable of safely moving wildlife across roads connecting them to habitat, dramatically reducing wildlife-vehicle collisions (see Figure 3.1.1). Building on this, emerging research has begun to explore the intersection of wildlife and human landscape connectivity in urban areas such as the Greater Toronto Area and Edmonton. Understanding the challenge of

Figure 3.3.1
Exploring integrative wildlife crossing design
Calgary - December 13, 2018

landscape connectivity along the Meadoway represents a complex, "wicked problem" where no one profession possesses the knowledge capable of proposing a response to this challenge. Understanding opportunities for redeveloping the Meadoway therefore requires a transdisciplinary approach to collaboration. Working with fellow research assistant Aaron Hernandez from the University of Toronto's Daniel's School of Architecture and Landscape Architecture, a list of 36 landscape barriers were compiled and categorized into barrier types of both geological and human origin (road, rail, and watercourse). Of the 36 barriers, 30 are roads ranging from local roads to expressways. These 30 roads were subsequently classified

into 5 subgroups: local roads, collector roads, minor arterials, major arterials, and expressways. The other 6 barriers include named watercourses such as the various branches of the Highland Creek, and transportation infrastructure rights-of-way such as the Scarborough RT and Stouffville GO line.

Using ArcGIS to layer data from the City of Toronto and the Toronto Region Conservation Authority, each of the 36 landscape barriers are visualized alongside data highlighting land use/land cover and high-level policy areas bordering the crossing points. These variables include:

Landscape Barrier Comparative Variables

- Land use designations (zoning) on either side of the Meadoway
- Additional planning policies (in place or under review)
- Land cover of the Meadoway on either side of the landscape barrier
- Neighbourhood Improvement Area designation
- Natural Heritage designation
- TRCA regulation area designation
- Environmentally Significant Area designation
- Existing crossing locations

The full table detailing these variables can be found in Appendix B.

3.4 Selecting Study Sites

As identified in Section 2.1, one of the greatest challenges associated with developing the Meadoway into a continuous corridor for human and wildlife movement is the inherent variability of landscape barriers that impede movement between the Don and Rouge rivers. Notably these barriers range from the daunting crossing where the Meadoway must cross 21 lanes over a span of 725 metres over Highway 401 to the seemingly mundane local roads. These two extremes are not the focus of this project however their importance in promoting an integrated corridor should not be forgotten given the pervasiveness of roads as barriers to connectivity along the length of the corridor and the potential to innovate new forms of crossing infrastructure. Rather this project aims to identify opportunities for connecting geographically larger trail gaps along the Meadoway while accounting for opportunities to deliver improved ecosystem connectivity in the process.

To narrow the field of potential cross-sections to investigate, landscape barriers were systematically sorted, distilling landscape barrier typologies that stress different opportunities and challenges that will impact how the Meadoway is developed. Landscape barrier study sites are first selected based on the absence of a trail connection at that barrier (coded as "0" under "existing multi-use trail access (within corridor)") or the presence of a trail ending (coded as "2" under "existing multi-use trail access (within corridor)"). This narrows the number of landscape barriers to 15. These connectivity gaps identify areas along the Meadoway that the TRCA and the City of Toronto in collaboration with the Weston Foundation are seeking to connect to the existing trail network along the Meadoway. Scanning the remaining landscape barriers, three landscape barriers emerge as study sites stressing a mix of landscape variables (outlined in Section 3.2) that will require different design responses as part of the development process. The three study sites selected for further analysis are:

Project Study Sites

1 The Meadoway at Eglinton Avenue
(near Victoria Park Avenue)

2 The Meadoway at the Scarborough Rapid Transit and GO Stouffville line
(near Kennedy Road and Lawrence East Avenue)

3 The Meadoway at Military Trail/ Highland Creek
(near Military Trail and Ellesmere Road)

These study sites highlight local differences in topography, land ownership, land cover, existing/planned land use and infrastructure development, environmental significance, and policy framework requiring different responses to implement infrastructure in pursuit of a more connected landscape.

3.5 Selecting Study Sites

To gain additional insight into the selected study sites, site visits were conducted between November 2018 and March 2019. Four site visits to the Meadoway were conducted, including one corridor visit conducted by bike between Morningside Avenue and Bermondsey Road, and one visit conducted on foot to each of the three case cross-sections. The objective of the corridor visit was the travel the length of the Morningside-to-Bermondsey segment of the Meadoway as a cyclist or pedestrian might in order to experience the different crossing points and trail diversions along the Meadoway. This corridor analysis provides a high-level experiential understanding of the Meadoway as a corridor for connectivity and was documented through constantly running point-of-view video and localized photography of crossing points and landscape barriers (see Figure 3.5.1). In contrast, the study site visits were intended to focus on experiencing and documenting the three study sites in greater detail noting the physical relationships between the Meadoway and adjacent properties including:

Site Observation Variables

- Landscape permeability
- Human and wildlife activity within and beyond the corridor's boundaries
- Locational amenities such as lighting, seating, washrooms, and recreation facilities
- The sensory qualities associated with walking these spaces alone

Undeveloped corridor near Morningside

Descending into Highland Creek ravine

Non-signalized trail crossing point

Signalized crossing point

A segment of the Scarborough Butterfly Trail

Off-corridor detour near Midland Ave

Trail route through Jack Goodlad Park

An older segment of trail near Kennedy Ave

Trail terminus at Eglinton Ave

Figure 3.5.1 Traveling the Meadoway corridor today
Screenshots from video - November 3, 2018

Subsequently, the landscape of the Meadoway can be read through the methods developed by Lynch (1960) with particular emphasis and attention to the paths and edges that shape connectivity. In this case, habitat patches can also be interpreted as potential paths which serve as 'stepping stones' facilitating wildlife structural linkages between habitat areas (Hou et al., 2017). The structural connectivity of the three study sites should therefore be understood as multi-dimensional with different species experiencing these connectivity gaps in different ways. For instance, while all three study sites present connectivity challenges for humans navigating these sites on foot or by bike, these sites may not be 'read' as a connectivity barrier for avian species. For this analysis, structural connectivity is considered from the perspectives of humans, small-size mammals, medium-size mammals, birds, and insects. To visualize this in preparation for further analysis, each study site is mapped according to Lynchian methods (see Figure 3.5.2) to differentiate the impact of these connectivity gaps on human and wildlife species. These connectivity visualizations form the basis of a Strengths-Weaknesses-Opportunities-Threats (SWOT) analysis conducted for each of the three study sites. The SWOT analysis is informed by both the GIS visualization and site observations, and assesses the three study sites based on the following parameters found within a 1-kilometre buffer of the potential crossing location:

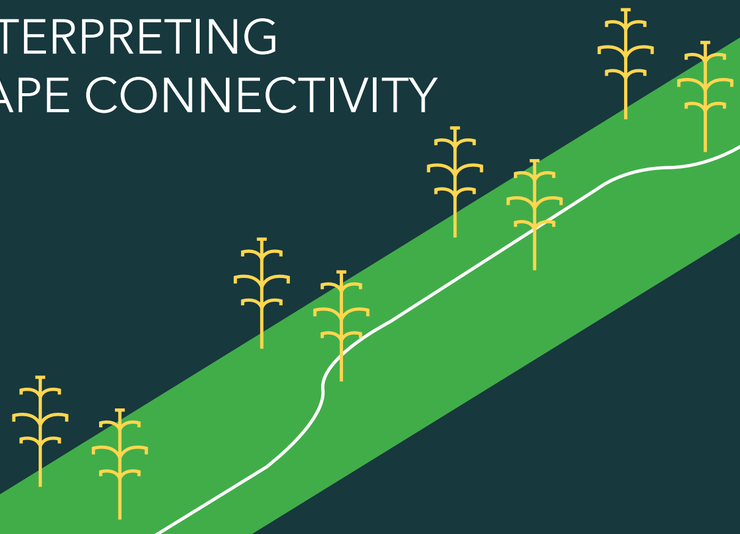
SWOT Analysis Variables

- Topography
- Land Cover
- Environmental Significance
- Neighbouring Land Use
- Land ownership
- Openings and other publicly accessible frontages on to the corridor
- Existing or planned land use or infrastructure development

Based on the findings of the SWOT analysis, recommendations for each site outline possible implementation strategies for crossing infrastructure. These recommendations specifically seek to address how land ownership and management agreements, and potential new development can provide opportunities for developing the Meadoway through collaboration and legislated planning tools.

A signalized crossing point along the Arbutus Greenway
Vancouver - March 2, 2019

CHAPTER 4
INTERPRETING LANDSCAPE CONNECTIVITY



4.1 CASE EXAMPLES

Emerging examples of linear adaptive re-use parkland projects

As cities continue to grow and intensify, the imperative to increase the amount of greenspace that provides a suite of ecosystem services to residents of cities will continue to face challenges, notably regarding the acquisition of land. As John Lorinc (2015) documents in Toronto, the cost and availability of land pose serious challenges to expanding Toronto's parks system owing primarily to strong competition from other land uses in areas of the city that need parkland most. Meeting greenspace and parkland requirements in the future therefore requires creative solutions to adaptively re-use and layer uses so that they assume multiple functions.

Quite possibly the most famous adaptive re-use project is New York City's High Line which over the course of 10 years transformed a 2.33-kilometre-long abandoned elevated rail line on the west side of Manhattan into a world-renowned destination that now attracts 8 million visitors a year (Bliss, 2017). Following its success, numerous other cities across the United States and in other countries across the globe have followed this emerging trend, adapting formerly under-utilized, decaying, or abandoned infrastructure for use as public space greenspace (see Appendix A).

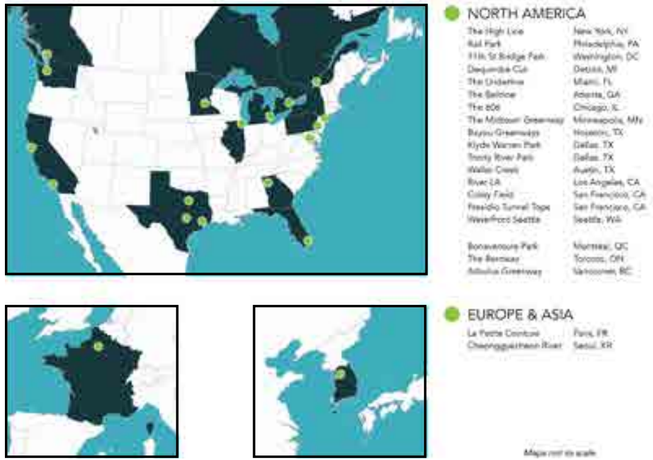


Figure 4.1.1
Location of linear adaptive re-use case examples

THE HIGH LINE

NEW YORK CITY, NY

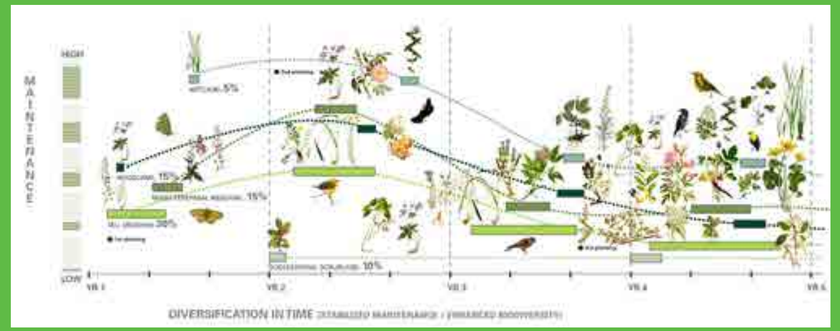
The High Line is widely regarded as one of the first iconic adaptive re-use parkland projects to see economic success and international stardom. It follows the path of an abandoned elevated rail corridor that once served the west side of Manhattan (see Figure 4.1.2), which community advocates fought to preserve amid pressure to tear it down (David & Hammond, 2011). The project is managed as a public-private-partnership between the Friends of the High Line who cover maintenance and operation of the park, and New York City. The entirely above-grade corridor can be accessed at ten locations along the 22 blocks it traverses through Chelsea providing pedestrians with a dedicated walking environment surrounded by vegetation. The vegetated design of the High Line boasts 210 species of plants, 40% of which were found on the High Line prior to its redevelopment and were specifically chosen by Dutch horticulturist Piet Oudolf to withstand the structure's dry low-fertility loam soil and its exposed climatic conditions while still providing a range of textures and variation along its length throughout different seasonal moments (Foster, 2010) (see Figure 4.1.3 & 4.1.4).

Figure 4.1.2 Pedestrians walk above traffic along the elevated High Line corridor
James Corner Field Operations & Diller Scofidio + Renfro (2015)

Figure 4.1.3 Carefully curated vegetation grows amongst remnants of the old trail corridor
Piet Oudolf No. 03/09 (n.d.)

Figure 4.1.4
The High Line's six biotopes offer a mix of paved and vegetated surfaces providing a diversity of habitat
James Corner Field Operations & Diller Scofidio + Renfro (2004), republished in 2015

Figure 4.1.5
Emergence through adaptive design
James Corner Field Operations & Diller Scofidio + Renfro (2004), republished in 2015 - see also James Corner Field Operations & Lister (1999)



A decade since the first section opened, the High Line has served as a learning opportunity for urban planners, landscape architects, and urban designers seeking to replicate its success. Notably, critical evaluation of the project has approached evaluating its impacts through the lenses of economic, ecological, and equity impacts derived from development (Lang & Rothenberg, 2017). Economically, the High Line is regarded as a huge success, catalyzing further redevelopment in Chelsea and providing New York City with an estimated additional tax revenue of $1 billion over the next 20 years from nearby properties (Bliss, 2017). Ecologically, Piet Oudolf's meticulously detailed planting plan addressing the particular micro-climatic conditions of the site has been praised for its ability to reintroduce the habitat of various species (including pollinators) into an urban setting (Ávila, 2018; Falah, 2018) while continued maintenance by the High Line's team of gardeners focuses on the adaptive management of this landscape allowing it to change and evolve similar to natural processes (see Figure 4.1.5) (Pettis, 2014). Unlike many other small parks (less than 500 hectares), the High Line strives towards an "operational ecology" by providing pockets of habitat for species to utilize while showcasing digestible elements of more complex natural systems at play by curating spaces into six different biotopes.

Yet, the principle weakness of the High Line lies in its failure to equitably represent the needs of surrounding stakeholders. Reflecting on the High Line's role in shaping changes in Chelsea, founders of the Friends of the High Line Robert Hammond and Joshua David acknowledge that the High Line has generated parkland equity, diversity, and inclusion issues surrounding how the park was designed and who ultimately it was designed for (Bliss, 2017). A 2016 study of the High Line argues that when comparing neighbourhood racial/ethnic identification to observations of who uses the High Line, the project has failed to address the needs of the community that surrounds it (Reichl, 2016). This "green gentrification" is one that highlights how utility corridors, once seen as a neighbourhood blight, now present value-added qualities to neighbourhoods, often displacing economically marginalized residents who lived close to these corridors (Pearsall, 2010).

KEY LEARNINGS

- Planning for adaptive re-use parkland must meaningfully engage with a diverse cross-section of nearby communities to identify how this new infrastructure can reflect their needs and benefit them - these benefits may include employment opportunities and particular design features that reflect an expressed community need.
- Adaptive re-use projects will influence to a varying degree the adjacent land value based on local conditions, necessitating proactive planning measures are implemented to mitigate against displacement.
- Landscape design should prioritize operational ecology when developing adaptive re-use parkland, reserving designer ecology for opportunities to integrate art showcasing ecosystem processes at play.

THE BELTLINE
ATLANTA, GA

The Beltline is a 35-kilometre multi-use trail and parkland encircling the City of Atlanta and represents one of the largest and most ambitious projects within the High Line Network's project database. Combining parkland improvements, multi-use trail creation, public transit expansion, and affordable housing development, this project represents a partnership of 22 organizations comprising both public and private entities. As a mixed below and above-grade trail, the Beltline does not have to contend with landscape barriers such as roads which typically pass below or are constructed above this former railway right-of-way (Perkins + Will, 2013). The result is an unencumbered network of trails that has been under steady construction since 2008 with completion anticipated for 2030.

The Beltline has been heralded as a catalyst for development in Atlanta with more than $3.7 billion in development underway within the project planning area as of 2017 with an anticipated long-term economic development outcome of $10-20 billion. To pay for the Beltline, the Atlanta Development Authority implemented a TIF district to capture increases in the value of land within the designated TIF district to fund bonds which will cover 50 to 70 percent of the project's development costs (Atlanta Development Authority, 2005). These bonds will be used to pay for the development of the trail, parkland, brownfield remediation, and affordable housing construction (Immergluck, 2009).

Figure 4.1.6 Multi-use trails provide opportunities for walking and cycling
Christopher T. Martin (n.d.)

Figure 4.1.7 Neighbourhoods across Atlanta back on to the Beltline providing convenient access to the trail
Stacey Funderburke (2017)

Yet the Beltline is not without its challenges, notably issues surrounding the displacement of marginalized communities nearby are at the forefront of research examining how this adaptive re-use trail network is impacting the city. Research has demonstrated that since announcement of the Beltline's construction, homes within a ½ kilometre of the Beltline experienced a greater increase in price premiums generating a 'Halo Effect' that gradually tapers off relative to distance from the corridor (Immergluck, 2009). While this has been viewed as a success in revitalizing the city's tax-base by attracting new development and increasing property values, the financial pressure this poses to lower-income residents surrounding the Beltline represents a significant negative outcome of the project reshaping nearby neighbourhood composition along socio-economic lines (Immergluck & Balan, 2017). Furthermore, while the TIF district was intended to fund affordable housing as well as trail improvements, poorly timed implementation of the TIF district as well as legal challenges surrounding the inclusion of a school tax as part of the TIF increment significantly hindered the development of affordable housing, while luxury developments seeking to capitalize on the new greenspace amenity flourished (Immergluck & Balan, 2017). As a cautionary tale, this analysis demonstrates that large redevelopment projects can have significant adverse effects on lower-income communities stemming from increases in residential land values, often before construction has even begun, requiring proactive and place-based planning and policy corrections to minimize potential displacement (Immergluck, 2009).

KEY LEARNINGS

- Adaptive re-use parkland projects require comprehensive planning studies examining the impacts greenspace development has on neighbouring land use change and land values.
- Adaptive re-use parkland projects should address 'green gentrification' proactively by stressing the social impacts these developments can support such as green jobs and community-led projects that meaningfully and equitably involve adjacent neighbourhoods.
- Adaptive re-use parkland projects should consider consolidating redevelopment activities to occur in tandem with the creation of naturalized corridors and multi-use trails, options include renovations to existing infrastructural utilities as well as the incorporation of new infrastructure and land uses such as light rail and affordable housing.

BAYOU GREENWAYS
HOUSTON, TX

The Bayou Greenway is an emerging plan to implement a century-old vision to utilize Houston's bayous as a connected system of naturalized riverfront and multi-use trails. Beginning in the mid-20th century, Houston channelized and hardscaped its bayous in an effort to control the flow of water (ASLA, 2016; Barth, 2016). With close to 2,500 linear kilometres of bayou in Harris County stretching through the City of Houston, the city embarked on a vision in 2012 to acquire, restore, and repurpose lands on the edges of bayous as parkland that can double as flood mitigation infrastructure (ASLA, 2016; Barth, 2016). Sections of the Bayou network such as the Buffalo Bayou (completed in 2006) have already demonstrated their capacity to fulfill this function by adding flood storage capacity, decreasing stormwater velocity shear stress, and sequestering CO_2 (Landscape Architecture Foundation, 2018). When completed, the close to 500 kilometres of trails and 1,620 hectares of parkland will combine a mix of high and low maintenance naturalized areas, with low maintenance naturalized areas such as meadowland and wetland performing important flood mitigation roles in addition to providing valuable habitat for urban wildlife (ASLA, 2016; Barth, 2016).

Figure 4.1.8 Many of Houston's bayous remain hardscaped posing flooding risks
Houston Parks Board (n.d.)

Figure 4.1.9 Restored bayou segments provide sites of recreation doubling as flood protection
Houston Parks Board (n.d.)

Figure 4.1.10
The Bayou Greenways Approach, connecting Houstonians through a network of bayou trails and parkland
Jonnu Singleton - SWA Group (2019)

The project is being developed through a combination of public funding matched by private contributions and is developed with oversight from the City of Houston which conducted the initial studies focused on trail alignments, transportation, land acquisition, landscape restoration, cursory design guidelines, and maintenance requirements and costs. From this plan, individual sections of the greenway network are assigned as project segments that are individually assessed for construction and bid on by local firms (ASLA,2016; Barth, 2016).

In a city historically known for poor health, park deficiency, ethnic and socio-economic polarization, the Bayou Greenway project is intended as one part of a broader plan to repair divides within the city and promote the equitable access to public green spaces (ASLA,2016; Barth, 2016).

Recent work by researchers at Rice University reveals that the priorities of different ethno-racial communities varies when considering how the Bayou Greenways is planned. This research found that Black and Latino communities were disproportionately underrepresented in public consultation and tended to prioritize greenspace quality and amenities over connectivity, something survey respondents self-identifying as white overwhelmingly prioritized (Smiley et al., 2016). The project has subsequently responded to these findings by adjusting lighting, visibility, and planting schemes to improve feelings of security (Landscape Architecture Foundation, 2019). These divergent responses to public priorities surrounding the development of parkland highlight the diversity of individual and community needs for these greenspaces as well as a more systematic need to ensure

meaningful discursive space is provided and accessible to ensure residents are represented in decision-making around these new projects.

With the population of Houston anticipated to double by 2035, efforts to plan ahead to ensure there is future access to parkland is imperative in a city infamous for its lack of zoning by-laws (ASLA, 2016; Barth, 2016). Upon its completion, the park system will connect 1.9 million Houstonians providing environmental, economic, and physical/mental health benefits with a median estimated benefit of $117 million per year (Crompton, 2012). The Bayou Greenways system presents the opportunity to capitalize on an emerging greenway network to anticipate and respond to projected regional management issues such as climate change and population growth to serve as a broader public policy tool focused on creating community coalitions addressing these challenges collectively (Fields, 2015).

KEY LEARNINGS

- Infrastructure designed to address 'worst-case scenarios' such as 100-yr floods possess latent capacity to support multifunctional infrastructure by accommodating uses that are designed to share these spaces.
- Large-scale greenways should consider the regional impacts this new infrastructure will contribute towards issues such as climate change, mobility, equity, economic uplift, and support for environmental systems and measure the impacts through existing landscape performance metrics and methods to inform future work.
- Adaptive re-use parkland projects must look beyond conventional public consultation techniques in working towards equitably capturing the views of communities traditionally underrepresented in these processes due to barriers whether social, economic, or temporal.

LA PETITE CEINTURE
PARIS

La Petite Ceinture is a 33-kilometre long predominantly below-grade naturalized corridor and trail running along a former railway right-of-way. Although only a few sections of the former railway which encircles the City of Paris are legally open to the public, this corridor has been the object of significant attention from nearby community members as well as Parisian officials for several decades. In the late 1980s, portions of the former railway were incorporated into Paris' regional express rail (RER) network, while other sections have been converted into naturalized corridors in recent years. The City of Paris plans to incrementally restore sections of the corridor following studies designed to identify potential best uses for the different corridor sections (Ville de Paris, 2019) and is in currently conducting public consultation sessions around accommodating community gardens, micro-wildlife reserves, and community centres along its length (O'Sullivan, 2016). In the meantime, residents of Paris routinely venture onto the closed sections and in many cases have proceeded with grassroots conversions of the corridor ahead of the Parisian government.

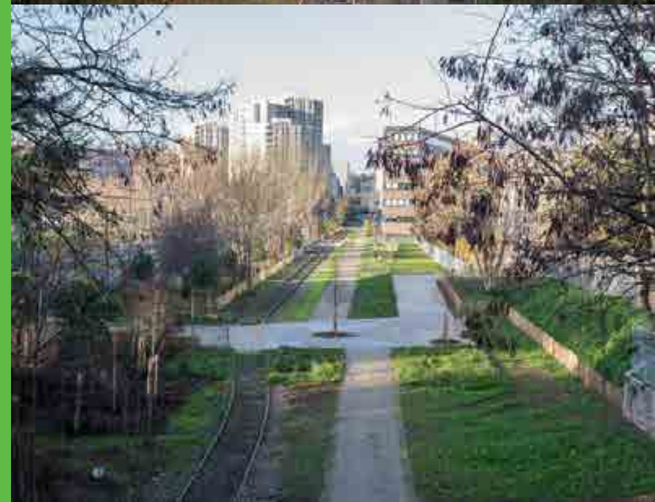


Figure 4.1.11 Legacy railway infrastructure sits side-by-side next to new trails
Guillaume Bontemps - Ville de Paris (2019)

Figure 4.1.12 New segments of La Petite Ceinture are being incrementally added to the network
Ville de Paris (2019)

Specifically, areas of La Petite Ceinture are known for their street art, urban gardens, and in some places temporary encampments (O'Sullivan, 2016).

From an ecological standpoint, Paris' Plan Biodiversité 2018-2024 identifies La Petite Ceinture as an opportunity to implement the plan's actions surrounding the preservation and restoration of urban biodiversity (Ville de Paris, 2019). Specifically, Paris' Urban Ecology Department have studied the ecological properties of this corridor, finding that not only do fauna use the corridor for movement but many are capable of meeting their biological needs within the narrow corridor (Foster, 2010).

KEY LEARNINGS

- Small naturalized spaces can provide valuable spaces for urban habitat supporting small mammals, amphibians, reptiles, avian species, and insects, and should not be overlooked when planning larger-scale adaptive re-use projects
- Community consultation should focus on how proposed uses may take advantage of locational amenities supporting temporary uses as these projects are incrementally phased in

THE ARBUTUS GREENWAY
VANCOUVER, BC

The Arbutus Greenway is a 9-kilometre long multi-use at-grade trail stretching from Kitsilano to the Fraser River in Vancouver. Final approval for a detailed design and cost analysis for the project was secured in 2018 to redevelop a former CP rail corridor purchased by the City of Vancouver for the construction of a multi-use corridor and trail. The plan envisions two scenarios, one with and one without a streetcar running the length of the corridor (Chan, 2018). To date most of the work on the corridor has been community driven with nearby resident groups converting spaces into urban gardens for growing produce, while the City of Vancouver has paved sections of the trail (Chan, 2018). Renderings of the proposed final vision for the trail suggest the City of Vancouver is also considering green infrastructure, habitat restoration, and the development of small public gathering spaces positioned throughout the corridor (Chan, 2018).

Although still in its early stages, the project has been forced to quickly deal with connecting the trail across numerous street crossings along its route. To cross these streets, different approaches were undertaken based on the street typology. On lower-traffic local and

Figure 4.1.13 Public art and seating create identifiable access points to the trail
Jennifer Gauthier (2018)

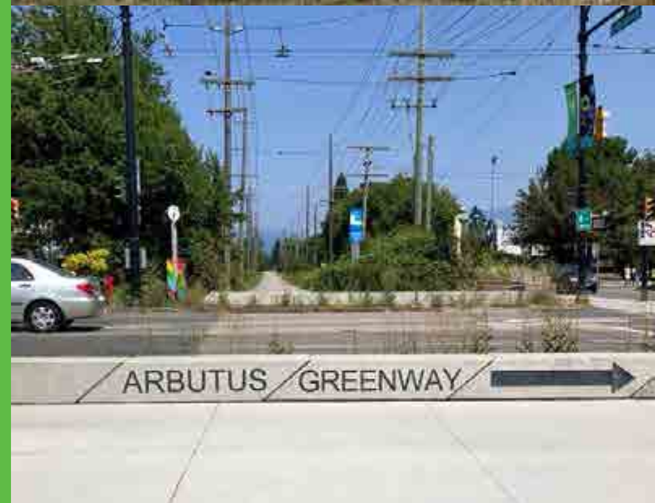


Figure 4.1.14 Major road intersections direct trail users to signalized crossing points
John Furneaux (2019)

Figure 4.1.15
Arbutus Greenway crossing features
A - Clear signage marking the trail from the road
B - Trail users are segregated by use
C - Signalized crossing points at arterial roads
John Furneaux (2019)

collector streets, vehicles must yield to pedestrians and cyclists crossing the street who have the right-of-way, while at arterial roads, crossing points are signalized and sometimes possess landscaped barriers (such as planters) directing trail users towards a nearby signalized intersection that does not align with the corridor (see Figure 4.1.14 & 4.1.15). Although these streets interrupt the flow of pedestrians and cyclists along this corridor, design to date has focused on transforming these crossing points into gateways from the street to the greenway network utilizing nature-based art, lighting, and seating to create nodes of activity (see Figure 4.1.13).

KEY LEARNINGS

- Crossing points require place-based solutions that account for the specific opportunities and challenges posed by their particular typological class
- Crossing points present opportunities to develop trailheads into 'gateways' of different scales that invite people in through the use of art and "designer ecology" to showcase ecosystem processes at play on these sites highlighting their wider significance
- Adaptive re-use projects should support and build upon grassroot community actions already taking place in utility corridors,

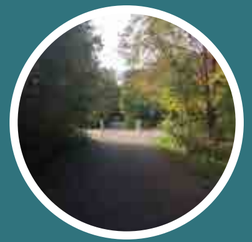
TORONTO'S EXISTING ADAPTIVE RE-USE TRAILS

Toronto has for several decades explored the adaptive reuse of former transportation corridors through the construction of multi-use trails along former utility rights-of-way. In recent years, policy shifts (explored in greater detail in Section 4.2) have provided increased capacity to layer uses within infrastructural corridors to provide more trails, greenspaces, and public areas. Across the city, numerous trails such as the York Beltline Trail and the Don Mills Trail utilize former railway lines, while other trails such as the West Toronto Railpath and the Bentway layer active transportation infrastructure with the establishment of trail connections and parks. These trails provide important linear corridor functions linking neighbourhoods through dedicated active transportation rights-of-way while also providing opportunities for the creation of naturalized habitat corridors facilitating the movement of a variety of species.

@datgtatrailguy (2016)

YORK BELTLINE TRAIL

The York Beltline Trail is a 9-kilometre-long trail stretching east-west across midtown Toronto from the Don Valley Brickworks in the east to Caledonia Road in the west. Opened in 1989, the trail utilizes a former Canadian National Railway (CNR) corridor acquired through a mix of purchases and land swaps between CNR and the City of Toronto between 1972 and 1988. The trail connects a variety of greenspaces including the Don Valley Brickworks Park, the Moore Park ravine, Mount Pleasant Cemetery, Oriole Park, Memorial Park, and Walter Saunders Memorial Park. This trail is unusual given that its path alternates between at-grade, above-grade, and below-grade sections.



Lynda Johnson (2018)

DON MILLS TRAIL (LEASIDE RAIL PATH)

The Don Mills Trail is a 3-kilometre-long at-grade trail running north-south from York Mills Road in the north to Overland Drive in the south. Opened in 2016, the trail utilizes a former CNR corridor that was abandoned in 1999 and bought by the City of Toronto in 2001. Expansion of the trail to connect with other areas of Toronto's trail network have stalled due to failures in agreement over access across private land. The trail connects a variety of greenspaces including Duncairn Park and Bond Park.

Toronto - June 2, 2018

THE WEST TORONTO RAILPATH

The West Toronto Railpath is a 2-kilometre-long at-grade trail running north-south from Cariboo Avenue in the north to Dundas Street West in the south. Opened in 2009, the trail utilizes a portion of a Canadian Pacific rail corridor acquired by the City of Toronto in 2003. It is anticipated that the trail will expand further south for an additional 2-kilometres connecting to Liberty Village at the Wellington Street bike lane. Neighbouring buildings and larger 'bump-outs' along the trail are frequently used as canvasses for community art projects and events

Toronto - August 4, 2018

THE BENTWAY

The Bentway is a 1.75-kilometre-long public space located at-grade underneath the Gardiner Expressway between Strachan Avenue and Bathurst Street. Opened in 2018, this public space offers year-round programming focused on art, culture, and recreational activities. The Bentway is maintained, operated, and programmed by the Bentway Conservancy, a non-profit entity. It is anticipated that the Bentway will be further expanded to Spadina Avenue in the coming years.

Placing the Meadoway's development in the context of these case examples reveals that the Meadoway is both connected to opportunities and challenges faced by similar linear adaptive re-use projects, but also situated in a unique position to contribute to innovating the linear adaptive re-use park typology further (see Table 4a & 4b). As an emerging greenspace typology, linear adaptive re-use parks represent an opportunity for cities seeking to repurpose surplus infrastructure corridors (primarily rail corridors) that formerly existed to support a manufacturing base that has disappeared from the landscape of central cities (Sinha, 2014). In many cases, these linear parks are developed with idea of multifunctionality in mind, combining greenscaping with the creation of multi-use trails or paths to provide pedestrians and cyclists with exclusive access promoting safety for these transport modes. These spaces redefine what a park can be, existing as hybrid spaces that serve as parks but also "public squares, open-air museums, botanical gardens, social service organizations, walkways, [and] transit corridors" (Highline Network, 2019).

Precedents for linear adaptive re-use parks have largely been driven by the desire to connect fragmented landscapes either from a human or environmental connectivity lens using abandoned infrastructure corridors as the means to achieve this. Comparatively, other linear adaptive re-use park projects have been able to achieve these connectivity goals because they have faced fewer challenging landscape barriers compared to the Meadoway. Infrastructure corridors are designed with the intention to move people and goods (these might be physical material goods or immaterial goods such as energy) efficiently by reducing barriers to movement, whether human-made or pre-existing in the landscape. To do so, infrastructure corridors often shift the physical plane upon which people or goods move along to either above or below grade in order to reduce these barriers (see Figure 4.1.16). Old railway lines and highways that were intentionally designed to reduce barriers to movement lend themselves well to the creation of active-transport-oriented linear corridors because they raise or lower the movement of people to a different plane than the surrounding urban fabric. For instance, the construction of the elevated railway that the High Line now occupies was born out of a desire to remove conflicts between road users and trains through the west side of Manhattan (David & Hammond, 2011). By elevating the tracks above grade, trains were given unencumbered movement across the landscape. As a result, these linear infrastructure corridors have proven particularly adept at facilitating the movement of people (and in some cases wildlife) while also creating linear naturalized vegetated landscapes by taking advantage of this plane-shifting to by-pass landscape barriers. Yet unencumbered movement is not without its challenges. As Bliss (2017) notes, one of the challenges the High Line has faced is that by elevating pedestrian movement above-grade, this can pre-empt street walking by providing a more convenient walking path, removing pedestrian presence from nearby at-grade streets.

Park	Purpose	Multi-Use Trail	Neighbourhood Parkland[1]	Public transit	Vulnerable Population Benefits[2]	Ecological Performance[3]	Commissioned Art
High Line	Development catalyst Greenspace access	○	○	○	○	◑	●
Beltline	Development catalyst Greenspace access Active Transportation	●	●	●	◑	○	●
La Petite Ceinture	Active Transportation	●	◑	◑	○	●	◑
Bayou Greenways	Ecological Restoration Greenspace access Active Transportation	●	●	○	●	●	●
Arbutus Greenway	Active Transportation	●	●	◑	○	○	●

● PRESENT IN THE DESIGN
◑ PARTIALLY INCLUDED IN THE DESIGN, OR PROPOSED
○ NOT INCLUDED IN THE DESIGN

1 Refers to directly abutting parkland
2 Refers to proactive measures to mitigate adverse impacts on vulnerable groups
3 Refers to the explicit inclusion of operational ecology principles

Table 4a.
Comparing linear adaptive re-use parkland precedent design features

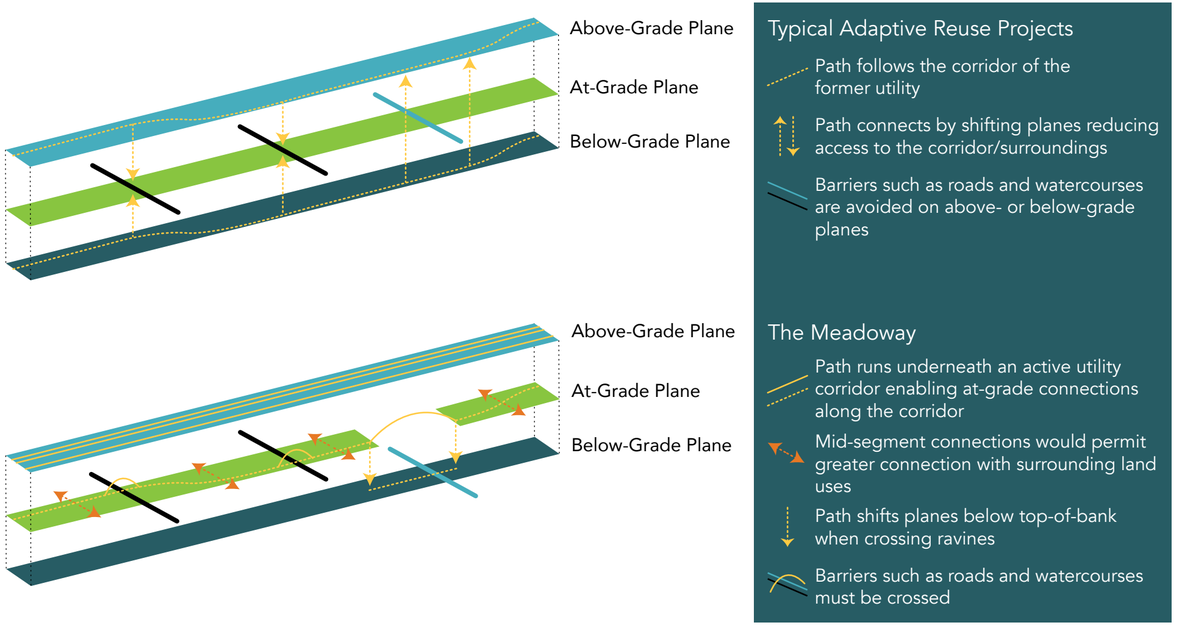
	Form	Function	Development Structure
Attributes	• Railways (above/below/at-grade) • River edges • Highways (above/below-grade)	• Multi-use trails • Open-air art galleries • Wildlife habitat restoration • Urban agriculture • Public transit corridors	• Municipally-led • Public-Private Partnerships • Parks Conservancies • "Friends of" Groups
Outcomes	Positive • Greater access to neighbourhood greenspace • Improved neighbourhood health outcomes • Micro-climate improvements • Stormwater management • Increased biodiversity • 'Green' jobs	Negative • Halo Effect (green gentrification)	

Table 4b.
Summary of the linear adaptive re-use parkland typology

In contrast, hydro corridors place the movement of goods on an elevated plane freeing the at-grade plane for other forms of movement across the landscape. Along the Meadoway, electricity (a good) is transmitted above the human/wildlife movement plane below. Unlike other linear adaptive re-use projects that substitute an infrastructural movement for human/wildlife movement, the Meadoway layers functions with electricity transmission functions occurring on the above-grade plane while other forms of movement occur on the at-grade plane. By providing at-grade pedestrian activity this may help to integrate the corridor with the surrounding fabric including neighborhoods (users) and adjacent greenspaces (destinations) by providing frequent access points through mid-segment connections creating a more permeable corridor. Yet by serving pedestrians and cyclists at-grade, these users must contend with every barrier along the corridor creating conflict between trail users various barriers. Landscape barriers at-grade, whether human created such as roads or naturally existing in the landscape such as ravine topography, form the core challenge facing the development of the Meadoway into a connected linear corridor, a challenge that other linear adaptive re-use parkland projects often do not have to contend with given their history of their inception and design.

FIGURE 4.1.16

CONCEPTUAL DIAGRAM OF MOVEMENT ACROSS LINEAR ADAPTIVE RE-USE PARKLAND PROJECTS



PLANNING CONTEXT

In the previous section, examples of linear adaptive re-use parks demonstrate the capacity of transportation and utility corridors to assume new uses when they are no longer needed. Unlike almost all of these examples which either serve as utility corridors or a naturalized greenspace trail, the Meadoway remains an active utility corridor possessing the concurrent secondary function of providing trail connections for humans and habitat patches for a mix of wildlife species. Policies found within provincial policy directions and plans, and municipal official plans provide the framework that has enabled the Meadoway to emerge as an opportunity that can be shaped by an array of existing by-laws, and strategies planned or in-effect in Toronto and the GTA. Furthermore, under the project direction of the TRCA, the Meadoway is well-positioned to meet objectives related to connectivity through the TRCA's mandate to plan at and execute projects with a watershed scale in mind.

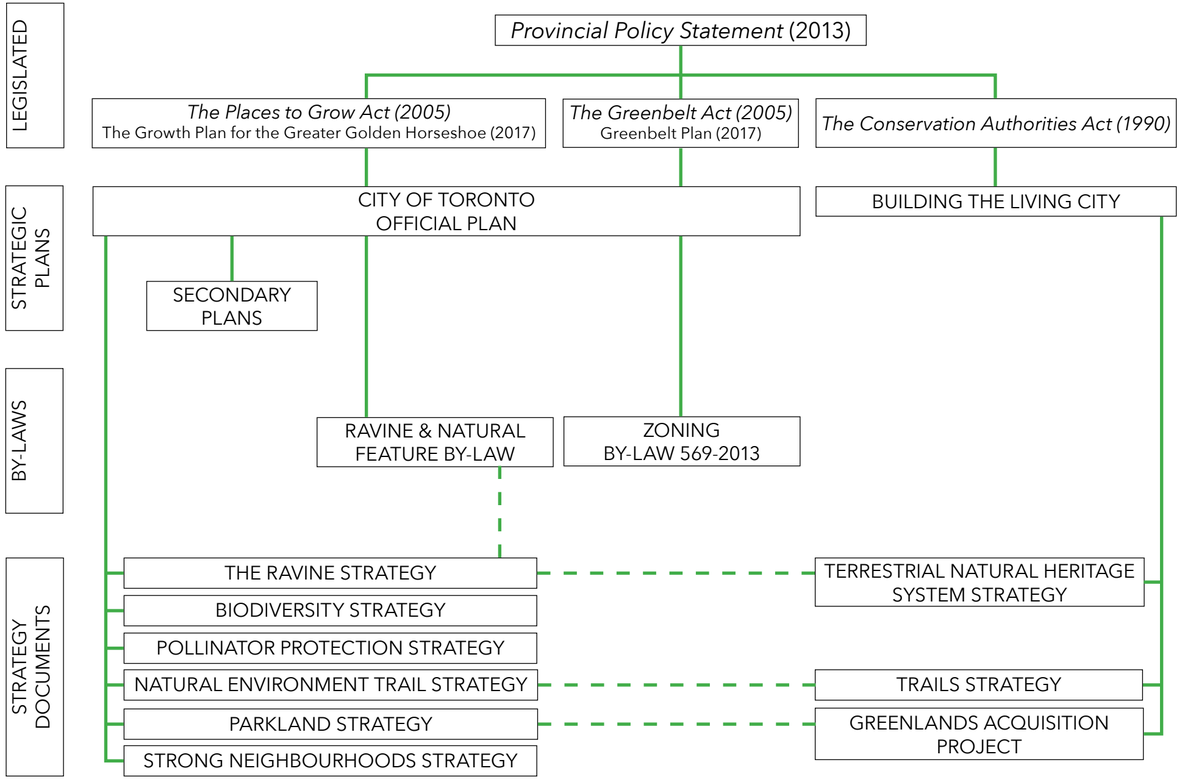
4.2.1 Provincial Planning Policy

The *Provincial Policy Statement [PPS] 2013* provides the overarching direction with regard to planning matters affecting the various upper, lower, and single-tier municipalities across Ontario (see Figure 4.2.1). These broad policies are interpreted by municipalities in their respective Official Plans and subsequently articulated through development conforming to these plans. The Meadoway touches upon three key areas of the PPS 2013: Section 1.5 Public Spaces, Recreation, Parks, Trails and Open Space; Section 1.6 Infrastructure and Public Service Facilities; and Section 2.1 Natural Heritage. Examined independently these policy sections set out particular visions for the planning and protection of existing assets anticipating additional demand in the future for the services they provide to communities. Furthermore, the *Places to Grow Act 2005* and the *Greenbelt Act 2005* (and their associated plans the Growth Plan for the Greater Golden Horseshoe (2017) and the Greenbelt Plan (2017)) take their direction from the *PPS 2013* with policy directives including sections focused on the importance of infrastructure (such as utility and transportation corridors) to support growth, protections for the Natural Heritage System, and the development of parkland, open spaces and trails (see Figure 4.2.2). Each of these legislated acts and their associated plans are intended to be "read in [their] entirety" stressing the importance of the linkages between these policy areas in each specific situation they are applied. Examining these select areas (see Appendix C) of the *PPS 2013*, the Growth Plan for the Greater Golden Horseshoe 2017 and the Greenbelt Plan 2017 provides the preliminary structure for the Meadoway's development stressing the co-location of uses, the development of a connected system of trails and green spaces that promote equitable access to these assets, and the imperative to maintain, restore, and improve ecological functionality. These pieces of legislation possess the authority to require municipalities to conform to these policies, yet the vision and execution of these policies is ultimately decided upon by municipalities and can be read in relation to the Meadoway's stated goals.

FIGURE 4.2.1

THE MEADOWAY'S PLANNING FRAMEWORK

Developing the Meadoway touches upon areas of the following policies, plans, and strategic documents which guide land use management



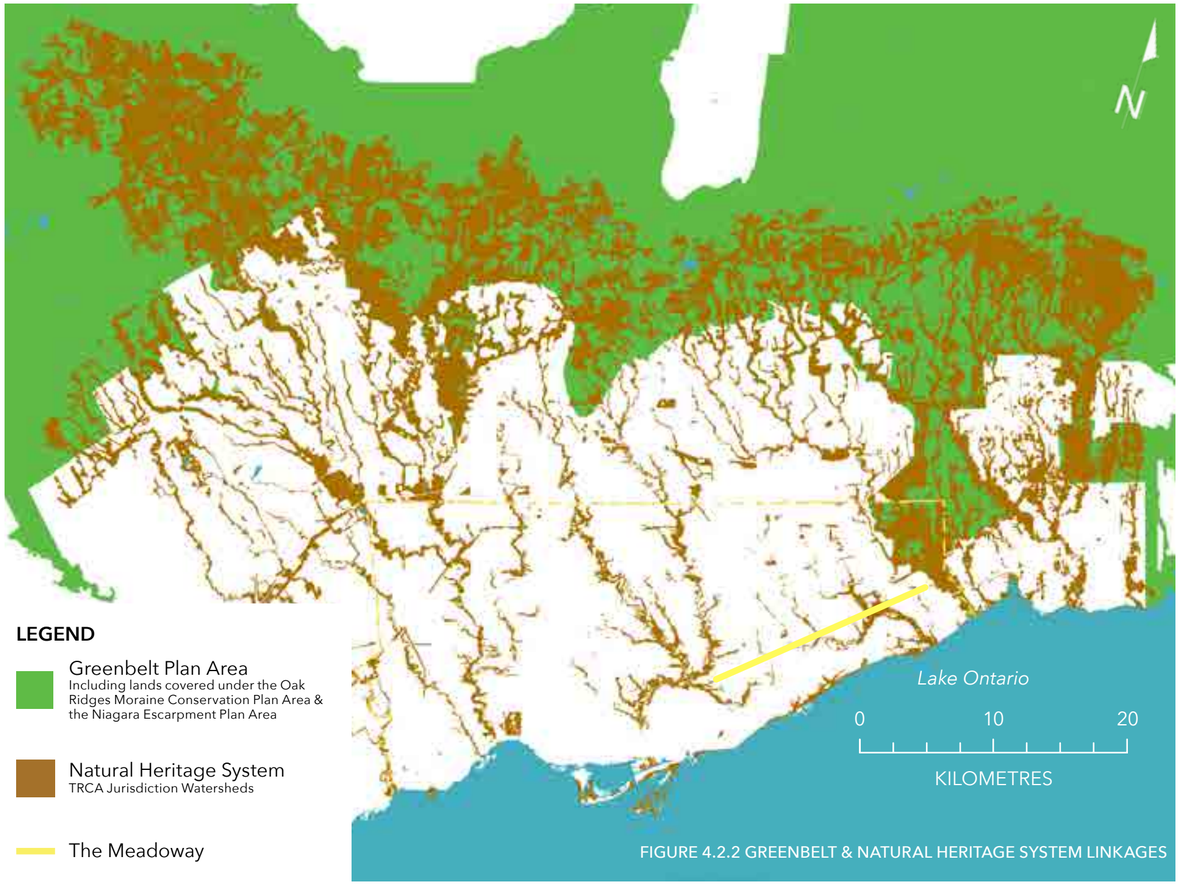


FIGURE 4.2.2 GREENBELT & NATURAL HERITAGE SYSTEM LINKAGES

THE MEADOWAY WILL...

Be a defining city-building opportunity for Toronto that can be celebrated among the most transformational revitalization projects in the world.

Allow people to travel between downtown Toronto and Rouge National Urban Park without leaving the natural environment.

Create active transportation links between parks, employment centres, and transportation hubs across Scarborough.

Contribute to fighting climate change by creating important meadow habitat in a highly urbanized area, as well as reducing vehicle emissions by providing alternative commuting opportunities.

Facilitate opportunities for urban agriculture by allowing local communities to grow their own food and build stronger community connections in the process.

Build critical east-west connections for a ravine system that is geographically orientated in a north-south direction, lacking the east west linkages required to maintain a strong natural system.

Allow for scientific research on meadow habitats in urban systems,and will integrate citizen science opportunities to educate on the importance of environmental conservation.

Be built with community contributions and active ownership to ensure that revitalization is maintained and effectively managed for generations.

Operate as an inclusive, open, and evolving component of the natural system that represents the vision, passion, and diversity of the residents of Toronto and visitors from around the world.

Represent a model to expand the revitalization to the over 4,200 acres and 500 kilometers of underutilized hydro corridors across the Toronto region.

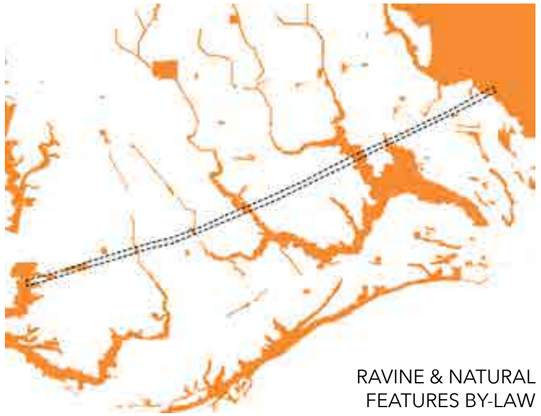
4.2.2 Municipal Planning Policy

Toronto's Official Plan (2015) provides the vision for how land use planning proceeds within the borders of the municipality. In relation to the Meadoway, its sections on Parks and Open Spaces (s3.2.3) and the Natural Environment (s3.4) are key areas providing vision statements and broad direction surrounding how the City of Toronto should manage, acquire, restore, and diversify its green space assets. Land within the Meadoway corridor falls under the land use designation of either Parks and Open Space (s4.3) or Utility Corridors (s4.4) with guiding visions for these land uses found in the Official Plan and then elaborated upon in the City's Zoning By-Law 569-2013. These land use designations are important to consider because they stress the multifunctionality of Utility Corridors permitting the inclusion of secondary uses such as parkland and other green spaces. Toronto's Official Plan (2015) s4.4.3 and s4.4.4 enables the City to acquire or lease surplus corridors for public services and amenities. This is similar to case examples found across the globe, however unlike these precedents, provisions within Toronto's Official Plan expand the scope of how infrastructural corridors are viewed. Toronto's Official Plan (2015) goes beyond Utility Corridor norms that see these spaces as the exclusive domain of one use or another to allow these spaces in certain circumstances to assume multiple functions through the layering of infrastructure. Specifically, while hydro corridors serve a primary function of transmitting energy, they may be used for an array of publicly accessible secondary purposes (Official Plan, s4.4.2c). This differentiation when compared to other linear adaptive re-use park projects presents a tremendous opportunity for landscape multifunctionality. As Toronto continues to grow, exploring opportunities for layering traditional infrastructure with green infrastructure presents an unprecedented opportunity to both increase the amount of functional greenspace available to residents as well as preserve and develop transportation and utility corridors based on present and future needs.

4.2.3 Municipal & Regional Strategy

To execute this vision, by-laws, management regimes, and municipal strategies are utilized to regulate land use and provide actionable initiatives to fulfill these policy directions and visions (see Appendix D). Toronto's Zoning By-Law 569-2013 and the Ravine and Natural Feature Protection By-Law (see Figure 4.2.3 provide a regulatory framework for responsible land use that dictates which uses can be included in specified zones. Within Utility Corridors, Parks and Transportation Uses are permitted as-of-right while recreation uses are also permitted on condition that they do not occur inside a building (100.10.20). Given that the Meadoway proposes all of these uses in its future development, this project will largely conform with the existing provisions of the City's zoning by-law. Furthermore, the Ravine and Natural Feature By-Law outlines that lands located within the Protected Area (including ravines, tableland forests, treed portions of the Lake Iroquois shoreline, Rouge Park, and publicly owned parks and golf courses located in valleys) must receive a permit in order to conduct changes to a property that: injure, destroy, or remove trees; place or dump fill or refuse; and alter the grade of land (Municipal Code Chapter 658). Future development along the Meadoway where it crosses the Ravine and Natural Feature Protected Area will therefore require approval to conduct changes to these lands. The development of the Meadoway is also shaped by Hydro One's management regime as it pertains to accessing and maintaining transmission infrastructure within the corridor. Hydro One sets out specific guidelines that dictate the vertical and horizontal clearance critical to determine where trails and plantings can go within the Meadoway corridor (see Figure 1.2.3). Lastly, the development of the Meadoway is guided through action-oriented strategies developed by the City of Toronto and the TRCA. Separately, these documents provide more focused action related to biodiversity, land use management and conservation, developing connectivity, and promoting equity. Stitching these strategies together provides opportunities to meet the actions outlined in separate documents through coordinated improvements to landscape. For instance, when the Scarborough Butterfly Trail was completed along the eastern portion of the Meadoway in 2015 it represented a coordinated action that addresses sections of the Biodiversity Strategy (2018) and Pollinator Protection Strategy (2017) by creating new habitat as well as incorporating trail improvements and adding new naturalized spaces for recreation in several NIAs.

ZONING



RAVINE & NATURAL FEATURES BY-LAW

SECONDARY PLANS

LEGEND

ZONING

- Residential
- Residential apartment
- Commercial residential
- Employment industrial
- Institutional
- Open space
- Utility & Transportation

SECONDARY PLANS

- Secondary Plan Areas
- City Greenspaces
- Proposed Golden Mile Secondary Plan

RAVINE & NATURAL FEATURE BY-LAW

- Ravine & Natural Feature By-Law area

FIGURE 4.2.3 MUNICIPAL PLANNING & REGULATION AREAS

THE TORONTO AND REGION CONSERVATION AUTHORITY

The Toronto Region Conservation Authority [TRCA] is an administrative authority which has existed in the Toronto region since 1946 under different forms. Its current iteration was established by the Province of Ontario under the *Conservation Authorities Act 1990* to manage the nine watersheds whose rivers and creeks transect the City of Toronto. With a focus on regional watershed management, the jurisdictional mandate of the TRCA extends to include the municipalities of Toronto, Peel, Durham, Dufferin, Simcoe, and York. As an authority with jurisdiction over multiple municipalities, the TRCA possesses legislated powers under Sections 20(1) and 21(1) of the *Conservation Authorities Act 1990* to conduct projects dealing with the conservation, restoration, development, and management of watersheds. The TRCA does this through the ownership of over 18,000 hectares of land in the Toronto region that it holds to protect and manage areas such as valley and stream corridors, floodplains, Lake Ontario shore lands, wildlife, vegetation, and environmentally significant areas within the Natural Heritage System (TRCA, 2019). Where it does not own land, the TRCA works with public and private land owners to support conservation efforts and requires land owners within TRCA regulated areas to acquire a permit prior to development (O.Reg 166/06).

The TRCA's mandate to plan at the watershed scale provides certain advantages when considering the development of the Meadoway from a landscape connectivity lens. The TRCA's capacity to model land-use change and proactively administer conservation and restoration projects at this scale enables it to plan as a coordinator for both projects within its portfolio while serving as a partner and inter-municipality link between projects being planned or implemented in the municipalities under its jurisdiction. This ability to oversee work being done by municipalities enables the TRCA to cross jurisdictional divides, allowing for a degree of regional coordination surrounding the management of environmental systems. This is important because environmental systems are not confined to a single municipality but extend beyond their reaches and are therefore shared by multiple municipalities. Protecting and enhancing these shared assets is important given that spillover effects from uses in one municipality generate both positive and negative externalities to other municipalities.

The TRCA executes its activities under the strategic vision provided by the Building the Living City plan which guides the Authority's work, similar to the way an Official Plan guides the vision of a municipality. This plan is then executed through projects that draw on the strategic direction of regional strategy documents such as the Terrestrial Natural Heritage System Strategy (2007), the Greenlands Acquisition Project (2015) and the Trails Strategy (2018). These three documents provide the guiding framework for some of the work being done by the TRCA in working towards a connected system of Natural Heritage areas and trails that support the movement of people and wildlife between these areas. As a regional authority, the TRCA's leadership on the Meadoway alongside the Weston Foundation and the City of Toronto is ideally positioned to implement initiatives transcending the jurisdictional boundaries of municipalities, providing the opportunity to integrate the Natural Heritage and trails systems through a comprehensive regionally-oriented planning process.

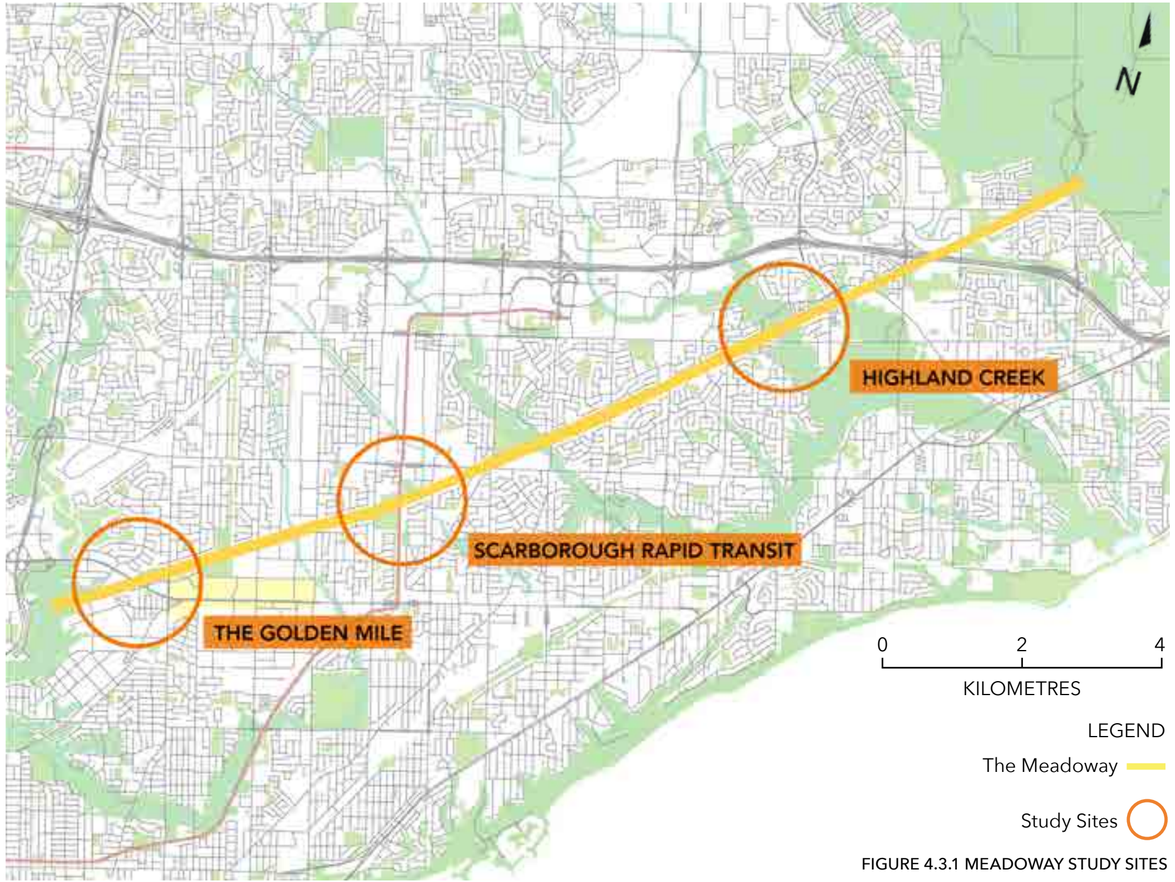


FIGURE 4.3.1 MEADOWAY STUDY SITES

STUDY SITES

Three study sites along the Meadoway were selected based on their capacity to reveal different challenges presented by significant human and wildlife barriers found along the corridor. All three study sites deal with opportunities and challenges associated with existing site conditions such as land use and land cover, topography, land ownership, policy frameworks and development pressure. As a result, each site requires subtly different responses towards promoting landscape connectivity.

These study sites consider connectivity as a multi-dimensional relationship affecting different species at different scales. In each of the study sites, consideration is given to both intra-connectivity (dealing with the Meadoway's capacity to connect segments of the corridor to each other) and inter-connectivity (dealing with the capacity of nearby land uses to connect to segments of the Meadoway along its path). Consideration is also given to variations in how landscape connectivity may affect the behaviour of different species.

Building on the case examples and policy research in previous sections, these study sites offer opportunities to ground background research, identifying strengths, weaknesses, opportunities, and threats associated with each site. Using a SWOT analysis, place-based characteristics are revealed and when integrated with key learnings drawn from precedent research, help to shape proposed recommendations for implementing measures to [re]connect landscape at these sites.

Project Study Sites

1. The Meadoway at Eglinton Avenue
   (near Victoria Park Avenue)
2. The Meadoway at the Scarborough Rapid Transit and GO Stouffville line
   (near Kennedy Road and Lawrence East Avenue)
3. The Meadoway at Military Trail/ Highland Creek
   (near Military Trail and Ellesmere Road)

THE MEADOWAY

EGLINTON AVENUE AT VICTORIA PARK AVENUE

Figure 4.3.1.1

LEGEND

- GREENSPACE
- NATURAL HERITAGE SYSTEM
- TRCA JURISDICTION
- BUILDING FOOTPRINTS
- ROAD RIGHT-OF-WAY
- WATERCOURSE
- MULTI-USE TRAIL
- TRANSMISSION LINES

This map uses 1m contours

SCALE - 1:10,000

THE GOLDEN MILE

Current Challenges & Connectivity Objectives

See Figure 4.3.1.1

Eglinton Avenue currently serves as the western terminus of the Meadoway trail stopping short of connecting with the East Don Trail and the Lower Don Trail system (see Figure 4.3.1.2 & 4.3.1.3). This major arterial road currently poses a significant barrier to human and wildlife movement across the Meadoway given its width and high rate of traffic flow. Furthermore, the soon-to-be opened Eglinton Crosstown LRT running down the middle of Eglinton Avenue East poses another potential weakness associated with safe passage across this road for both humans and wildlife. To safely cross the road, trail users must currently travel 800 metres out of their way to reach a signalized intersection and then return to the trailhead at the opposite side of the road. [Re]connecting this section of the Meadoway to surrounding land uses and corridors of movement should therefore prioritize developing this segment's intra-connectivity crossing Eglinton Avenue and Victoria Park Avenue as well as enhance existing adjacent frontages and corridor uses to support the inter-connectivity of land uses.

Figure 4.3.1.2
Construction on Eglinton Avenue on the Crosstown presents a signficant barrier
Toronto - March 27, 2019

Figure 4.3.1.3
Bermondsey Road represents a gateway to enter the Meadoway from the Don Valley trail system
Toronto - March 27, 2019

Figure 4.3.1.4 Landscape Barriers & Movement
Golden Mile

- Landscape barriers
- Human movement
- Wildlife movement
- Primarily human barrier
- Primarily wildlife barrier
- Human & wildlife barrier

Figure 4.3.1.5 Landscape Permeability & Community Assets
Golden Mile

- Permeable frontage (public access)
- Impermeable frontage (private access or no access)
- School
- Recreation Centre
- Place of Worship
- Medical Services
- Urban Agriculture
- Childcare Services
- Library Services

	Positive	Negative
Internal	STRENGTHS • Low topographic variability • Part of TRCA Natural Heritage System • Existing meadow habitat between Eglinton and Victoria Park alongside Wilson Brook • Agricultural plots in place between Eglinton Avenue and Victoria Park Avenue (community use) • Large areas of permeable frontage on to the corridor	WEAKNESSES • Land occupied in the Meadoway ROW by an auto dealership • High rates of traffic flow along Eglinton (6-lane) with incoming at-grade LRT corridor creates a significant barrier • The Crosstown is already under construction, implementing a safe crossing point would require redesign where the Meadoway crosses Eglinton Avenue
External	OPPORTUNITIES • Linking the Meadoway Trail with the Lower Don Trail network west of Bermondsey • Creating a safe passage point across Eglinton Avenue • Linking the Victoria Village NIA across the Meadoway and providing greenspace amenities • Restoration and daylighting of the Wilson Brook • New development presenting legislated opportunities to secure more parkland and parkland improvements	THREATS • Land use intensification in the Golden Mile placing increased pressure on neighbourhood parks for space (potential conflict between recreational use and restoration)

Table 4c
Meadoway - Eglinton Avenue/Victoria Park Avenue Gap SWOT Analysis

As the western terminus of the Meadoway and a site of significant new development in the Golden Mile, this section of the Meadoway carries tremendous potential to serve established and emerging communities in the area. Specifically, Eglinton Avenue and Victoria Park Avenue serve as important potential nodes for activity along the corridor and secondary gateways to the Meadoway if this space is developed in tandem with land use intensification planned for the Golden Mile.

GOLDEN MILE SECONDARY PLAN

As the Golden Mile Secondary Plan develops, consideration should be given to policies, land use schedules, and urban design guidelines that orient areas of Secondary Plan towards the Meadoway as well as Eglinton Avenue. One of the easiest ways to integrate the Golden Mile into the Meadoway is through the strategic siting of new parkland required through parkland dedication (*Planning Act 1990* s.42) located next to the Meadoway and extending outward from the corridor into the Golden Mile. While this segment of the Meadoway already possesses numerous openings enabling access to the corridor from surrounding land uses (see Figure 4.3.1.5), new parks leading towards the Meadoway can further break down barriers to integrating these land uses and better utilizing this space. Furthermore, including policies that implement at-grade commercial activity that supports pedestrian activity associated with nearby uses along the Meadoway and nearby parkland can provide a lively and activated frontage on to these public spaces.

Figure 4.3.1.7
Preliminary visualization of the Golden Mile's massing
City of Toronto (2018)

As new residential and commercial uses are introduced to the Golden Mile, this will produce additional pressure on existing parkland assets such as Wexford Park and the Ashtonbee Reservoir Park. New parkland in the Golden Mile and along the Meadoway provides an opportunity to satisfy the parkland needs of current and future residents (see Figure 4.3.1.7). The Meadoway is ideally suited to serve as a connecting point between existing and new parkland, and should be designed as such to support existing community uses of this space such as the Jonesville Allotment Gardens. As new uses are proposed and implemented, planning and design should ensure that ecological restoration is continued in these areas and not overlooked at the expense of providing other more active community uses (such as traditional recreational uses) given that sections of the Meadoway in this area are part of the Natural Heritage System.

HUMAN-WILDLIFE SAFE PASSAGE

See Figure 4.3.1.4

The more challenging element of this study site relates to the intra-connectivity of the Meadoway corridor where it crosses Eglinton Avenue and Victoria Park Avenue. An opportunity exists to exploit the Wilson Brook, a small watercourse running underneath Victoria Park Avenue and Eglinton Avenue, as a more formalized safe crossing point for terrestrial mammals, reptiles, and amphibians. Detailed study of which species might utilize this crossing point should therefore be conducted to assess the safe crossing potential for these species. For humans, the challenge for safe passage remains crossing Eglinton Avenue. A signalized crossing point aligning with Jonesville Crescent on the south side of Eglinton Avenue presents one opportunity roughly halfway between two existing signalized intersections that could be implemented close to the corridor and could foreseeably serve as a future link to a trail segment connecting to Bermondsey Road. Challenges with this alignment revolve primarily around disrupting the flow of vehicles and transit along Eglinton Avenue.

IDENTITY

In pursuit of both intra- and inter-connectivity, developing nodes for people to connect with the Meadoway and enhancing the permeability of surrounding land uses represents a key priority for this study site. Case examples offer some indication that when sited well, activities, programming, and art can be deployed to attract people to linear adaptive re-use corridors (see Figure 4.3.1.8). Furthermore, learning specifically from the Arbutus Greenway, developing clear, recognizable, and interesting entry points into this space using amenities such as art, seating, and signage can help raise awareness of these spaces and orient people to their location along the corridor relative to the urban fabric. Developing distinct nodes that highlight the corridor's presence and encourage people to explore this area, particularly at key entry points to the Meadoway, represents one method of increasing activity and connection to the corridor.

Figure 4.3.1.8
New construcion on the Altanta Beltline Trail paired with adjacent land development providing destinations for trail users
Jonathan Phillips (2018)

THE MEADOWAY

SCARBOROUGH RAPID TRANSIT LINE NEAR
KENNEDY ROAD AND LAWRENCE AVENUE
Figure 4.3.2.1

LEGEND

- GREENSPACE
- NATURAL HERITAGE SYSTEM
- TRCA JURISDICTION
- BUILDING FOOTPRINTS
- ROAD RIGHT-OF-WAY
- WATERCOURSE
- MULTI-USE TRAIL
- TRAIL CONNECTION
- INFORMAL TRAIL (DESIRE LINES)
- TTC/GO TRAIN LINE
- TRANSMISSION LINES

This map uses 1m contours

SCALE - 1:10,000

SCARBOROUGH RAPID TRANSIT

Current Challenges & Connectivity Objectives

The SRT/CNR tracks serve as a significant barrier cutting through the Meadoway, dividing the corridor's path, separating nearby Jack Goodlad Park and Arsandco Park, and disconnecting nearby neighbourhoods (see Figure 4.3.2.2). In order to by-pass this barrier, one pedestrian bridge forms a link connecting Mooregate Avenue and Tara Avenue. This pedestrian bridge represents the start of a 1.7-kilometre (see Figure 4.3.2.3) bypass around the SRT/CNR line, a branch of the West Highland Creek, and Midland Avenue that requires pedestrians and cyclists to follow sidewalks and sharrows on suburban sidestreets to where the Meadoway trail begins again near Marcos Boulevard and Lawrence Avenue East. [Re]connecting this section of the Meadoway to surrounding land uses and corridors of movement should therefore seek to develop this segment's intra-connectivity crossing the rail right-of-way as well as enhance existing adjacent frontages and corridor uses to support the inter-connectivity of land uses.

Figure 4.3.2.2
The SRT and GO lines present a significant landscape barrier for humans and wildlife
Toronto - February 10, 2019

Figure 4.3.2.3
The only crossing opportunity is a pedestrian bridge that will require replacement when GO lines are electrified
Toronto - February 10, 2019

Figure 4.3.2.4 Landscape Barriers & Movement
Scarborough Rapid Transit

- Landscape barriers
- Human movement
- Wildlife movement
- Primarily human barrier
- Primarily wildlife barrier
- Human & wildlife barrier

Figure 4.3.2.5 Landscape Permeability & Community Assets
Scarborough Rapid Transit

- Permeable frontage (public access)
- Impermeable frontage (private access or no access)
- School
- Recreation Centre
- Place of Worship
- Medical Services
- Urban Agriculture
- Childcare Services
- Library Services

	Positive	Negative
Internal	STRENGTHS • Low topographic variability • Part of TRCA Natural Heritage System • Large amounts of existing meadow and wetland habitat • Directly connected to two existing parks on either side of the SRT/CNR line	WEAKNESSES • SRT/CNR corridor impassible within Meadoway ROW • West Highland Creek impassible within Meadoway ROW • Drainage issues caused by SRT/CNR line • Large amounts of Hydro One infrastructure west of the SRT/CNR line • Complex stakeholder relationships (TTC, Metrolinx, CNR, TRCA, City of Toronto, Hydro One) • Few areas of permeable frontage on to the corridor
External	OPPORTUNITIES • Redeveloping a crossing point at SRT/CNR line in conjunction with SRT replacement (see Belleville Underpass, Lower Don Trail) • Linking NIAs (Ionview & Eglinton East) within and across each other • New development offering legislated opportunities to secure more parkland and parkland improvements	THREATS • Land use intensification at Lawrence and Midland placing increased pressure on neighbourhood parks for space

Table 4d
Meadoway - Scarborough Rapid Transit Gap SWOT Analysis

HUMAN-WILDLIFE SAFE PASSAGE

See Figure 4.3.2.4

As one of the largest gaps found along the Meadoway, the SRT/CNR gap presents as serious obstacle to the intra-connectivity of the Meadoway as a continuous trail system as well as a barrier to connectivity between two parks and significant existing vegetation patches. With the SRT scheduled for replacement with either a Light Rail Transit (LRT) line or a subway, and Metrolinx currently undertaking an expansion of the Stouffville GO line between St Clair Avenue East and Steeles Avenue, opportunities exist to connect the two sides of this rail corridor using a crossing structure. Currently the rail line presents a barrier for humans and medium-sized mammals due to a chain-link fence that prevents incursion on to the tracks. Potential options for crossing structures include a rail underpass similar to the Belleville Underpass created along the Lower Don Trail (see Figure 4.3.2.6), or a bridge, although this option should consider construction restrictions imposed by Hydro One as well as future infrastructure supporting the electrification of GO's lines. Other landscape barriers such as a small branch of the Highland Creek may be easily bridged to provide passage and may be paired with stream restoration initiatives.

ENHANCING MEADOWAY FRONTAGE

Land use intensification near the intersection of Lawrence Avenue East and Midland Avenue presents a similar set of considerations to those found in Section 4.3.1 although on a smaller scale. Land use intensification

Figure 4.3.2.6
The Belleville Underpass on the Lower Don Trail
Toronto Star (2017)

in this area should consider its relationship to the Meadoway through frontage orientation and pathways connecting the Meadoway to these new developments. Currently there are few opportunities to access the Meadoway from surrounding land uses other than two parks, and the roads that transect the Meadoway. Desire lines criss-crossing the segment of the Meadoway to the east of Midland Avenue radiating from the Abu Bakr Siddique Masjid provide some indication that this segment of the Meadoway is utilized as a cut-through to and from this destination (see Figure 4.3.2.7). Responding to these desires may take many forms and should be considered in the development of the trail and restoration of meadowland in this area. The extent to which the inter-connection of neighbouring land

Figure 4.3.2.7
Desire lines criss-cross the Meadoway indicating the corridor's use as a short-cut to community destinations
Toronto - March 27, 2019

Figure 4.3.2.8
Existing trailheads offer few amenities and present few opportunities for programming, however they are consistent in design across the entire corridor
Toronto - November 3, 2018

uses are implemented will depend largely on proposed activations for this space which currently has no public recreation, formal trail, or landscaped features within the corridor.

TRANSITIONAL ENTRY POINTS

Expanding on the idea of entry points into the Meadoway discussed in Section 4.3.1, certain Meadoway entry points may be strategically developed to gradually introduce a meadow landscape to the trail user as they enter the corridor. Research has demonstrated that people are largely unfamiliar with native habitat, expressing various anxieties about its appearance, associating it commonly with unkept or unmanaged space commonly associated with danger and insecurity (Jay & Stolte, 2011; Hoyle et al., 2017). This is of particular importance and highlights the need for tangible interventions such as better lighting and landscape design that considers sightlines to provide a sense of security (see Figure 4.3.2.8). Consideration may also be given to gradually transitioning into meadow habitat as trail users enter the Meadoway, utilizing familiar and inviting spaces at entry points that gradually transition into more heavily restored meadow habitat further in. Considering this characteristic of the corridor's development will also involve and benefit from greater activation of this space through events, programming, and educational activities which generate a greater presence along the trail as well

Figure 4.3.2.9
Land of Giants - a proposal to create transmission towers in the shape of human figures
Choi +Shine Architects (2008)

Figure 4.3.2.10
Reimagining transmission towers as artistic representations of local wildlife
Design Depot (2012)

as develop community familiarity with the space.

SIGNATURE ART

Lastly, when considering the challenge posed by large amount of Hydro One infrastructure on the western side of the SRT/CNR line, opportunities exist to consider this infrastructure as an artistic amenity capable of attracting people to this space. Several architecture and design firms have experimented with the reinvention of transmission towers into giant sculptures illustrating people and wildlife superimposed at a massive scale in the landscape (see Figure 4.3.2.9 & 4.3.2.10). Although likely to see considerable opposition from Hydro One, even a single redesigned transmission tower centred around the human and wildlife uses of the Meadoway could serve to highlight the significance of this corridor and attract people to this space.

THE MEADOWAY

EAST HIGHLAND CREEK
NEAR ELLESMERE ROAD + MILITARY TRAIL

Figure 4.3.3.1

LEGEND

- GREENSPACE
- NATURAL HERITAGE SYSTEM
- TRCA JURISDICTION
- BUILDING FOOTPRINTS
- ROAD RIGHT-OF-WAY
- WATERCOURSE
- MULTI-USE TRAIL
- TRAIL CONNECTION
- INFORMAL TRAIL (DESIRE LINES)
- TRANSMISSION LINES

This map uses 1m contours

SCALE - 1:10,000

HIGHLAND CREEK

4.3.3

Assessing growth and demand for the City's parkland

Current Challenges & Connectivity Objectives

The Highland Creek represents one of the most environmentally significant areas transected by the Meadoway. This section of the Highland Creek is formally protected under the Ravine and Natural Feature By-Law, is part of the Natural Heritage System, is designated as an Environmentally Significant Area, and is under the jurisdiction of the TRCA, all this in addition to accommodating Hydro One's transmission infrastructure which passes over the ravine creating a significant landscape barrier to movement. Trail users wishing to travel across Highland Creek must exit the Meadoway corridor at Scarborough Golf Club Road (the last in-corridor section of the trail until after Highway 401 at Collins Road) following a separated multi-use trail along Ellesmere Road until they reach Military Trail. From here, pedestrians and cyclists must share Military Trail with no separation from vehicles driving along this road as it dips down into the ravine and then climbs back up the other bank (see Figure 4.3.3.2). To continue further east, trail users must either walk along the sidewalk or bike along an unseparated section of Military Trail as it continues east running adjacent to the hydro corridor. Public access to the hydro corridor is difficult throughout this section due primarily to topography and adjacent private land uses to the corridor (see Figure 4.3.3.3). [Re]connecting this section of the Meadoway to surrounding land uses and corridors of movement may therefore take a different form than other study sites, prioritizing a more distinct separation of human and wildlife in this area to preserve and enhance the established ESA.

Figure 4.3.3.2
Highland Creek represents a challenging topographic barrier to landscape connectivity
Toronto - March 3, 2019

Figure 4.3.3.3
Private residences reduce public access to the Meadoway in several segments
Toronto - March 3, 2019

Figure 4.3.3.4 Landscape Barriers & Movement
Highland Creek

- Landscape barriers
- Human movement
- Wildlife movement
- Primarily human barrier
- Primarily wildlife barrier
- Human & wildlife barrier

Figure 4.3.3.5 Landscape Permeability & Community Assets
Highland Creek

- Permeable frontage (public access)
- Impermeable frontage (private access or no access)
- School
- Recreation Centre
- Place of Worship
- Medical Services
- Urban Agriculture
- Childcare Services
- Library Services

	Positive	Negative
Internal	STRENGTHS • Designated as an Environmentally Significant Area (ESA) • TRCA secured lands • Part of TRCA Natural Heritage System • No development pressure on the surrounding area	WEAKNESSES • High topographic variability • Obtrusive Hydro One infrastructure (infrastructure dips into the ravine) • Few areas of permeable public frontage on to the corridor
External	OPPORTUNITIES • Linking Woburn and Morningside NIAs within and across each other • Bridging the ESA keeps people away from sensitive areas lessening potential disruption • Meaningful Indigenous place-making initiatives at the Highland Creek crossing reviving and celebrating the cultural heritage of this landscape	THREATS • Risk of negative habitat impacts during construction of crossing infrastructure

Table 4e
Meadoway - Highland Creek Gap SWOT Analysis

HUMAN-WILDLIFE SAFE PASSAGE

See Figure 4.3.3.4

The proximity of the Highland Creek and Ellesmere Ravine (located slightly further to the east) presents a significant challenge to implementing a within corridor trail. For the multi-use trail to remain within the corridor, bridges crossing Highland Creek and Ellesmere Ravine represent one option for providing safe passage across this landscape (see Figure 4.3.3.6). Constructing a bridge to pass over the ravine presents the opportunity to keep human activity separate from wildlife while still offering views of this important naturalized area (see Figure 4.3.3.7). This human-oriented crossing structure which separates human functions in this space highlights the option to restrict access and restore habitat in some areas of the Meadoway rather than seeking to mix these uses in a topographically and infrastructurally challenging area. The main challenge with this option stems from Hydro One's regulations surrounding how structures and landscapes can be modified within the corridor right-of-way, especially as it pertains to clearance heights between the bridge and transmission wires which dip into the ravine responding to topographic change.

An alternative alignment along the existing Military Trail could be implemented through the revitalization of Military Trail as a more pedestrian and cyclist friendly path through the implementation of a paved multi-use trail and separated from vehicles using this space. Although the topography may pose a challenge to some trail users, this option provides a relatively simple retrofit to an existing

Figure 4.3.3.6
Pedestrian connection bridge across Mud Creek
Toronto - April 10, 2019

Figure 4.3.3.7
Research Evolve Design (RED) - a shortlisted proposal for the ARC International Wildlife Crossing Design Competition separates human and wildlife landscape uses
Janet Rosenberg & Studio (2010)

path across the landscape that improves safety for non-vehicular users of this space. Furthermore, by keeping the trail outside of the corridor, this introduces the opportunity to develop segments of the Meadoway at this location into habitat patches that form transitions mimicking those found in nature. For instance, between Highland Creek and the Ellesmere Ravine an opportunity exists to redevelop this space into purely meadowland creating a human-made ecotone transitioning from wooded valleylands to meadow tablelands. Furthermore, this study area's highly impermeable (see Figure 4.3.3.5) surrounding fabric may assist in discouraging human intrusion into this space allowing wildlife to occupy this space to a greater extent.

PLACE-MAKING

In both alignments, opportunities exist to create viewpoints from which to experience or interact with the corridor from the tableland areas surrounding the ravines through programming and the creation of distinct nodes in these areas, highlighting their physical and cultural significance. Particular attention should be paid to meaningfully highlighting the Indigenous heritage of this site through collaboration with Indigenous peoples such as the Mississauga's of the New Credit First Nation who refer to this site as Yat-qui-i-be--no-nick (creek comes out under high [lands]) but also the Anishinaabe, Haudenosaunee, Wendat, and Métis peoples who all claim the territory now known as Toronto as home (TRCA, 2015). Precedents for Indigenous place-making are varied but share a common need to provide distinct representations of culture that are significant to a particular place and established through

Figure 4.3.3.8
Hoop Dance Gathering Place is an outdoor gathering space at Mohawk College designed by Brook McIlroy
Tom Arban (2016)

on-going collaborative work between cities and Indigenous peoples in the spirit of reconciliation (see Figure 4.3.3.8). As such, meaningfully working with Indigenous groups in Scarborough represents an integral priority to the development of the Meadoway and an opportunity to implement Truth and Reconciliation Commission (2015) calls to action surrounding education and visibility of Indigenous peoples in a colonial landscape.

Members of the TRCA, Perkins + Will, and the Ecological Design Lab meet to discuss the Meadoway
Toronto - March 5, 2019

CHAPTER 5
RECOMMENDATIONS & NEXT STEPS

5.1 IMPLEMENTING CONNECTIVITY

- Existing trail
- Within corridor alignment
- Outside corridor alignment
- Meadow land cover
- Programmable space
- Forest land cover
- Proposed development
- Crossing structure
- Nodes/Gateways

Figure 5.1.1 Connectivity Opportunities - Golden Mile

Figure 5.1.2 Connectivity Opportunities - Scarborough Rapid Transit

Figure 5.1.3 Connectivity Opportunities - Highland Creek

As the planning and design of the Meadoway continues to develop, consideration from the involved stakeholders, including the TRCA, the Weston Foundation, the City of Toronto, and any associated consultants working in collaboration with these organizations should consider three key takeaways. Figures 5.1.1; 5.1.2; and 5.1.3 provide a conceptualization of how this planning and design might be organized based on the analysis performed in Chapter 4.

Understood broadly, when planning and designing the Meadoway connectivity should be considered in its various forms and implications for different users. The Meadoway must be both a space to connect people and wildlife between the various segments that comprise its length while also attracting and facilitating access to the corridor from neighbouring areas. Attention should therefore be paid not only to the relationship of the Meadoway to itself, but also the Meadoway to its surroundings. Secondly, when considering connectivity, attention should be placed on how the corridor can evolve alongside land use change occurring at different intensities along its path, responding accordingly to this change and seeking out opportunities for integrated redevelopment that removes barriers to access. Third, the Meadoway's success will be defined by its capacity to engage communities around visions for this space that reflects their needs and incorporates the imperative to undertake ecological restoration. Achieving the activation of the Meadoway through acts of ecological restoration that bring people to this space through shared education and learning represent a desirable middle-ground fostering community stewardship and involvement in this space.

5.2 PHASING & SCALING CONNECTIVITY

Connectivity is two-fold along the Meadoway, dealing with intra-connectivity along the entire corridor, and inter-connectivity at the scale of individual Meadoway segments defined by the spaces between existing barriers. At an intra-connectivity scale, landscape barriers such as roads, topography, and watercourses represent challenges that will require incremental change that capitalize on opportunities to reconnect this landscape by collaborating on projects that are planned or underway through a comprehensive planning approach. The comprehensive planning approach applied on the Atlanta Beltline project provides a partial indication of how this might unfold with different stakeholders working together, providing not only a multi-use trail but also a myriad of supporting services, destinations, and infrastructure that supports the trail's use. For the Meadoway to serve as a corridor providing intra-connectivity, this will inevitably involve integrating advocacy for landscape connectivity into projects seeking to intensify land around the corridor and replace infrastructure serving as barriers to this type of connectivity. At a smaller scale, supporting the intra-connectivity of the Meadoway will also require developing a cohesive identity for the space that is recognizable from the various roads that cross the corridor, showcasing these different segments as part of a symbolically connected series of spaces, even if these spaces have different functions.

Connectivity along the Meadoway should also be conceptualized as a more than just a thoroughfare for movement along its entire path. At 16-kilometres long and separated by 36 landscape barriers, the value of the Meadoway as a series of 'rooms' that can be utilized by both humans and wildlife should also be considered when planning for inter-connectivity along the corridor. While users of the Meadoway may seek to use the corridor as a means of safe passage across Scarborough as envisioned in the project's guiding documents, improving people's access to individual corridor 'rooms' and tailoring these 'rooms' to localized needs and conditions should also serve as a priority for the project. Currently, most properties bordering the Meadoway turn their back to the corridor using fences, windowless walls, and other barriers to create an impermeable obstacle to accessing the Meadoway. Some properties possess gates to access the corridor or simple chain-link fences providing visual connection to the space, however these remain private connections to the space (see Figure 5.2.1). Achieving inter-connectivity will require incremental change at sites along the Meadoway's path by introducing new public connections with surrounding land uses and adjusting the orientation of buildings so that additional frontage can be directed towards the Meadoway. This can be paired with the creation of nodes at various locations along the Meadoway that allow people to gather around communal activities. These nodes may focus on an array of uses that activate these spaces that are permanent such as allotment gardens, play structures, and art, or temporary activations such as performances, stewardship activities, and other community-based events. Examples of this can already be found along the Meadoway where parks and backyards spill over into the corridor and new uses such as allotment

Figure 5.2.1
Many private residences enjoy exclusive access to sections of the Meadoway
Toronto - March 27, 2019

Figure 5.2.2
Several residences have informally extended their backyard into the corridor right-of-way for activities such as gardening
Toronto - February 10, 2019

gardens serve to activate sections of the Meadoway bringing people into this space (see Figure 5.2.2). Drawing on Jacobs' (1961) notion of "eyes of the street", activating sections of the Meadoway and improving the permeability of the Meadoway's borders may serve to create 'eyes on the Meadoway' encouraging further use of this space and reinforcing comfort in using this space. Improving inter-connectivity through the Meadoway may also serve as a means supporting nearby NIAs through community-oriented programming that supports their development in line with the Toronto Strong Neighbourhoods Strategy.

The notion of 'rooms' for human interaction, can also be applied to certain areas of the Meadoway that can serve as 'rooms' for wildlife to inhabit, particularly in sections of the corridor that are close to the existing Natural Heritage System or isolated by challenging landscape barriers. These 'rooms' tailored to the creation of habitat supportive of wildlife such as pollinators, birds, small mammals, reptiles, and amphibians when sited strategically may assist in creating habitat patches allowing wildlife to move across the landscape at both the intra- and inter-connectivity scales. Selecting locations for these habitat patches should consider, through consultation with ecologists, the capacity of these habitat patches to support both intra- and inter-connectivity along the Meadoway as well as targeted safe passage opportunities that link habitat patches across landscape barriers.

5.3 GROWTH & DEVELOPMENT PRESSURE

New development along the Meadoway presents the opportunity to further enhance this corridor through its integrated redevelopment in conjunction with nearby land use and infrastructure redevelopment. In areas such as the Golden Mile, and at Lawrence Avenue near Midland Avenue, new projects seeking to intensify land use in these areas present a development imperative as identified in the province's planning framework to connect these areas to active and public transit options as well as greenspaces. [Re]connecting these landscape gaps along the Meadoway presents opportunities to repair inter-connectivity between adjacent land uses and the Meadoway by increasing landscape permeability through the removal of barriers and the creation of new public frontages and connections to the corridor. In the Golden Mile, and at Lawrence Avenue near Midland, these land use intensification redevelopments present the opportunity to connect these new developments and their residents to the Meadoway through new frontages on to this space and parkland that extends outward from the Meadoway into surrounding land uses.

[Re]connecting these spaces will also involve the challenging task of defining through public consultation and professional analysis, what these spaces should be used for (see Section 5.4). In its current form, the Meadoway provides a variety of uses including sports fields, utility services, parking, and naturalized vegetated areas. The Meadoway will be required to balance the imperative to restore ecosystems and their habitat as a conservation priority, but also provide the many cultural services people expect of greenspaces in cities. Finding opportunities to balance these sometimes competing priorities will be crucial to the success of the Meadoway and will ultimately respond to localize conditions. As discussed in the study sites, responses will differ by location with areas such as the Golden Mile likely seeing a greater emphasis on recreational services designed to meet new demand for parkland compared to more eastern sections of the Meadoway where greater opportunity exists to restore ecosystem functions due to a large supply of existing parkland in these areas.

As the Meadoway develops, one pressing concern among its planners should be the potential impact its creation will have as a new amenity influencing the use and price of land surrounding it. Land use intensification and redevelopment are common to almost all linear adaptive re-use parkland projects outlined in Section 4.1. Converting underused utility corridors into corridors for human movement has traditionally reversed how this space is conceptualized transforming it from an inconvenience (whether due to noise, pollution, obstruction of view, or other) into an amenity. With the introduction of this new amenity, redevelopment follows seeking to translate this amenity into value-added on new development. This is particularly problematic in examples of linear adaptive re-use given historic inequalities that contribute to the clustering of lower-income and marginalized communities around areas that are environmentally hazardous or present a real or perceived inconvenience (see Figure 5.3.1) (Farber, 1998; Hite, 2000; Su et al., 2009). In many

Figure 5.3.1
Caution should be used around hydro infrastructure however many fears surrounding EMFs are inconclusive
Toronto - February 10, 2019

Figure 5.3.2
City dwellers must learn to co-exist with wildlife in urban ecosystems without prejudice
Toronto - March 27, 2019

cases, long-time residents have been displaced from their neighbourhoods due to this abrupt change in land valuation. Further study should seek to examine the anticipated impact on nearby land value in response to the introduction of the Meadoway as part of an emerging system of trails and greenspaces through the city. This is especially relevant given that the Meadoway represents a subtly different form of linear adaptive re-use parkland.

As a multifunctional piece of infrastructure that remains an active utility corridor, people may continue to view this space as an undesirable feature to live next to given its aesthetics (Atkinson, Day & Mourato, 2006) but also due to lingering public uncertainty surrounding the health implications of the electromagnetic fields (EMFs) created by hydro corridors (City of Toronto, 2008). Furthermore, the reintroduction of naturalized habitat will encourage the reintroduction of various species, including those seen as desirable (such as songbirds and butterflies) as well as those seen as undesirable (such as snakes and coyotes). Recent public outcry over the presence of coyotes in areas surrounding ravines (City of Toronto, 2015; Bañares, 2019) exposes challenges associated with humans feeling they have the authority and power to selectively pick which elements of an ecosystem they wish to experience as part of their interaction with nature (see Figure 5.3.2). Increasing educational opportunities that stress the importance of complete rather than selective

ecosystems, and best practices for interacting with species perceived as dangerous or a nuisance must represent part of an on-going public engagement exercise around the Meadoway's redevelopment and other naturalized areas of the city to manage and inform human interaction with wildlife. As a result of both the transmission functions of the Meadoway and public hesitancy to restoring habitat that may facilitate the reintroduction of species viewed as problematic in urban areas, this may mitigate against Halo Effects seen in other adaptive re-use parkland projects. Ongoing study should therefore be done to understand the extent of change stemming from the Meadoway's development and its impacts on neighbourhood characteristics such as affordability, land use change, service demand, and human interaction with wildlife.

Although the Meadoway's development many not spur large scale redevelopment centred on proximity to this corridor, it will largely meet the characteristics of a city park providing an attractive space worth visiting due to its size and the potential programming and recreational opportunities it can offer (see Figure 5.3.3). As with other city parks in Toronto which serve both local communities as well as district and city-wide users, balancing uses and programming to serve a range of users will be an important step in the Meadoway's development that should ideally be shaped through community participation and action to drive the design and programming of these spaces. This will ensure that the Meadoway serves the communities closest to it (such as the numerous NIAs that stand to benefit from the space), not just users who come to visit from elsewhere in the city.

Figure 5.3.3
Many segments of the Meadoway currently possess valuable community amenities such as allotment gardens, parks, playing fields, and dog runs
Toronto - November 27, 2018

Finally, adaptive reuse linear parks are largely driven by the communities that border them and are championed by individuals and organizations expressing a desire to reimagine this space in their community. The success of projects such as the High Line and the Beltine came from the initiative and concern from local citizens who gathered the initial support from select members of the surrounding community and political decision-makers advocating on behalf of retaining and reimagining this infrastructure. Yet as can be seen across numerous linear adaptive re-use parkland projects discussed in Section 4.1, it is vital to ensure that community partnerships on these projects help to shape their development to serve as a reflection of diverse community needs rather than a vision imposed upon the space by a select group of individuals. Supporting existing uses of this greenspace and providing space for these uses that reflect individual and community ideas for the space represents one potential way to provide space for communities to express pride of place and agency over the development specific 'rooms' along the Meadoway, many of which are already partially occupied through grassroots initiatives along the edges of the Meadoway. Specifically, outreaching to local communities along the entire length of the Meadoway, particularly in NIAs which have been identified by the City for opportunities to improve community well-being, will be vital to generating the support, engagement, and community agency around shaping the future of Meadoway as a neighbourhood amenity. This is particularly important to capture needs, interests, and uses that are traditionally missed in discussions designed to uncover the interests of various publics. Consultation surrounding the Meadoway's development should therefore be mindful of who is not being captured through the public consultation process as it evolves, and course correct to ensure the views of racialized, discriminated, and socio-economically vulnerable groups traditionally underrepresented in the consultation process are heard.

Beyond traditional channels of community consultation (such as public meetings), immersive consultation that engages communities in place through conservation and restoration events targeted towards children and adults serves as a visionary step undertaken by the TRCA and the Weston Foundation to support ecological literacy through free educational programming and gather support for the project through tactile interaction with the landscape. This style of engagement carries the potential to better understand how the Meadoway is used in ways that produce minimal traces, for instance opportunities to play or use the corridor as a short-cut to neighbourhood destinations (see Figure 5.4.1). Opportunities to expand Meadoway programming include outreaching to nearby schools, community organizations, the Indigenous community, and religious organizations surrounding corridor (see Figure 4.3.1.5; 4.3.2.5; 4.3.3.5) capable of leading improvements and stewardship at the scale of the individual segments between barriers (see Figure 5.4.2). These events bring people to the Meadoway to take part in restoration and maintenance activities provide opportunities to explore community visions for this space while highlighting the importance of restoration

Figure 5.4.1
A paved path transitions into an informal trail (desire line) between a neighbourhood and a school
Toronto - March 27, 2019

Figure 5.4.2
Children take part in a planting pollinator habitat as part of the Scarborough Butterfly Trail project
Park People (2013)

and ensuring that the space serves as a co-created reflection of the community. As mentioned in Section 5.2 animating the Meadoway through a mix of permanent and temporary activations of the space represents one of the key priorities to increasing community use of the Meadoway, representing one metric in analyzing the project's success. These initiatives while may capitalize on designer ecology (Lister, 2007) to create distinct entry points and nodes employing art and other interactive elements that raise awareness about this space and spark the interest of visitors to explore it in greater detail. In this sense, strategically sited designer ecology initiatives can have the effect of increasing interest in the more complex functional ecology processes at play by fostering awe over these naturalized spaces and providing a unique experience of nature in the city.

5.5 RECOMMENDATIONS

THE TORONTO AND REGION CONSERVATION AUTHORITY SHOULD:

1. Coordinate developing the Meadoway near Kennedy Road and Midland Avenue, and Eglinton Avenue East in conjunction the Toronto Transit Commission and Metrolinx as they renovate and upgrade transportation infrastructure transecting the Meadoway

2. Continue to engage communities along the Meadoway through a mix of public meetings and experiential events held along the corridor to collaborate on place-specific interventions designed to better understand how communities currently use the Meadoway as well as provide insight into their visions for the corridor
   - *Specifically collaborate with the Indigenous community surrounding the significance of sites such as Highland Creek as Indigenous place-making opportunities*
   - *Where applicable, identify demographic groups missing from public consultation to course correct on engagement events to better capture views of traditionally underrepresented groups*

3. Identify key points of wildlife crossing and opportunities for species-specific wildlife crossing infrastructure to be implemented in these locations

4. Consider the value of designer ecology (Lister, 2007) expressed through art as a place-making tool tied to the intra-connected identity of the Meadoway's various segments

5. Document the process of redeveloping the Meadoway to inform future decision-making around the development of other hydro corridors within the TRCA's jurisdiction for similar uses

THE CITY OF TORONTO SHOULD:

6. Through the site plan approval process, identify opportunities to add public frontages and uses on to the Meadoway from neighbouring land uses

7. Develop policies in documents such as the Golden Mile Secondary Plan that support the creation of new parkland adjacent to the Meadoway providing destinations for trail users

8. Monitor the redevelopment of the Meadoway and its potential impacts on NIAs with particular attention to mitigating a potential Halo Effect caused by the corridor's redevelopment

9. Study how intensification adjacent to the Meadoway may present new demands on the trail and greenspace network

10. Partner with the TRCA on educational initiatives designed to improve awareness of the need for complete ecosystems, offering information and training on how to co-exist and support species as

THE WESTON FOUNDATION SHOULD:

11. Continue its efforts to advocate for the creation of meadowland along hydro corridors through the development of programs in collaboration with the TRCA and the City of Toronto focused on improving access to educational opportunities for interacting with nature in cities

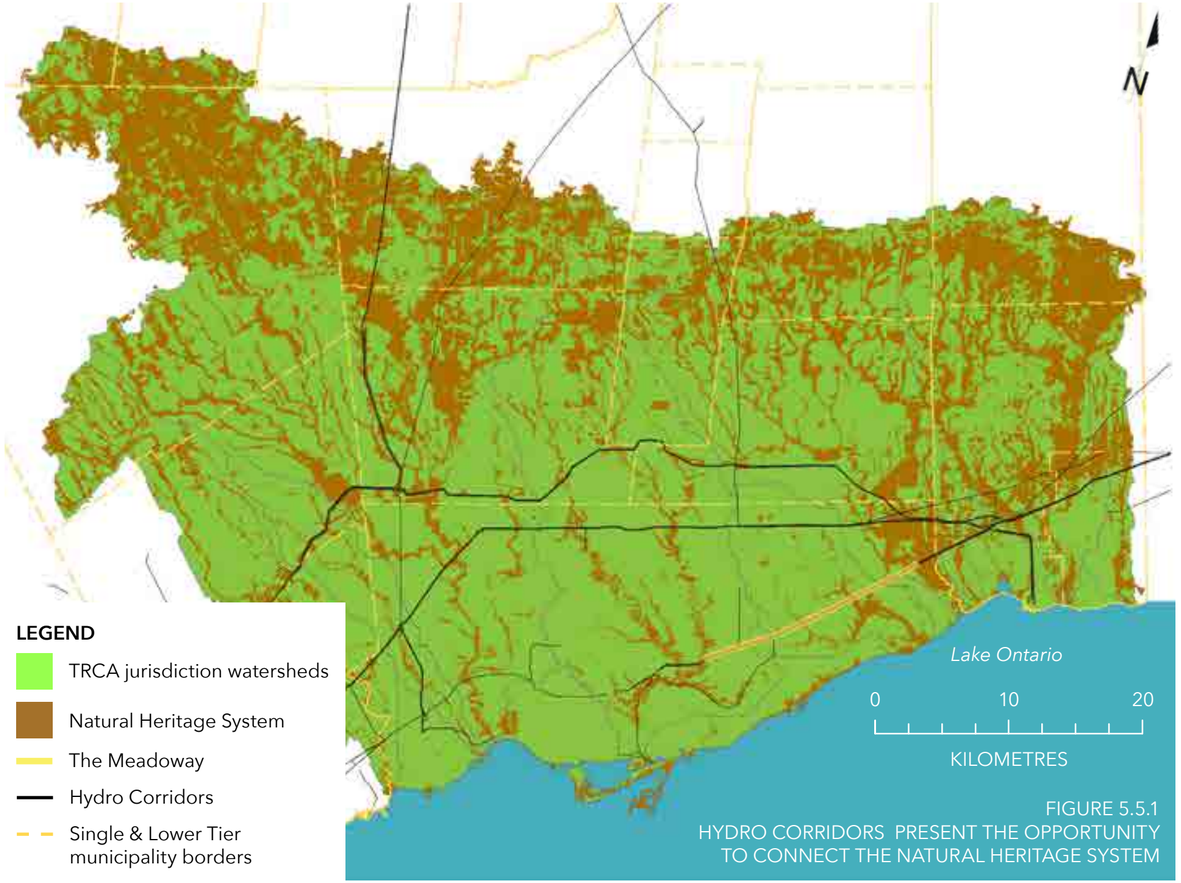


FIGURE 5.5.1
HYDRO CORRIDORS PRESENT THE OPPORTUNITY TO CONNECT THE NATURAL HERITAGE SYSTEM

MOVING FORWARD

5.6

The Meadoway is ideally situated to serve as a test site for a new type of linear adaptive re-use parkland that is functional as both an active utility corridor and a space for recreation. With an extensive network of hydro corridors in the GTA (see Figure 5.5.1 & 5.5.2), hydro corridors are well-suited to serve as valuable assets capable of connecting different areas of the City to each other as well as connecting residents to greenspaces and the ecosystem services that accompany them. By learning from precedents and from the Meadoway's development as a safe-to-fail project (Lister, 2016), this will help inform future linear adaptive re-use parkland projects and drive the creation of a network of meadoways connecting the region's natural heritage system, connecting wildlife to habitat, and connecting Torontonians to new opportunities to experience nature in their city.

The Meadoway represents an unparalleled opportunity to [re]connect landscape dissected by human development, and in doing so enhance, restore, and strengthen this landscape for humans and wildlife. Moving forward, the TRCA, the Weston Foundation, and the City of Toronto may implement key learnings from this document as they pertain to the Meadoway's development as both an intra- and inter-connected corridor for connecting humans and wildlife across Scarborough. Understanding this connection between landscape change and the goals and objectives set forth by these organization represents a key component of city-building that is not the exclusive domain of planners. In working towards complex "wicked problems", planners alongside other professionals and the communities they serve will be required to meaningfully collaborate to respond to the unpredictability of ecological systems. Through this process, understanding landscape and collaborating on initiatives that seek to better understand the processes at play that affect them represents a key element of building resilience into cities.

Figure 5.5.2
A segment of the future Green Line near Geary Avenue and Ossington Avenue
Toronto - April 4, 2019

A Cooper's Hawk rests on a transmission tower near the Meadoway
Toronto - February 10, 2019

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A pair of robins ground-feeding along an undeveloped section of the Meadoway
Toronto - March 27, 2019

APPENDICES

A.A LIST OF CASE EXAMPLES

	Park	City	Opened	Length (km)	Area (ha)	Former Use	Former Owner	Development Structure	Cost (millions USD, unless specified)
OPENED	High Line	New York	2009	2.4	2.71	Above-grade railway	New York Central Railroad	P3	152
	Bloomington Trail/The 606	Chicago	2015	4.3	8.09	Above-grade railway	Canadian Pacific Railway	P3	95
	Beltline	Atlanta	2008	35		Above-grade railway	Multiple	P3	4,800
	The Midtown Greenway	Minneapolis	2000	9.2		Below-grade railway	Minnesota Commercial Railway	P3	68
	La Petite Ceinture	Paris	2008	33		Below-grade railway	Multiple	Municipal-led	
	Cheonggyecheon River Project	Seoul	2005	5.84	40.46	Elevated Highway		Municipal-led	380
	Arbutus Greenway	Vancouver	2018	9	17	At-grade railway	Canadian Pacific Railway	Municipal-led	30 CAD
	Dequindre Cut	Detroit	2009	3.2		Below-grade railway	Grand Trunk Railway	Conservancy	
	Rail Park	Philadelphia	2018	4.8		Above-grade railway	Reading Railroad	P3	11
	Bonaventure Park	Montréal	2017	0.5	3.56	Above-grade Highway	Municipality	Municipal-led	142 CAD
	Bayou Greenways	Houston	2014	241	1214	Waterfront	Multiple	P3	220
	Crissy Field	San Francisco	2001		40.46	Airfield	US Military	Conservancy	
	Klyde Warren Park	Dallas	2012		2.1	Highway		P3	51

Stakeholders	Societal Benefit/Goals (1)	Multi-Use Trail (2)	Neighbourhood parkland (3)	Public transit (4)	Vulnerable population benefits (5)	Ecological performance (6)	Commissioned Art (7)
Friends of the High Line New York City	Development catalyst Greenspace access	No	No	No	No	Yes	Yes
Chicago Park District Trust for Public Land City of Chicago	Greenspace access Health/Active Transportation	Yes	Partial	No	Yes	No	Yes
Atlanta Beltline Inc. Altlanta Beltline Partnership City of Atlanta	Development catalyst Greenspace access Health/Active Transportation	Yes	Yes	Yes	Partial	No	Yes
Hennepin County Regional Railroad Authority City of Minneapolis	Greenspace access Health/Active Transportation	Yes	Partial	Proposed	Yes	No	Yes
City of Paris	Health/Active Transportation	Yes	Partial	Proposed	No	Yes	Proposed
City of Seoul	Greenspace access Ecological Restoration	No	No	No	No	Yes	Yes
City of Vancouver	Health/Active Transportation	Yes	Yes	Proposed	No	No	Yes
Detroit Riverfront Conservancy City of Detroit	Health/Active Transportation	Yes	Partial	No	No	No	Yes
Friends of Rail Park Center City District Foundation City of Philadelphia	Development catalyst Greenspace access	No	No	No	No	Proposed	Yes
City of Montréal	Development catalyst	No	No	No	No	Partial	Yes
Houston Parks Board City of Houston	Ecological restoration Greenspace access Health/Active Transportation	Yes	Yes	No	Yes	Yes	Yes
National Parks Service Golden Gade National Parks Conservancy	Ecological restoration Greenspace access	Yes	Yes	No	No	Yes	Yes
City of Dallas Woodall Rodgers Park Foundation	Greenspace access	No	No	No	No	No	Yes

LANDSCAPE BARRIER INVENTORY

Landscape Barrier ID	Landscape Barrier	Barrier Type	Road Classification	Road Classification Code	Zoning Neighbours	Predominant Neighbour Zoning	Predominant Neighbour Zoning Code	Additional Planning Policies (in place or under review)	NIA	Linear Habitat Neighbour	Linear Habitat Neighbour Code	Natural Heritage	TRCA Reg.	ESA	ExistingMulti-Use Trail Access (w/in corridor)
1	Bermondsey Rd	Road	Minor Arterial	3	E OR	E	2		1	Sod	1	1	1	0	0
2	Eglinton Avenue E	Road	Major Arterial	4	RM RA RAC	R	1	Golden Mile Secondary Plan	1	Sod Meadow	4	0	1	0	2
3	Victoria Park Ave	Road	Minor Arterial	1	RM RA RAC	R	1	Golden Mile Secondary Plan	1	Sod Meadow	4	0	1	0	1
4	Pharmacy Ave	Road	Collector	2	RD RA	R	1		0	Sod Meadow	4	0	0	0	1
5	Warden Ave	Road	Major Arterial	4	RD E	E	2		0	Sod	1	1	0	0	1
6	Crockford Blvd	Road	Collector	2	E	E	2		0	Sod	1	1	0	0	1
7	Massey Creek	Watercourse			E	E	2		0	Sod Meadow	4	1	1	0	1
8	Birchmount Rd	Road	Major Arterial	4	RD RA E	R	1		1	Sod Meadow	4	0	0	0	1
9	Givendale Rd	Road	Local	1	RD	R	1		1	Sod	1	0	0	0	1
10	Kennedy Rd	Road	Major Arterial	4	RD OR	R	1		1	Sod	1	0	0	0	2
11	Scarborough RT/GO	Rail			RD	R	1		1	Sod Meadow		1	0	0	0
12	Creek	Watercourse			RD RAC	R	1		0	Meadow	2	1	1	0	0
13	Midland Ave	Road	Major Arterial	4	RD RAC CR	R	1		0	Sod	1	1	1	0	0
14	Marcos Blvd	Road	Local	1	RD CR	R	1		0	Sod	1	0	0	0	2
15	Brimley Rd	Road	Major Arterial	4	RM CR	R	1		0	Sod	1	1	0	0	1
16	Lawrence Ave E	Road	Major Arterial	4	RM CR	R	1		0	Sod	1	1	0	0	1
17	West Highland Creek	Watercourse			IH	I			0	Forest	3	1	1	0	1
18	McCowan Rd	Road	Major Arterial	4	RD	R	1		1	Sod Meadow		1	1	0	1
19	Benshire Dr	Road	Local	1	RD	R	1		1	Meadow	2	0	0	0	1
20	Bellamy Rd N	Road	Minor Arterial	3	RD	R	1		1	Meadow	2	0	0	0	1
21	Daventry Rd	Road	Local	1	RD	R	1		1	Sod Meadow	4	0	0	0	1
22	Markham Rd	Road	Major Arterial	4	RD RAC	R	1		1	Meadow	2	0	0	0	1
23	Brimorton Dr	Road	Collector	2	RD	R	1		1	Meadow	2	0	0	0	1
24	Scarborough Golf Club Rd	Road	Minor Arterial	3	RD	R	1		1	Meadow	2	1	0	0	1
25	Ellesmere Rd	Road	Major Arterial	4	RD	R	1		1	Meadow	2	1	0	0	1
26	Military Trail	Road	Collector	2	RD	R	1		1	Sod	1	1	0	0	2
27	Highland Creek	Watercourse			ON	O	3		1	Meadow Forest	5	1	1	1	0
28	Neilson Rd	Road	Minor Arterial	3	RT	R	1		1	Sod	1	1	0	0	0
29	Ellesmere Ravine	Watercourse			RT	R	1		1	Forest	3	1	1	1	0
30	Military Trail	Road	Collector	2	RD OR	R	1		1	Sod	1	1	0	0	0
31	Morningside Ave	Road	Major Arterial	4	RD	R	1		1	Sod	1	1	0	0	0
32	HWY 401	Road	Expressway	5	RD E	E	2		0	Meadow	2	1	0	0	0
33	Conlins Rd	Road	Collector	2	RD E	R	1		0	Meadow	2	1	0	0	2
34	Dean Park Rd	Road	Collector	2	RD RS RT	R	1		0	Meadow	2	1	0	0	1
35	Sheppard Ave E	Road	Major Arterial	4	RD RS RT	R	1		0	Sod Meadow	4	1	0	0	1
36	Meadowvale Rd	Road	Collector	2	RD RM	R	1		0	Sod Meadow	4	1	1	1	2
												24	11	3	32

A.C PROVINCIAL PLANNING FRAMEWORK

Provincial Policy Statement
(2013)

Policy	Focus
Public Spaces, Recreation, Parks, Trails and Open Spaces	
1.5.1.b	Plan and provide for a full range and equitable distribution of publicly-accessible built and natural settings for
Transportation and Infrastructure Corridors	
1.6.8.1	Plan and protect corridors and rights-of-way for infrastructure to meet current and projected needs
1.6.8.4	Preserve and reuse abandoned corridors for purposes that maintain the corridor's integrity and continuous linear characteristics should be encouraged
Natural Heritage	
2.1.1	Natural features and areas shall be protected for the long- term
2.1.2	Maintain, restore, and where possible improve diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems
2.1.4a 2.1.5b-e	Restrictions on development and site alteration apply to significant wetlands, woodlands, valleylands, wildlife habitat, and areas of natural and scientific interest. Some exceptions when it is demonstrated that there will be no negative impacts on the natural features or their ecological functions
2.1.7	Development and site alternations shall not be permitted in habitat of endangered and threatened species, except in accordance with provincial and federal requirements
2.1.8	Development and site alteration on lands adjacent to those in policies 2.1.4, 2.1.5, and 2.1.7 are subject to the same tests found in policy 2.1.5

The Growth Plan for the Greater Golden Horseshoe
(2017)

Policy	Focus
Infrastructure to Support Growth	
3.2.3.4	Comprehensive and integrated transportation planning providing for active transportation and continuous linkages through safe and dedicated spaces
3.2.5a	Encourage co-location of linear infrastructure
3.2.5b	Meet current and projected need in accordance with the PPS
3.2.5d	Avoid and minimize through EA process impacts to Natural Heritage and hydrological features
3.2.5eiii	For existing or planned corridors provide opportunities for inter-modal linkages
Protecting What is Valuable	
4.2.2.2	Municipalities are to incorporate the Natural Heritage System overlay in official plans applying appropriate policies to maintain, restore, or enhance diversity and connectivity of the ecological system, its features, and functions
4.2.5.1b	Develop a system of publicly-accessible parkland, open space and trails that is based on a coordinated approach to trail planning and development
4.2.5.2	Open space may include opportunities for urban agriculture, communal courtyards, and public parks

The Conservation Authorities Act
(1990)

Policy	Focus
Objects, Powers and Duties	
s 20	The objects of an authority are to provide, in the area over which it has jurisdiction, programs and services designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals.
s 21(1)	For the purposes of accomplishing its objects, an authority has power,
	To study and investigate the watershed and to determine programs and services whereby the natural resources of the watershed may be conserved, restored, developed and managed
	To acquire by purchase, lease or otherwise and to expropriate any land that it may require to meet their objects
	To construct infrastructure managing the flow and management of water including reservoirs, dams, and other alterations to watercourse channels
	To use lands that are owned or controlled by the authority for purposes, not inconsistent with its objects, as it considers proper
	To use lands owned or controlled by the authority for park or other recreational purposes, and to erect, or permit to be erected, buildings, booths and facilities for such purposes and to make charges for admission thereto and the use
	To collaborate and enter into agreements with ministries and agencies of government, municipal councils and local boards and other organizations and individuals
	To plant and produce trees on Crown lands with the consent of the Minister, and on other lands with the consent of the owner, for any purpose

The Greenbelt Plan
(2017)

Policy areas of the Greenbelt Plan (2017) concern for the most part areas designated as "Protected Countryside" of which the only areas found in Toronto are in Rouge National Urban Park at the eastern end of the Meadoway. Yet as part of an interconnected system, policies found in sections 3.2.2 Natural Heritage System Policies and 3.3.3 Parkland, Open Space and Trail Policies present similar language to that used in the PPS and the Growth Plan.

A.D LOCAL AND REGIONAL STRATEGIC DOCUMENTS

TORONTO

Strong Neighbourhoods Strategy 2020 (2012)
Toronto's Strong Neighbourhoods Strategy is an equity strategy with the intent to promote strong neighbourhoods through physical design, economic opportunities, healthy living, social development, and participation in civic decision-making. It identifies Toronto's 31 Neighbourhood Improvement Areas (NIAs) as target sites for implementing the report's 248 equity actions.

Natural Environment Trail Strategy (2013)
Toronto's Natural Environment Trail Strategy was created in response to managing the 277 km of natural-surface trails across the city with the intent to protect natural areas by formalizing trails in environmentally sensitive areas, removing and providing alternatives to harmful natural-surface trails, and encouraging continued stewardship of these trails through education and community initiatives.

Parkland Strategy (2017)
Toronto's Parkland Strategy provides strategic direction for growing the City's parkland supply based on projected population changes across the city relative the parkland provision on a per capita basis. It is intended to guide parkland acquisition which expands the city's parkland network and works to connect these assets to improve city-wide access to these spaces.

Pollinator Protection Strategy (2017)
Toronto's Pollinator Strategy was developed to provide and restore habitat supporting pollinators such as bees and butterflies through the creation of new habitat, connecting green spaces, partnering on projects, investing in opportunities to improve habitat, and educating and celebrating the importance of pollinators with members of the public. Specifically, this strategy identifies the Scarborough Centre Butterfly Trail along the eastern Meadoway as a successful model for designing a connected habitat area for pollinators to thrive rooted in community involvement and participation.

Ravine Strategy (2017)
The Ravine Strategy is intended to support a ravine system that is natural, connected for the well-being and health of the city, where use and enjoyment support protection, education, and stewardship. Its five guiding principles to protect, invest, connect, partner, and celebrate are supported by twenty actions intended to ensure pressures posed by population growth, development, and climate change are managed.