Natural Heritage &
Urban Forest Strategy

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Janice Baker, Gary Kent, Paul Mitcham (Project Champion), Martin Powell and Ed Sajecki.

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STAKEHOLDERS

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Aboriginal Organizations: Mississaugas of the New Credit First Nation, Peel Aboriginal Network, and Six Nations of the Grand River.

City of Mississauga Committees of Council: Accessibility Advisory Committee (AAC) and Heritage Advisory Committee (HAC).

Community Groups / Residents' Associations: Credit Reserve Association, Erindale-Woodlands Community Association, Gordon Woods Homeowners Association, Lakeview Estates Ratepayers' Association, Meadowvale Village Community Association, Meadow Wood Rattray Ratepayers Association, Mississauga - Kane Road Ratepayer's Association, Mississauga Oakridge Ratepayer's Association, Mississauga Road Sawmill Valley Ratepayers Association, Mississauga Resident's Association Network (MIRANET), Peel Environmental Youth Alliance (PEYA), Port Credit Village Residents Association, Streetsville Credit Valley Residents Association, Town of Port Credit Association, and Whiteoaks Lorne Park Community Association.

Economic and Business Development Organizations: Building Industry and Land Development Association (BILD), Chamber of Commerce / Tourism, Glen Schnarr & Associates, Mississauga Board of Trade, Port Credit Business Improvement Association and Streetsville Business Improvement Association.

Educational Organizations: Association for Canadian Educational Resources (ACER), Dufferin-Peel Catholic District School Board, Peel District School Board; Sheridan College (Sheridan Institute of Technology and Advanced Learning), Tutored by Nature and University of Toronto.

Environmental Organizations: Credit River Alliance (CRA), David Suzuki Foundation, EcoSource Mississauga, Environmental Defence, Evergreen Foundation, Halton Peel Biodiversity Network, Halton-Peel Stewardship Council, Nature Conservancy of Canada (NCC), Ontario Nature; Partners in Project Green, Peel Environmental Network, Peel Naturalists' Club, Rattray Marsh Protection Association, Riverwood Conservancy, Sierra Club and South Peel Naturalists' Club.

Federal and Provincial Government: Environment Canada (EC), Ministry of the Environment (MOE), Infrastructure Ontario, Ministry of Municipal Affairs and Housing (MMAH), Ministry of Natural Resources (OMNR) and Ministry of Transportation (MTO).

Municipal Governments, Local Conservation Authorities and Agencies: City of Brampton, City of Toronto, Credit Valley Conservation (CVC), Greater Toronto Airport Authority (GTAA), Halton Region Conservation (HRC), Region of Halton, Town of Caledon, Town of Milton, Town of Oakville, Region of Peel, Toronto and Region Conservation Authority (TRCA).

Recreational Groups / Organizations: Braeben Golf Course, Credit River Anglers Association, Credit Valley Golf and Country Club, Lakeview Golf Course, Mississauga Bassmasters, Mississauga Canoe Club, Mississauga Golf and Country Club and Toronto Golf & Country Club.

Utility Companies and Arboriculture Firms: Arborcorp Tree Service, Colonial Tree Care, Diamond Tree Care, Hydro One Networks Inc., Ontario Power Authority (OPA), Ontario Power Generation and Pineridge Tree Care.

Summaries of the input received from stakeholders and the community are provided in **Appendices A and B** to this Strategy.

Special thanks are extended to CVC and Peel Region for providing project-specific technical support related to natural heritage and urban forest analyses respectively.

EXECUTIVE SUMMARY

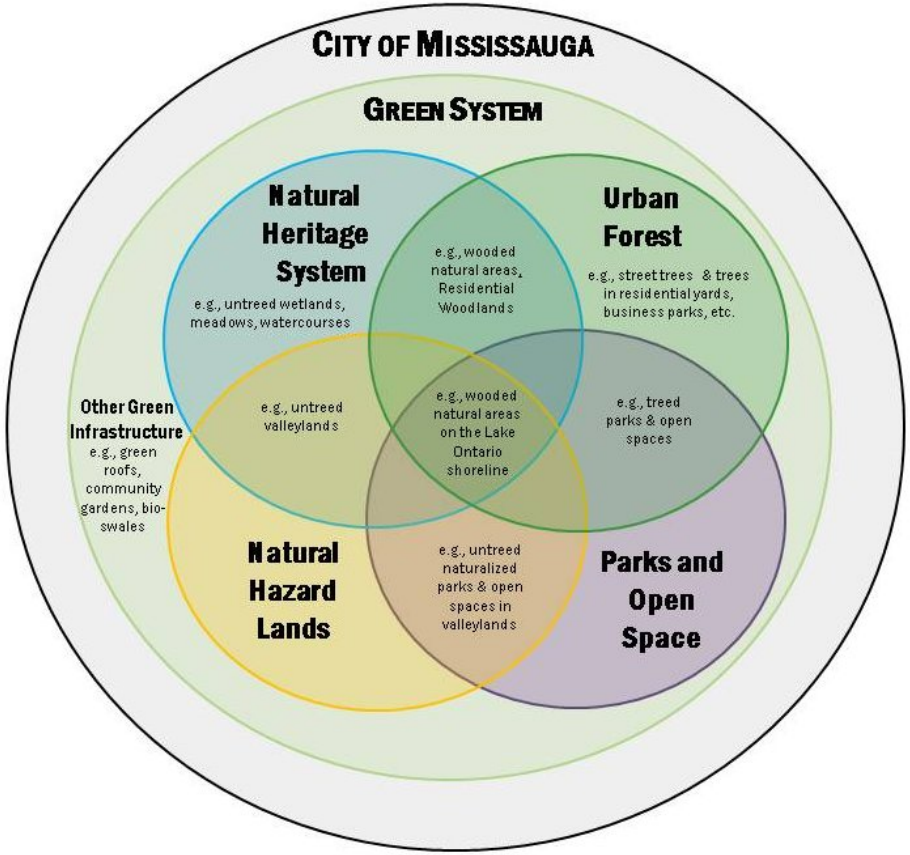
Introduction

Mississauga's Natural Heritage System[1] and Urban Forest[2] are critical to the city's green infrastructure because of the wealth of services (called "ecosystem services") they provide. Urban green spaces (including woodlands, wetlands and meadows), and trees scattered throughout the city, directly support human health and safety by: removing pollution, alleviating urban heat island effects[3], helping manage storm water, storing carbon (helping to mitigate climate change), providing shade and cooling, reducing stress and anxiety, improving concentration and creativity, and supporting outdoor, active living as well as social interaction and community building.

Mississauga's Natural Heritage System and Urban Forest assets are found within the City's parks and open spaces, along its valley and stream corridors, across its lakeshore, and within its built-up areas on a wide range of public and private lands. These green spaces and green elements are the natural and cultural heritage shared by the community, and provide a vital connection to Mississauga's past, and its future.

While a number of municipalities have undertaken either Natural Heritage Strategies or Urban Forest Strategies, Mississauga is the first one to address them in a joint Natural Heritage & Urban Forest Strategy (NH&UFS). This Strategy is also one of the first to look at natural heritage and urban forest assets from a more holistic perspective in terms of their relationship to other "green" elements in the city, and identify shared opportunities. This integrated approach is useful for effectively addressing natural heritage and urban forest challenges, including threats and opportunities arising as a result of climate change.

In its Official Plan (2011), the City of Mississauga identifies a "Green System" that includes the Natural Areas System, Natural Hazard Lands and Parks and Open Space on both private and public lands. This Green System has been recognized through this Strategy as a useful framework for showing the interrelatedness of the Natural Heritage System and the Urban Forest, as well as their relationship to other components of the City's Green System, and the central importance of the City's Green System within Mississauga as a whole. The figure below, developed through this Strategy, illustrates these relationships.



[1] Notably, Mississauga's Natural Heritage System is currently called a "Natural Areas System", however this label is proposed to be changed through this study to "Natural Heritage System". This change was approved by the project Core Working Team and Steering Committee, and has therefore been adopted for use in this Strategy.

[2] The Urban Forest includes all trees, as well as the soils that sustain them, located on public and private property within a given jurisdiction. This includes trees in natural areas as well as trees in more manicured settings such as parks, yards and boulevards.

[3] The urban heat island effect describes the documented phenomenon of urban areas being significantly warmer than the surrounding rural areas largely due to the extent of built structures and paved areas.

Two key recommendations made through this Strategy to refine the City's Green System framework are to: (1) change the label "Natural Areas System" to "Natural Heritage System" (to be more consistent with Provincial policy direction), and (2) more explicitly recognize the Urban Forest as a cornerstone of the Green System. These refinements are illustrated in the figure above.

Although the focus of this Strategy is on what can be done within the boundaries of Mississauga, there has also been consideration for connections with natural heritage beyond the City's boundaries (e.g., watershed connections, lakeshore connections, connections to the Provincial Greenbelt). These broader landscape considerations are addressed in several strategies (listed below), and in the feasibility study for expanding the Provincial Greenbelt into Mississauga's valleylands, which is available under separate cover.

Strategy Development

This Strategy has been developed based on:

- a critical review of all the relevant data, mapping, legislation, policies, plans and guidelines
- a review of the City's relevant operational and procedural practices
- consideration for relevant best practices and precedents, as well as the current technical and scientific literature, and
- input from the: City Leadership Team, City Steering Committee, Core Working Team, Environmental Advisory Committee, City Council, City Resource Team, Conservation Authority Resource Team, a wide range of stakeholders[4], and representatives for the community at large.

The direction in this NH&UFS has also been informed by relevant Federal, Provincial and Regional policies, and several key City plans. In addition, its implementation is directly supported by the City's Urban forest Management Plan (UFMP), which has been developed in tandem with this Strategy (as shown in the figure to the right). The NH&UFS and UFMP share a vision, guiding principles and strategic objectives, but are two stand alone documents that can generally be distinguished as follows:

- The NH&UFS is the overarching document for both natural heritage and the urban forest that includes planning context and Strategies addressing opportunities with respect to planning, management, engagement and partnerships, and tracking. It includes 25 Strategies (summarized below).
- The UFMP is more detailed and technical document focused on the operational, technical and tactical aspects of urban forest management (including stewardship) required to implement many of the Actions related to the broader Strategies identified in the NH&UFS. It includes 30 Actions (summarized below).

Although the UFMP is the primary document that has been developed to support the implementation of the NH&UFS, there are also several other deliverables that have been developed under separate cover as part of this project (e.g., Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga, implementation guides for both the NH&UFS and UFMP). Additional plans or documents may also be developed over the course of this Strategy.

[4] Stakeholders representing a range of local groups and organizations invited to participate in this process include representatives from: aboriginal organizations, government and agencies (including adjacent municipalities and local conservation authorities), committees to City Council, local educational institutions, environmental groups, community groups and residents associations, recreational facilities, business and development organizations, local utilities and transit firms, and arboriculture firms.

NH&UFS Framework and Performance Review

A 20-year framework has been identified for the NH&UFS (2014 – 2033) that is broken down into five four-year review periods, as follows, with a "State of the Natural Heritage System and Urban Forest" report to be generated at the end of each of these periods: 2014 – 2017, 2018 – 2021, 2022 – 2025, 2026 – 2029, 2030 – 2033. The specific indicators to be assessed as part of this regular review are identified in the Monitoring Framework provided in the UFMP.

Mississauga's Natural Heritage System

Mississauga's Natural Heritage System (called a Natural Areas System) was originally conceived in 1996. Since that time it has evolved and been refined in response to changes in Provincial and City policy direction, increased involvement of the conservation authorities in natural heritage planning, an increase in the availability and accuracy of information related to the natural environment, and changes in the approach taken to protect natural heritage. The City's current Natural Heritage System includes woodlands, wetlands, watercourses, and valleylands, as well as some meadow habitats.

Current and recommended components of Mississauga's Natural Heritage System (NHS)

	2012 NHS Area ha (acres)	2013 Recommended Additions ha (acres)	2013 Recommended NHS Area ha (acres)	2013 Updated NHS % of City*
Natural Areas**	2147 (5303)	287 (709)	2434 (6012)	8.32%
Residential Woodlands	232 (573)	0 (0)	232 (573)	0.79%
Linkages	186 (459)	- 6 (- 15)	180 (444)	0.62%
Special Management Areas	172 (426)	476 (1176)	648 (1601)	2.22%
TOTALS	*2737 (6760)*	*757 (1870)*	*3494 (8630)*	*11.95%*

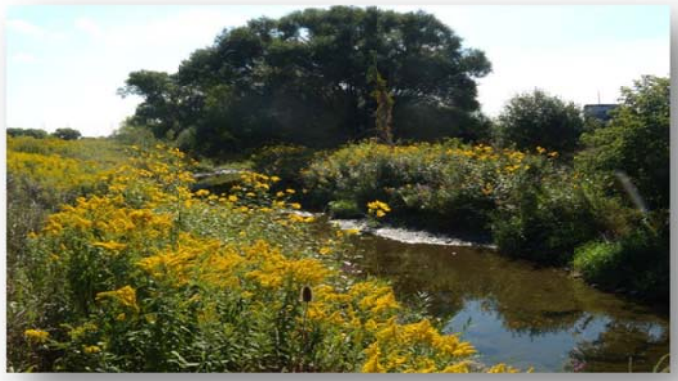
* Percentages based on an area of 29,213 ha, which includes the recently acquired Ninth Line Corridor lands

** Includes Significant Natural Areas and Natural Green Spaces under the recommended revised framework

In 2012, Mississauga's Natural Heritage System comprised 2737 ha (6760 ac) and covered 9.5% of the city (excluding the recently acquired Ninth Line Corridor lands). Approximately 757 additional ha (1870 ac) have been identified for potential addition through this Strategy (including the newly acquired Ninth Line Corridor lands). The recommended additions increase the Natural Heritage System cover to just under 12% of the city (see the table and Map 1 of this Strategy).

Major trends identified through the annual Natural Areas update reports completed since 1996 include: (1) a decrease in the area of tableland and smaller wetland natural areas in the City, (2) a gradual decrease in the quality of the vegetation communities, (3) a City-wide decline in the diversity and abundance of amphibian species, and (4) an increase in naturalization projects undertaken by the City, usually as part of community based stewardship initiatives which, in some cases, have contributed to small expansions of the Natural Heritage System.

These trends point to the need for: (1) stronger protection for Natural Areas – particularly woodlands and smaller wetlands, (2) more active management of protected areas (at least those that are City or conservation authority owned), (3) habitat enhancement and, where possible, expansion, as well as mitigation (e.g., as it relates to amphibian breeding, overwintering and movement) and (4) building on existing stewardship initiatives.



Mississauga's Urban Forest

The figure to the right shows Mississauga's existing tree canopy cover (TC) by small geographic units (from *City of Mississauga Urban Forest Study* 2011).

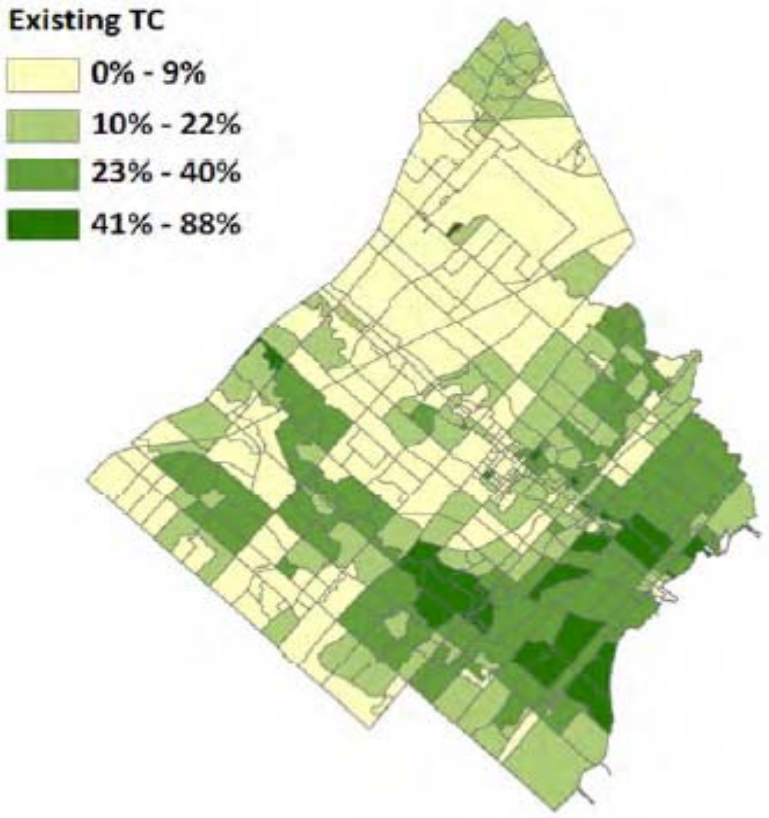
Mississauga's Urban Forest is fundamental to the City's environmental, social and economic well-being. The City's estimated 2.1 million trees (along with the untreed natural areas) provide valuable ecosystem services such as pollution filtration, flood control, carbon storage, benefits related to mental and physical health, and various economic benefits. The urban forest includes all the wooded areas within the Natural Heritage System, plus all the trees outside this system within the city's boundaries (e.g., trees along streets, and in parks, residential yards, business parks, commercial lots, school grounds, hospital grounds, golf courses, cemeteries, etc.), as well as the soils that sustain them.

In addition to the data collected through the City's Natural Areas Surveys (ongoing since 1996), recent urban forest studies undertaken by the Toronto and Region Conservation Authority (TRCA) with support from the other members of the Peel Region Urban Forest Working Group[5] have provided additional useful data about Mississauga's urban forest as a whole.

Key findings include: (1) Mississauga has an urban forest canopy cover of approximately 15% which is unevenly distributed across the city, (2) most of Mississauga's trees are in relatively good health, but small in stature (e.g., about 60% are 15 cm in diameter or less), (3) the dominant trees in the city are maple and ash, with ash accounting for about 18% of the trees in residential areas and 10% of the street trees, and (4) more than half of the city's canopy cover is located in residential areas.

These facts point to: (1) the need to target tree establishment in areas with relatively low canopy cover, (2) the importance of establishing and maintaining recently planted trees so that they are able to mature to canopy producing stature, (3) the need to increase the diversity of tree species being planted on public and private lands so that the urban forest is more resilient to the next invasive pest or pathogen that arrives, as well as climate change, and (4) the important role of residential areas and the remaining natural areas in sustaining and expanding the current canopy cover.

[5] The Peel Region Urban Forest Working Group is comprised of the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC).



Ecosystem Services Provided by Mississauga's Green System

In Ontario, and around the world, there is increasing recognition of the many benefits and services afforded to people by natural areas and green spaces, and of the fact that our survival on this planet depends on sustaining the natural features and areas that provide these services.

There are a number of different terms used to capture this concept, but "ecosystem services" has been adopted for this Strategy. Other terms such as "green infrastructure" and "natural capital" are used to describe the natural features and areas, as well as other "green" system elements (like green roofs), that provide the ecosystem services.

Critical ecosystem services provided by the City's Green System include:

- flood and drought management
- air and water purification
- temperature moderation
- local adaptation to climate change (e.g., cooling)
- pollination of crops and other vegetation
- safer cities
- human physical health,
- mental health and spiritual well-being
- social networking opportunities
- habitat for native biodiversity, and
- ecological connectivity.

One research paper reported a 46% decrease in crash rates across urban arterial roads and highways after landscape improvements were installed.
Naderi, J. R. (2003)

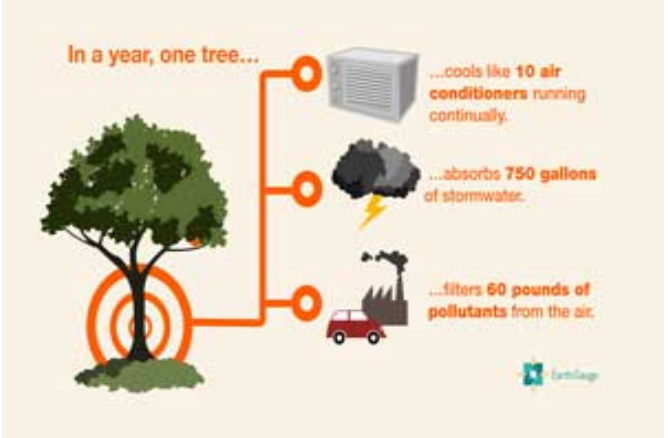
Research in Portland Oregon found that the presence of street trees, on average, added $8870 to the sales price of the house and reduced the time on the market, on average, by 1.7 days.
Donovan, G. H. and D. T. Butry. 2010. "Trees in the city: Valuing street trees in Portland, Oregon". Landscape and Urban Planning 94: 77-83.

Researchers at Columbia University have found that for every additional 343 trees per square kilometer, asthma rates drop by 25% in young children.

... [P]hytonicides (essential oils derives from trees) have been suggested to exert a preventative effect on cancer generation and development.
A Healthy Dose of Green (Trees Ontario 2012)

Vision, Guiding Principles and Objectives

The following vision, guiding principles and objectives have been developed in consultations with various project stakeholders, are intended to provide the "big picture" and long term direction for this Strategy.



Vision

Together we will protect, enhance, restore, expand and connect Mississauga's Natural Heritage System and Urban Forest to sustain a healthy community for present and future generations.

Guiding Principles

1. Act Now
2. First Protect - then Enhance, Restore and Expand
3. Maximize Native Biodiversity
4. Recognize and Build On Past and Current Successes
5. Learn From Our Past and From Others
6. View the Natural Heritage System and Urban Forest as part of the City's broader Green System
7. Understand the Value of the City's Green System and the Essential Ecological Services it Provides
8. Make Stewardship on Public and Private Lands Part of Daily Living
9. Integrate Climate Change Considerations in Natural Heritage and Urban Forest Planning
10. Protect, Enhance, Restore, and Improve Natural Connections
11. Track the State of the Natural Heritage System and Urban Forest, and Practice Adaptive Management
12. Recognize Natural Areas and the Urban Forest as Critical Components of the City's Infrastructure

The nine ***Strategic Objectives*** recognize different approaches are required for public versus private lands, and include the following direction:

General Objectives

1. Increase internal (within the City) and external (among the community and other stakeholders) awareness of the value and need to protect, enhance, expand and restore the Natural Heritage System and the Urban Forest.
2. Expand the Natural Heritage System and Urban Forest by pursuing opportunities through the development application process, in-filling and re-development of public and private lands, and public acquisition.
3. Build on existing, and develop new, public and private sector partnerships to help pursue and implement the vision and targets for the Natural Heritage System and Urban Forest.
4. Undertake regular monitoring of the Natural Heritage System and Urban Forest to evaluate performance and identify trends or changes that may require a shift in management approaches or practices.

Objectives for Public Lands

5. Protect the Natural Heritage System and Urban Forest on public lands through proactive management, enforcement of applicable regulations, and education.
6. Enhance and restore the Natural Heritage System and Urban Forest on public lands by establishing service levels to improve: the condition of natural areas, linkages among protected natural areas, and tree establishment practices.
7. Support the Natural Heritage System and the Urban Forest by managing public open spaces to maximize their ecological functions (while maintaining their existing uses).

Objectives for Private Lands

8. Protect the Natural Heritage System and Urban Forest on private lands through education, implementation of applicable policies and regulations, the development review process and enforcement.
9. Enhance and restore the Natural Heritage System and Urban Forest on private lands by promoting stewardship, naturalization, restoration, tree planting and proactive tree care with creative outreach and incentives.

Natural Heritage System and Urban Forest Targets

Indicators and targets are recognized as useful tools in measuring performance in relation to established objectives. This Strategy builds on the direction provided in the City's *Strategic Plan* (2009) and *Living Green Master Plan* (2012), and has developed six targets against which the City can measure its progress over the next 20 years (i.e., the timeframe of this Strategy, and the related UFMP, 2014 to 2033).

Notably, the targets for this Strategy (outlined in the table below) have been selected because, in the context of Mississauga, they are considered progressive and achievable over the next 20 years. These should be re-evaluated for the next Strategy to see if more optimal targets are considered achievable in the future. In addition, target ranges (as opposed to single target values) have been selected for #1 and #4 to reflect the fact that there are variables outside the City's control that will influence gains (and losses) in Natural Heritage System and Urban Forest cover over the next 20 years, and which may influence cover levels. Targets #3 and #5 only apply to City and conservation authority lands.

TARGET 1: The lower end of the target range (12%) for the City's Natural Heritage System is considered both achievable and sustainable, assuming the applicable recommended strategies are implemented, while the higher end of the range (14%) is considered ambitious for Mississauga, and close to the maximum that could be achieved in the current land use context.

Between 1996 and 2012 the Natural Heritage System had net gains of 49.76 ha (3.1. ha/yr). If all of the 757 ha of potential expansion areas were to be added to the City's Natural Heritage System, then the 12% would basically be achieved. Substantially greater net gains of 15.5 ha/yr would be needed over 20 years to achieve 13% cover, while 30.1 ha/yr would be required over the 20 year lifespan of the Strategy to meet the higher end target of 14%.

Even though the potential expansion areas bring the levels of cover very close to 12%, the target range of 12% to 14% is still considered both pragmatic and progressive because of (a) the limited opportunities for further expansion in Mississauga, and (b) the substantial challenges of ensuring even 12% remains protected. Large increases beyond what have been identified through this Strategy are unlikely, but some small net gains over the next two decades are still possible (e.g., annual Natural Areas updates, updates to the Residential Woodlands mapping, naturalization, and other opportunities to be determined).

Recommended Natural Heritage System (NHS) and Urban Forest (UF) targets for 2033

Target Type	Current Status	Recommended Target
1. NHS Size	9.5% of the City	12% to 14% of the City
2. NHS Linkage	a. 62% of the watercourses have vegetation for at least 30 m on either side b. 80% of Significant Natural Areas are linked through the NHS and Green System	a. 75% of the watercourses have vegetation for at least 30 m on either side b. 85% of Significant Natural Areas are linked through the NHS or other Green System components
3. NHS Quality	a. Overall terrestrial and aquatic quality across the city is variable among sites sampled b. Conservation Management Plans have been completed for a few Significant Natural Areas	a. Substantially improve overall terrestrial and aquatic quality across the city using 2013 as a baseline b. Conservation Management Plans are developed and in effect for all high priority publicly-owned Significant Natural Areas
4. UF Canopy Cover	approximately 15%	15% to 20%
5. UF Quality (of City Street and Park Trees)	a. Current City tree inventory is not up to date, or comprehensive b. Six species account >40% of the City's street and park trees c. Invasive species account for more than 15% of the City's street and park trees	a. The city tree inventory is comprehensive, up to date, and actively maintained b. No tree species represents >5% of the tree population City-wide or >20% on a given street c. Invasive tree species represent less than 8% of the street and park tree population
6. UF Canopy Distribution	Current canopy cover distribution in the city is very uneven (although analyses by land use have yet to be done)	Canopy cover meets or exceeds 15% (the current city-wide average) in at least 95% of the City's residential areas and in 50% to 75% of the city's other land uses use categories

* Data Source: *City of Mississauga Urban Forest Study* (2011) and subsequent analyses by the Peel Urban Forest Working Group.
** Data are collected and analyzed by the conservation authorities.

However, it is also recognized that there will be some losses to the Natural Heritage System through site-specific studies and refinements completed through the planning process. In particular, because many of the potential expansion areas are in the category of "Special Management Areas" (i.e., undeveloped areas immediately adjacent to Natural Areas that are high priorities for naturalization / restoration but have more flexible protection policies) it is expected that they will not be protected in their entirety.

TARGET 2: Although the connectivity of Mississauga's Natural Heritage System is constrained by the built environment, there remain opportunities to enhance and improve it: (a) along the watercourses, and (b) by recognizing the linkage functions of the other components of the Natural Heritage System as well as of the Green System in supporting natural connectivity (see Map 2 in this Strategy).

TARGET 3: Both Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA) have programs to collect and assess data from representative aquatic and terrestrial sites across the city. These data are assessed and summarized in monitoring reports or bulletins that can be used by the City to measure changes in the quality of its natural areas. The conservation authorities have indicated their willingness to share this information with the City.

Although not all sources of impact can be readily addressed, major invasive plant species infestations and management of human-use are two important sources of impacts that can be readily addressed through management. Therefore it is recommended that Conservation Management Plans be developed for all publicly-owned Significant Natural Areas in the city.

TARGET 4: In reality, increasing canopy cover in an urban area is more challenging than might be expected. Even with ongoing tree planting efforts, a target of 15% to 20% is considered realistic for Mississauga because: (a) emerald ash borer, a pest that kills almost all ash trees, is established in Mississauga and will peak over the next few years, (b) many lands have existing zoning that permits some type of development, (c) infrastructure still needs to be improved or expanded, (d) hazard trees must be removed, (d) most of the City's trees are small and will not start contributing substantially to canopy cover for at least 10 to 20 years, (e) some trees, in the past, were planted in poor conditions, (f) it is an added challenge to maintain newly planted trees under conditions of climate change (e.g., more intense periods of drought, more frequent storms).

TARGET 5: Improving the species diversity of street and park trees, and having a comprehensive and well-maintained inventory of all these trees, will be critical to ensuring the City's urban forest is more resilient to climate change and other stressors. Invasive tree species like Norway maple have been planted in Mississauga, and elsewhere, for many years because they are relatively tolerant to many of the stressors associated with street tree life. However, street trees do not exist in isolation from the natural areas, and the abundant seeds from these trees spread to places where they out-compete the native vegetation and disrupt ecosystem processes. Many "weedy" tree species are also more prone to structural problems as they mature. Despite these issues, all trees provide important ecosystem services (e.g., air pollution removal, shade), and so the recommended approach is one of gradual replacement with non-invasive species as trees are removed as part of planning or maintenance.

TARGET 6: The canopy cover distribution in Mississauga is currently very uneven. Although this is the result of the city's history of development, as well as some constraints outside the City's control (e.g., extensive tree cover is not permitted within the Pearson airport lands due to safety reasons), having a more evenly distributed canopy across the city, and particularly across all residential areas, was recognized as an important objective warranting a target.

Feasibility of Extending the Provincial Greenbelt into Mississauga

On April 28, 2010, Mississauga City Council supported the addition of public lands in the Credit River Valley to the Provincial Greenbelt in principle, and directed staff to complete a feasibility analysis. The analysis, completed as part of the NH&UFS, concluded that the expansion is feasible, and therefore the City is able to move forward with this initiative.

Although there are no clear policy-related benefits related to including publicly owned lands as "Urban River Valleys" within the Greenbelt Plan (because it will not result in any greater level of protection of natural heritage features beyond what the City already provides through its Official Plan policies), the analysis recognized that including the lands in the Greenbelt Plan would have a number of other benefits including:

- raising awareness of the role of the urban river valleys in connection to a larger, regional natural heritage system
- increasing the profile of the lands subject to the Urban River Valley designation in the Greenbelt Plan, and
- providing educational and stewardship opportunities.

In addition, pursuing this designation locally would be an opportunity for the City to show leadership in being the first GTA municipality undertaking the Greenbelt Plan Area expansion through this new designation.

Given all these considerations, in conjunction with feedback received through consultations, City staff are recommending that the City pursue including suitable public lands within the Credit River and Etobicoke Creek Valleys into the Greenbelt Plan Area under the Urban River Valleys designation with the Region, and ultimately the Province. More details are provided in the *Feasibility Analysis for Expanding the Provincial Greenbelt Plan Area into Mississauga* (2013) available under separate cover.

Recommended Strategies and Supporting Actions

The primary purpose of this NH&UFS is to provide strategic guidance to ensure that the Natural Heritage System and Urban Forest in the city are protected, enhanced, restored and expanded to the greatest extent feasible on both private and public lands, while still recognizing the need to accommodate continued growth and economic development in this urban landscape. The key to achieving this balance will be in recognizing that the City's continued growth and economic development are reliant on and enhanced by a healthy Natural Heritage System and Urban Forest within the city, and beyond.

The following 26 STRATEGIES have been identified to provide the guidance required to meet the NH&UFS objectives and targets. The Strategies are organized under the following four themes: (1) planning, (2) management, (3) engagement and (4) tracking. Strategies are grouped under similar topics, and not arranged in order of priority.

Notably, many STRATEGIES are supported by ACTIONS in the Urban Forest Management Plan (UFMP) that provide more detailed operational, management and/or stewardship guidance. Therefore the UFMP should also be read for a complete understanding of the implementation requirements for this Strategy.

PLANNING FOR THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

Effective planning requires clear policies that are aligned with Regional and Provincial policies, but also appropriate for Mississauga's context.

STRATEGY #1: Improve interdepartmental coordination and information sharing on natural heritage and urban forest issues

STRATEGY #2: Revise the City's Green System policy framework to clarify Natural Heritage System components and include the Urban Forest

STRATEGY #3: Revise Official Plan policies related to the Natural Heritage System to be more consistent with Provincial and conform to Regional policies

STRATEGY #4: Clarify and strengthen Official Plan policies related to the Natural Heritage System

STRATEGY #5: Refine Official Plan policies to better support connectivity of the Natural Heritage System

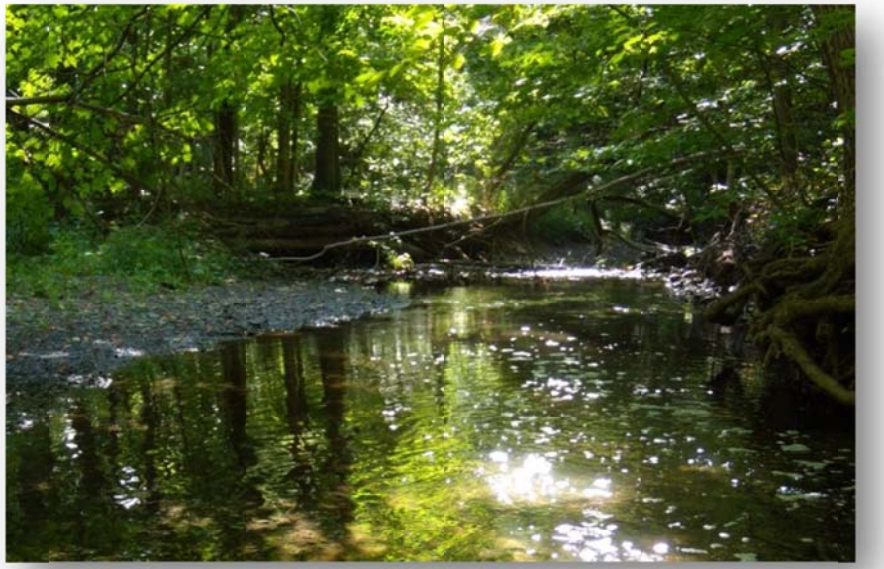
STRATEGY #6: Strengthen Official Plan policies related to the Urban Forest

STRATEGY #7: Update Residential Woodlands mapping and ensure site plan control areas include all Residential Woodlands

STRATEGY #8: Strengthen existing by-laws to improve their ability to support Natural Heritage System and Urban Forest objectives

STRATEGY #9: Implement and build on existing policies and guidelines related to green infrastructure

STRATEGY #10: Pursue expansion of the Provincial Greenbelt into Mississauga



PROTECTION AND MANAGEMENT OF THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

A commitment to investing in the maintenance and management of the Natural Heritage System and Urban Forest will be required to sustain them for the long term.

STRATEGY #11: Enhance and expand the Natural Heritage System

STRATEGY #12: Maintain and improve Natural Heritage System connectivity

STRATEGY #13: Enhance and expand the Urban Forest

STRATEGY #14: Improve tree establishment practices on public and private lands

STRATEGY #15: Make tree health and risk management practices on City lands more proactive and effective

STRATEGY #16: Work with local conservation authorities to identify opportunities to support aquatic ecosystem objectives

STRATEGY #17: Continue strategic acquisition of high priority natural areas

STRATEGY #18: Ensure effective implementation and enforcement of Natural Heritage System and Urban Forest policies, guidelines and by-laws on public and private projects

ENGAGING THE COMMUNITY AND PARTNERS IN CARING FOR THE NATURAL HERITAGE SYSTEM AND THE URBAN FOREST

Broad support from and partnerships with both the public and the private sector will be required to achieve the objectives and targets of this Strategy.

STRATEGY #19: Leverage social media to expand promotion and outreach related to the Natural Heritage System and Urban Forest

STRATEGY #20: Use daily planning, operational and enforcement activities as opportunities for outreach

STRATEGY #21: Continue to pursue and expand current outreach and stewardship programs with various stakeholders

STRATEGY #22: Develop and undertake a campaign to promote the City's Natural Heritage System

STRATEGY #23: Build on partnerships with the Region, agencies, institutions and nearby municipalities to share information, pursue joint initiatives, and coordinate responses to shared environmental threats

STRATEGY #24: Pursue funding from a range of sources, and support non-profit organizations and institutions doing the same

STRATEGY #25: Identify cost-effective incentives to support the implementation of Natural Heritage System and Urban Forest objectives

TRACKING THE STATE OF THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

If we do not know the state of the Natural Heritage System and Urban Forest, how can we best protect, enhance, restore and expand them?

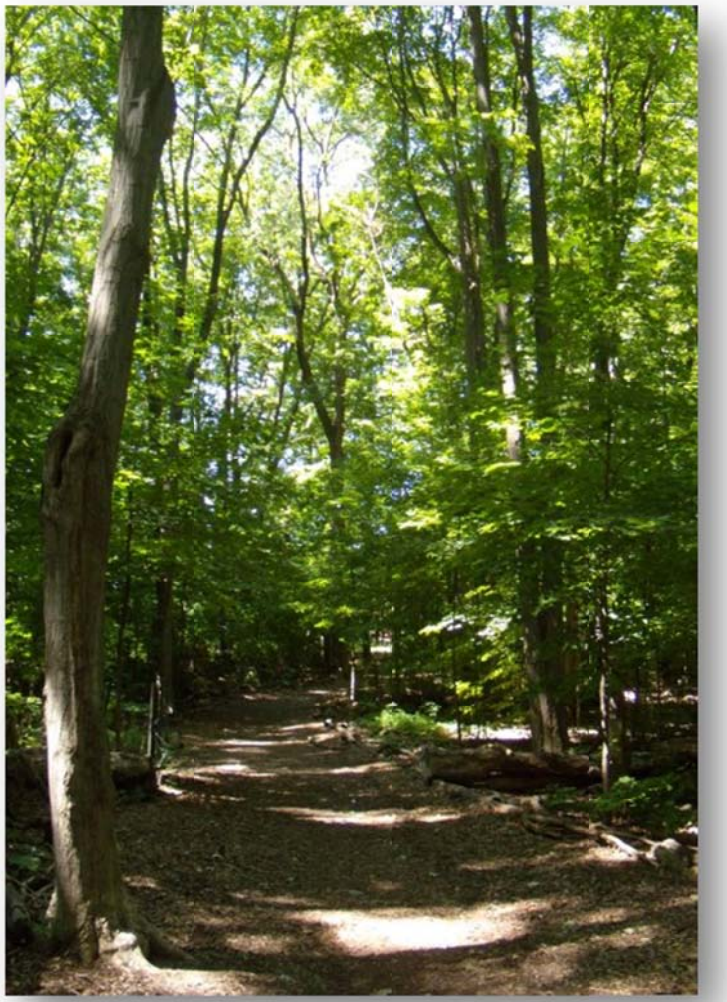
STRATEGY #26: Track and report on the state of the Natural Heritage System and Urban Forest

Implementation

An implementation guide for the NH&UFS has been developed in support of this Strategy as a separate stand-alone document so that it can be updated as required. The total of the new resource requirements identified for the entire 20 year period for implementation of the NH&UFS amount to $2,141,713 (an average of about $107,000 per year). The bulk of these costs (about 80%) are associated with the creation of an Environmental-Natural Heritage Planner position, with the remaining costs linked to activities supporting broader education and engagement related to the Natural Heritage System and Urban Forest. The new Environmental-Natural Heritage Planner position will be required to implement most of the planning-related Strategies, and support the implementation of a number of the management and engagement-related Strategies.

Notably, additional costs associated with the implementation of many of the N&UFS Strategies are identified in the UFMP Implementation Guide, which anticipates $2,866,970 of new budget being required over the 20 year period of the Plan. These costs are linked to a variety of operational and management initiatives designed to increase efficiencies and support the sustainability of the Natural Heritage System and the Urban Forest, plus hiring two new seasonal staff and two students required to support broader stewardship initiatives.

Although the NH&UFS and UFMP are each stand-alone documents with their own Implementation Guides, effective implementation of this Strategy will require the funding and implementation of both. This allocation of funds is a cost-effective and necessary investment in Mississauga's sustainability. This investment is in recognition that the City's continued growth and economic development are reliant on and enhanced by a healthy Natural Heritage System and Urban Forest, both within the city and beyond, and will help ensure the physical and mental well-being of the community, while also helping Mississauga mitigate and adapt to climate change.



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APPENDICES

MAPS (Appended to end of Strategy)

1 INTRODUCTION

Mississauga's Natural Heritage System[6] and Urban Forest[7] assets are found within the City's parks and open spaces, along its valley and stream corridors, across its lakeshore, and within its built-up areas on a wide range of public and private lands. These green spaces and green elements are the natural and cultural heritage shared by the community, and provide a vital connection to Mississauga's past, and its future.

Mississauga's Natural Heritage System and Urban Forest are also critical to the community because of the wealth of services (called "ecosystem services", see **Section 4**) they provide. Urban green spaces directly support human health by removing pollution, alleviating urban heat island effects[8], reducing stress and anxiety, improving concentration and creativity, and supporting outdoor, active living as well as social interaction. New research is finding that people feel access to green spaces a basic human right, and intuitively understand many of the benefits from spending time within and near green spaces. Conversely, research also indicates that people are spending less time in green spaces, and are increasingly disconnected from the natural world around them[9]. In a survey done in Mississauga, while most residents were found to be supportive of having trees on their properties and in their neighbourhoods, they were less inclined to support regulations related to tree removal or planting on private property[10].

The contradictory nature of these findings illustrates a fundamental challenge that needs to be addressed through this Natural Heritage & Urban Forest Strategy (NH&UFS) – how to get a greater number of people throughout Mississauga, along with the City and external stakeholders, to become more supportive of, and engaged in, care for the natural areas, urban forest and other green spaces around them? The Strategy addresses this challenge in three ways: (1) promoting a new way of thinking about natural heritage and the urban forest in the city, (2) undertaking an assessment of current information and practices to identify gaps and opportunities for improvement, and (3) developing a series of strategies to implement (1) and (2).

[6] Mississauga's Natural Heritage System is currently called a "Natural Areas System", however this study proposes to change it to "Natural Heritage System". The change was approved by the project Core Working Team and Steering Committee, and has therefore been adopted for use in this Strategy.

[7] The Urban Forest includes all trees, as well as the soils that sustain them, located on public and private property within a given jurisdiction. This includes trees in natural areas as well as trees in more manicured settings such as parks, yards and boulevards.

[8] The urban heat island effect is the phenomenon of urban areas being significantly warmer than the surrounding rural areas, largely due to the extent of built structures and paved areas. The temperature difference usually is larger at night than during the day, is most apparent when winds are weak, and is noticeable during the summer and the winter.

[9] Husqvarna's *2013 Global Green Spaces Report* available at http://www.husqvarna.com/ca/en/forest/news-listing/

[10] University of Toronto, Mississauga campus, unpublished research paper from the Department of Geography: "Trees and Residents: An exploration of residents' role in growing Mississauga's urban forest" by T. Conway and T. Shakeel, 2012.

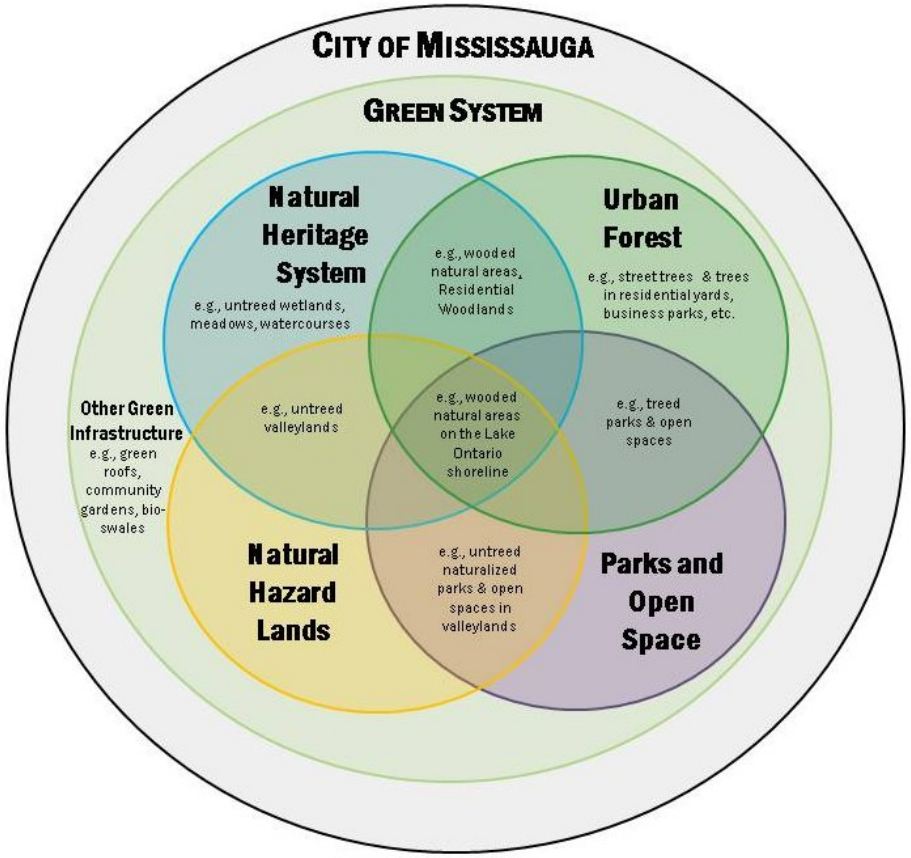


Figure 1. Conceptual illustration of the interrelatedness of the Natural Heritage System and the Urban Forest, with other components of the City's Green System, and the central importance of the Green System within Mississauga as a whole

The first step in developing a new way of thinking about the relationship between the Natural Heritage System and Urban Forest was to develop a graphic to show the interrelatedness between them, with other components of the City's Green System, and to illustrate the central importance of the City's Green System within Mississauga as a whole. This is illustrated conceptually in **Figure 1**. Notably, all illustrated components include public and private lands.

The second step was to undertake a critical review of all the relevant data, mapping, legislation, policies, plans and guidelines relevant to the City's natural heritage and Urban Forest, as well as a review of operational and procedural practices.

The third and final step in the development of this Strategy involved careful consideration of: the interrelationships illustrated in **Figure 1**, the findings of the critical background review, and input received through the various internal and external consultations in order to develop strategies that will allow the city to better conserve and manage the Natural Heritage System and Urban Forest.

Mississauga is a well-established urban centre with a population of more than 740,000 residents that is expected to continue to grow. As the city's population grows, its natural and treed areas will become increasingly under pressure from urban stresses, which will be exacerbated by climate change. These areas will become increasingly valuable as filters for air and water, respite from summer heat and winter winds, spaces for active outdoor living, and living classrooms for all ages and backgrounds.

The primary purpose of this NH&UFS is to provide strategic guidance to ensure that the Natural Heritage System and Urban Forest in the city are protected, enhanced, restored and expanded to the greatest extent feasible on both private and public lands, while still recognizing the need to accommodate continued growth and economic development in this urban landscape. The key to achieving this balance will be in recognizing that the City's continued growth and economic development are reliant on and enhanced by a healthy Natural Heritage System and Urban Forest within the city, and beyond.

1.1 STRATEGY CONTENTS AND ORGANIZATION

An overview of the approach used and materials referenced for the background review and analyses for this Strategy are provided in **Section 2**.

Key findings from the background review and analyses assessment are presented in this Strategy, as follows (with more detail provided in the Urban Forest Management Plan (UFMP) that supports this Strategy):

- State of Mississauga's Natural Heritage System and urban forest (**Section 3**)
- Ecosystem Services Provided by Mississauga's Green System (**Section 4**)
- Planning Context and Precedents (**Section 5**)
- Big Picture Challenges and Opportunities (**Section 8**)

The key products of this Strategy are presented as follows:

- Vision, Guiding Principles and Objectives (**Section 6**)
- Natural Heritage System and Urban Forest Targets (**Section 7**)
- A suite of 25 strategies designed to effectively support the protection, enhancement, restoration and expansion of Mississauga's Natural Heritage System and Urban Forest that are appropriate for the city's biophysical, land use and social context (**Section 9**), and
- Implementation Guidance (**Section 10**).

1.2 A UNIQUE APPROACH: A JOINT STRATEGY FOR THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

Over the past decade or so, many municipalities across southern Ontario have identified natural heritage systems in their Official Plans. These systems are based on the premise that in a landscape fragmented by other land uses, the best way to sustain natural heritage is to protect "core" features and provide connectivity between them (see **Figure 2**).

Concurrently, an increasing number of urban and urbanizing municipalities have also begun to recognize the role of trees, both within and outside of natural heritage systems, in providing essential ecosystem services (e.g., clean air, clean water, shade) and directly supporting the mental and physical health of the community. In order to better protect and manage their treed assets, some municipalities have developed Urban Forest Strategies or Management Plans.

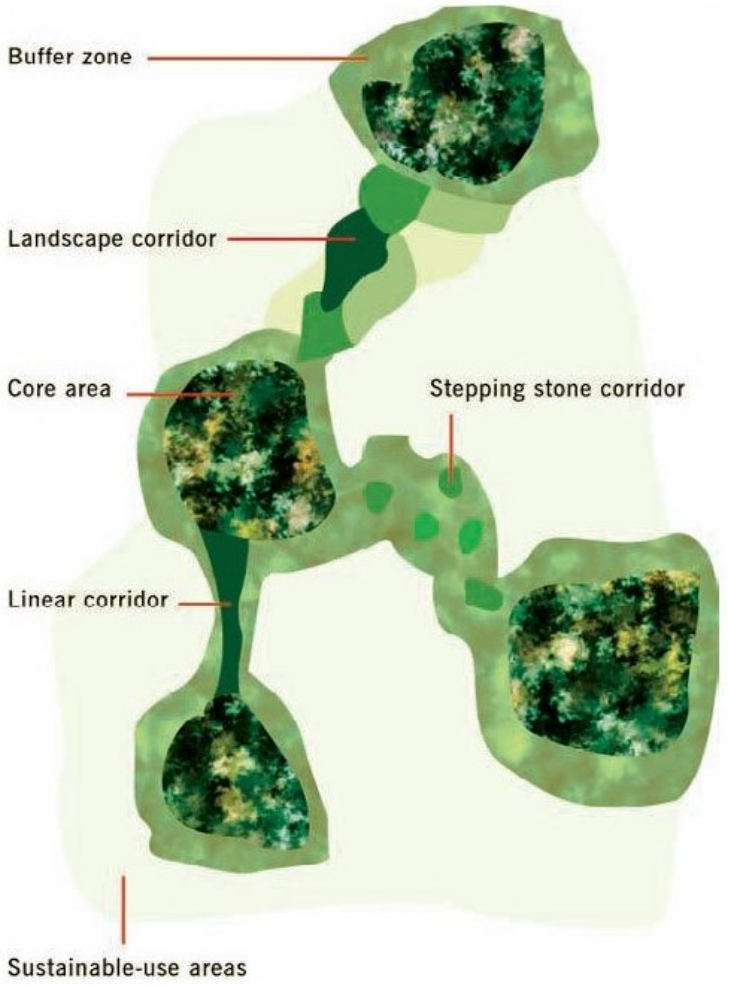


Figure 2. Diagrammatic representation of a natural heritage system illustrating the connection of natural "core" areas" with three different types of ecological "corridors" (from Bennett and Mulonguoy 2006[11])

[11] Bennett, G. and K. J. Mulongoy. 2006. Review of Experience with Ecological Networks, Corridors and Buffer Zones. Secretariat of the Convention on Biological Diversity, Montreal, Technical Series No. 23, 100 pages.

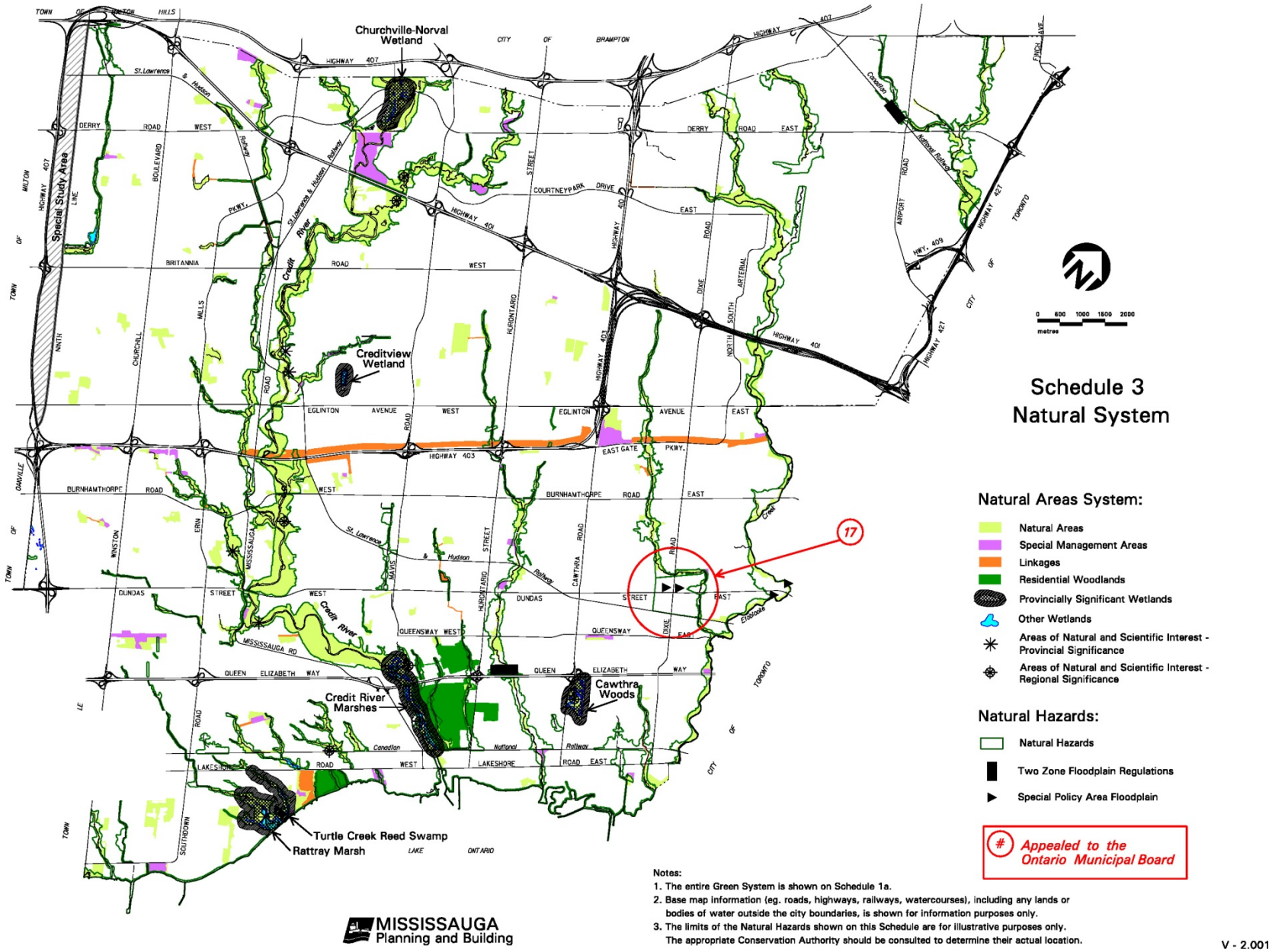


Figure 3. Current Natural Areas System (herein called a Natural Heritage System) identified in the City of Mississauga's Official Plan (2011)

The City of Mississauga already has a Natural Areas System (see **Figure 3**), (referred to in this Strategy as a Natural Heritage System). The city is also entering a new stage of growth that will focus on intensification and urbanization. It is in this context that the City has embraced a progressive approach of looking at the Natural Heritage System and the Urban Forest together for the purposes of identifying strategies for improving the protection, enhancement, restoration and expansion of these assets. This project is the first to integrate natural heritage and the urban forest in one comprehensive and inclusive Strategy.

Distinguishing the Natural Heritage System (NHS) from the Urban Forest

In Mississauga the Natural Heritage System includes (see Figure 3):

- Natural Areas (including woodlands, wetlands, and Areas of Natural and Scientific Interest, fish habitat, etc.)
- Special Management Areas
- Linkages, and
- Residential Woodlands.

Many of the Natural Areas are wooded (e.g., woodlands, swamps, valley corridors). Special Management Areas and Linkages contain some individual trees or small treed areas. Residential Woodlands are a unique designation that capture areas within (generally older) residential neighbourhoods where there are concentrations of mature trees forming continuous canopy cover.

All of the wooded components of the Natural Heritage System are part of the urban forest (as illustrated in Figure 1), however Mississauga's urban forest also includes all other trees within the City limits, irrespective of location and ownership.

Although all of these trees and treed areas are considered holistically as part of Mississauga's "urban forest", it is understood that different management approaches are required for wooded natural areas as compared to individual trees (like those along City streets and in manicured parks). It is also understood that different strategies are required for addressing management of natural areas and the urban forest on City-owned lands, where the municipality has direct control, and on privately-owned lands.

1.3 RELATIONSHIP OF THE NH&UFS TO THE UFMP

This Strategy is unique in that it recognizes the interrelationships between the City's Natural Heritage System and Urban Forest, and is designed to consider and explore opportunities for protecting, enhancing, restoring and expanding both of these assets together. These opportunities, and strategies for implementing them, are identified in this NH&UFS.

However, in order to implement some aspects of this Strategy, the City will require more specific technical, operational and tactical guidance. This guidance as it relates to Urban Forest and Natural Area management is provided through a separate and comprehensive Urban Forest Management Plan (UFMP). Although the UFMP is the most substantive supporting Plan developed to facilitate implementation of the NH&UFS to date, additional supporting plans that are much shorter have also been developed through the NH&UFS project (e.g., Engagement Plan, Invasive Species Management Plan) and other supporting plans may still be developed as required over the course of this Strategy.

Figure 5. Illustration showing the key guiding documents for the Natural Heritage & Urban Forest Strategy (NH&UFS), and the close relationship between the NH&UFS and the Urban Forest Management Plan (UFMP)

As illustrated in **Figure 5**, both the NH&UFS and UFMP are guided by the City's *Strategic Plan* (2009), *Official Plan* (2011), *Parks and Natural Areas Master Plan* (2009), and *Living Green Master Plan* (2012) (as described in **Section 5.3**). Of the two documents, the NH&UFS is the primary source of strategic direction related to natural heritage and the urban forest planning and engagement for the City, while the UFMP provides more technical, operational and tactical guidance focused primarily to the Urban Forest, but also related to the management, stewardship and monitoring of the Natural Heritage System.

Although the UFMP is a stand-alone document, its close relationship to the NH&UFS is illustrated by the fact that: (a) the two documents share the same vision, guiding principles, and objectives (presented in **Section 6**), and (b) the recommended Actions in the UFMP provide more detailed direction to support many of the Strategies identified in the NH&UFS (as identified in **Section 9**).

The two stand alone documents can generally be distinguished as follows:

- NH&UFS: overarching document for both natural heritage and the urban forest that includes planning context and Strategies addressing opportunities with respect to planning, management, engagement and partnerships, and tracking

- UFMP: more detailed and technical document focused on the operational, technical and tactical aspects of urban forest management (including stewardship) required to implement many of the actions related to the broader strategies identified in the NH&UFS

1.4 NH&UFS FRAMEWORK AND PERFORMANCE REVIEW

1.4.1 NH&UFS MONITORING AND REVIEW FRAMEWORK

A 20-year framework has been identified for the NH&UFS (2014 – 2033) that is broken down into five four-year review periods, as follows, with a "State of the Natural Heritage System and Urban Forest" report to be generated at the end of each of these periods: (2014 – 2017, 2018 – 2021, 2022 – 2025, 2026 – 2029, 2030 – 2033.

The vision, guiding principles and strategic objectives identified in this Strategy (see **Section 6**) are intended to set the strategic direction for the 20-year period. The regular performance reviews integrated within this framework allow for both the state of the Natural Heritage System and Urban Forest in Mississauga to be assessed, along with the status of the implementation of the various strategies (and supporting UFMP actions).

The rationale for selection of a 20-year time frame is:

- It takes time to observe changes and management responses of natural systems and elements (including trees), and 20 years is a sufficient amount of time in which real changes or trends in natural systems can be detected, as well as being understandable from a human perspective.

- It aligns with the recommended time frame for the UFMP and allows planning and management to be easily coordinated between the recommendations in these two documents. (Coincidentally, the 20 year period also aligns closely with the 20 year timeline for the One Million Trees Program and the four-year cycle for annual Natural Area Systems updates).

- The 20 year timeframe fits within the long term City planning framework that looks to 2050 to make Mississauga "*a place where people choose to be*", as illustrated in the City's Official Plan (2011), and will also overlap with several five year Official Plan reviews, allowing for revisions to be made to policies over time, as appropriate, to help implement this Strategy.

The rationale for undertaking performance reviews on a four-year cycle is:

- Regular review of various metrics facilitates evaluation of the current state of the City's natural heritage, performance of management prescriptions, as well as implementation of adaptive management approaches if required, and

- It aligns with the City's budgetary cycles, which will facilitate planning that tied to available budgets and current priorities, and allow for targeted budget requests that correspond to advancing specific strategies within these four year windows.

1.4.2 ADAPTIVE MANAGEMENT

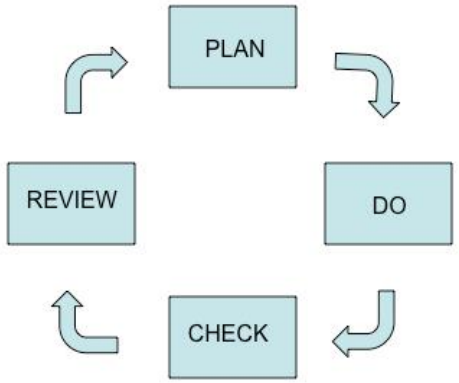


Figure 6. Illustration of the basic cycle of adaptive management (in which "check" could be replaced with "monitor")

Natural systems are complex dynamic entities. Natural heritage and urban forest managers cannot always predict the changes or events (such as severe weather, invasive species infestations or changing resource allocation priorities) that need to be accommodated on the path to achieving objectives and targets. Adaptive management facilitates refinement of management prescriptions in response to unpredicted changes and new knowledge. For this reason, the concept of active adaptive management is firmly embedded in this Strategy, as well as supporting Plans.

Adaptive management acknowledges that our understanding of natural systems is incomplete and that most problems or issues need to be assessed on an ongoing basis. As understanding increases, strategies can be refined through the four-year review. To accommodate this, the objectives and targets of the NH&UFS and supporting Plans will be monitored in a systematic manner (as described in Strategy #26), and any required adjustments will be made based on experience gained as well as new information. The adjusted approach is then be implemented, and the evaluation cycle is repeated for as long as is necessary to meet the desired objectives and/or to address changing environmental, social or policy conditions.

What is Active Adaptive Management?

A systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for the purpose of learning.

United Nations Millennium Ecosystem Assessment, 2005

1.5 STRATEGY IMPLEMENTATION

This Strategy is intended to build on past and current successes by identifying opportunities for addressing these challenges that will ultimately sustain the City's Natural Heritage System and Urban Forest in an efficient and coordinated manner. This Strategy will require broad support from both the public and private sector and partnerships for its full implementation.

Externally, although the City has been successful in bringing components of the Natural Heritage System into public ownership, and engaging various groups, organizations and businesses in stewardship activities, much of the Natural Heritage System remains in private ownership. Similarly, one third of Mississauga's Urban Forest is on private residential lands[12]. Therefore, broad engagement of residents and other private landowners and stakeholders in Mississauga is crucial to the success of this Strategy.

[12] *Mississauga Urban Forest Study* (2011) was developed by Toronto and Region Conservation Authority (TRCA) in association with the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, and Credit Valley Conservation (CVC).

Internally, City staff will need to become and remain informed and supportive (as described in Strategy #1), and Council will need to recognize that an investment in the NH&UFS is an investment in Mississauga's future as a liveable, sustainable, economically thriving community.

An implementation guide for the NH&UFS has been developed in support of this Strategy as a separate stand-alone document so that it can be updated as required. As described in more detail in **Section 10**, the new resource requirements identified for the entire 20 year period of the NH&UFS amount to $2,141,713 with creation of an Environmental-Natural Heritage Planner position accounting for about 80% of those costs and expanded outreach activities accounting for the remaining 20%. The new Environmental-Natural Heritage Planner position will be required to implement most of the planning-related Strategies, and to help implement a number of the protection / management and engagement-related Strategies.

Notably, additional new costs are found within the UFMP Implementation Guide, which identifies $2,866,970 of new budget as being required over the 20 year period of the Plan for some key operational improvements (e.g., updating and expanding the City's tree inventory, targeted invasive species management) as well as the hiring of two seasonal staff and two students to support broader stewardship initiatives, and the design and operation of a new City Arboretum.

These costs are largely related to updates to or shifts in operational activities that require an initial investment in order to secure medium to long term gains for the health and sustainability of the Urban Forest (e.g., updates to the street and park tree inventory, investment in a pest management plan, etc.).

Although the NH&UFS and UFMP are each stand-alone documents with their own Implementation Guides, effective implementation of this Strategy will require that both are funded. This allocation of funds should be viewed as much more than an expense, as it will be a cost-effective investment into Mississauga's sustainability that will help ensure the physical and mental well-being of the community, including helping it mitigate and adapt to climate change.

2 DEVELOPMENT OF THE STRATEGY

One of the guiding principles for this Strategy is to "recognize and build on past and current successes", and so before presenting the background on the development of this Strategy, an overview of relevant past and current initiatives is provided in **Section 2.1** for context.

This Strategy has been developed:

- based on a comprehensive review of the City's current policies, practices and resources related to natural heritage and the urban forest
- by building on the comprehensive data collected and analyses conducted since the early 1990s (the Natural Areas System or NAS)
- based on review and consideration of natural heritage analyses conducted by the local conservation authorities, and the urban forest canopy cover assessments provided by the Peel Urban Forest Working Group
- with consideration for key guiding documents developed by the Province, Region and City
- with consideration for relevant best management practices and precedents in other jurisdictions, and in the scientific and technical literature, and
- with input from City staff, a wide range of stakeholders, and members of the community (as summarized in **Appendices A and B**).

More details are provided in **Section 2.2 through 2.4**.

2.1 OVERVIEW OF PAST AND CURRENT INITIATIVES

In terms of natural heritage assessment, Mississauga was one of the first municipalities to assess and identify its significant natural areas in a systems context, starting with its Natural Areas Survey in 1996. Subsequent updates to this survey has generated a municipal natural areas inventory that is one of the most comprehensive in Ontario, and that provides valuable data that can inform planning and management.

In terms of the urban forest, the City recently completed an Urban Forest Study (2011) led by Toronto and Region Conservation Authority and in partnership with the Region, City of Brampton and Town of Caledon. Representatives from each of these organizations have continued to meet several times a year as part of the Peel Urban Forest Working Group to share information and pursued joint urban forestry initiatives.

From a planning perspective, the City's recently updated *Official Plan* (2011) recognizes the interrelationships between Mississauga's Natural Heritage System, Natural Hazard Lands and Parks and Open Space systems by including them all within a broader Green System framework (see **Figure 13**), and also including a new section that speaks specifically to the urban forest. These progressive changes are supported by a number of by-laws[13] (i.e., Private Tree Protection By-law, Public Tree By-law, Encroachment By-law, Erosion Control By-law) that have either been recently updated or are currently under review to bring them in line with current planning direction and policies.

The City has also recently completed, or is in the process of completing, a number of strategies and master plans (described in **Section 4.4**) that recognize natural heritage and the urban forest as cornerstones of Mississauga's sustainability and quality of life. These include:

- *Future Directions: Master Plan for Parks and Natural Areas* (2009)
- *Green Development Strategy Phase 3 Report* (2009)
- *Living Green Master Plan* (2012)
- *Credit River Parks Strategy* (in progress)

[13] A more detailed review of these by-laws is provided in the Urban Forest Management Plan (UFMP), under separate cover.

Other notable projects undertaken in partnership with the Region, local conservation authorities and adjacent municipalities include: the *Peel Climate Change Study* (2011) and the *Lake Ontario Integrated Shoreline Strategy* (in progress).

In terms of management, key City recent initiatives and successes include:

- acquisition of more than 90 hectares (220 acres) of land, much of it for natural heritage objectives, into public ownership between 2008 and 2013
- completion of a street tree inventory in 2009 and current updates to its inventory of ash trees on all of its lands as part of the implementation of the *Emerald Ash Borer Strategy* (2012)
- gradual expansion of its tree planting and maintenance services to try and keep up with the increasing numbers of street and park trees on City lands (see the UFMP, for more detail)
- development of management plans for some of its more ecologically sensitive and/or high profile natural areas (e.g., Cawthra Woods, Creditview Wetlands) and implementation of aspects of these plans as resources permit
- stewardship programs in the City's Natural Areas
- implementation of control programs for selected invasive plants (as resources permit) and plant pests
- proactive enforcement of its Private Tree Protection By-law and Encroachment By-law, with the encroachment program supporting the protection of public natural areas and resulting in the reclamation of more than 3 ha (7.4 ac), and
- management of the City's 30 or so natural and engineered watercourses and more than 50 storm water management facilities.

The City has also become increasingly active in terms of trying to engage various sectors of the community, and build partnerships with both the public and private sectors. Some examples of recent and ongoing initiatives include:

- having maps and detailed fact sheets describing each of the City's identified Natural Areas available on-line
- regular updates to the City's Natural Areas and Forestry web pages
- annual community tree planting and stewardship events that engage more than 2,500 volunteers from schools, businesses, community groups, and non-profit organizations. and result in the planting of close to 30,000 native trees and shrubs on City lands
- work with community volunteers to help manage local woodlands (e.g., manual removal of invasive species, restoration plantings, etc.), and
- launching the One Million Trees Program in April 2013 along with its unique website with the intent of encouraging and tracking the planting of 1 million trees over the next 20 years.

Indeed, there are many successes to recognize. However if Mississauga's Natural Heritage System and Urban Forest are to remain healthy and sustainable into the future, there must be efforts to continue to build on these successes in order to address the challenges that lie ahead (as described in **Section 8**). As an urbanized municipality, Mississauga must plan, manage and engage strategically to ensure that it protects and enhances existing natural heritage features, and restores and creates a diversity of habitats where opportunities are presented. This will be increasingly challenging in the face of continued growth pressures, stressors such as invasive plants and insects, climate change, and the need to compete with other municipal and private sector priorities. However, unless proactive care of the Natural Heritage System and Urban Forest remain a priority in the city, Mississauga is at risk of losing the core assets that make the city a great place to live.

2.2 RESEARCH AND ANALYSES

Numerous documents were reviewed as part of the development of this Strategy (listed in **Appendix C**). These include:

- Provincial policies, guidelines and strategies relevant to natural heritage planning and management
- Regional policies and strategy documents relevant to natural heritage and urban forest planning (notably Regional Official Plan Amendment 21b, known as ROPA 21b)
- The *Peel Region Urban Forest Strategy* and *Mississauga Urban Forest Study*, both published in 2011
- Local conservation authority policies, strategies, plans, programs and resources relevant to natural heritage and urban forest planning, outreach and stewardship (in particular those of Credit Valley Conservation (CVC) and Toronto and Region Conservation Authority (TRCA), as well as Conservation Halton (CH))
- Relevant City-wide policies, plans, strategies, by-laws, reports, data, programs and outreach materials, and
- Other relevant policies, plans, strategies, scientific publications, programs, practices and outreach materials that serve as useful best practices or precedents from other urban or urbanizing jurisdictions in southern Ontario, and beyond.

An overview of guiding planning documents is provided in **Section 5**, and references to some of the other documents reviewed are interspersed throughout this Strategy. This critical review was supplemented by field work and data analyses focussing on potential expansion areas for the Natural Heritage System, and assessments of various policy options, as described in the following sections.

2.2.1 ANALYSIS OF CURRENT CONDITIONS

The City's Natural Heritage System was originally identified in 1996 and has been known as the "Natural Areas System" (**Figure 3**) since that time. In keeping with current practice and the intent to be more consistently with current Provincial terminology, this term has been revised to "Natural Heritage System" (NHS) and has been adopted for use throughout this Strategy.

The Natural Areas Survey (NAS) is the program that monitors the NHS and collects and stores data on biodiversity, condition and management needs. Since the original NAS in 1996, annual update assessments have been conducted to (a) track the status of identified natural areas (as well as other system components), and (b) identify any opportunities for potential new areas that could be added to the system. The updates are undertaken for one quarter of the city each year so that the entire city is covered every four years. This work, which has been ongoing for more than 15 years, has generated a comprehensive database that is useful for both planning and management, as well as being a valuable resource for assessing trends within the Natural Heritage System.

2.2.2 ANALYSIS OF POTENTIAL EXPANSION AREAS

Beyond reviewing existing conditions, a key component of this Strategy was to identify opportunities for expanding the City's Natural Heritage System.

The primary source of opportunities for screening was CVC's Landscape Scale Analysis (LSA) of the City of Mississauga which was completed over 2009 and 2010 using a "desktop" approach to evaluate the ecological importance of all remaining natural, as well as opportunities for enhancement within the City of Mississauga[14]. A total of 477 potential expansion sites from the LSA were considered through this Strategy and a representative subset of these were subject to targeted field evaluations during the summer of 2012 to confirm their suitability for inclusion in the Natural Heritage System. Notably, only lands that were in public ownership, or where permissions for access were obtained were subject to field assessment.

Further desktop analyses with City staff identified some additional potential expansion areas. These included new sites recommended as part of the most recent (i.e. 2011) annual Natural Areas updates, areas identified as Core Areas by the Region and areas added as a result of the recent addition of the Ninth Line Corridor lands to the City (identified through a separate study) have also been included. More details on the analysis of potential expansion sites are provided in **Appendix D**.

[14] The full report can be viewed at http://www.creditvalleyca.ca/watershed-science/our-watershed/natural-heritage-system-credit-river-watershed/

2.3 POLICY REVIEW AND ASSESSMENT

In addition to the review of relevant policy documents from the Province, Region and City, as well as selected best practices and precedents from elsewhere, there was a specific assessment of policies and by-laws relevant to the NH&UFS.

Key questions considered as part of the policy assessment included:

1. Is the City's natural heritage policy framework clear and consistent with policies at the Provincial and Regional levels?
2. Should there be policies that are more explicitly consistent with the natural heritage policies in the Provincial Policy Statement and Regional Official Plan?
3. How can natural heritage and urban forest policies be improved to better support the objectives of the NH&UFS?
4. Would there be any value to having a Ravine Protection By-law (like the one in the City of Toronto) in Mississauga?
5. Should Mississauga request an extension of the Provincial Greenbelt into the publicly owned portions of its river valleys?

These questions, along with other options, were considered through internal discussions with City staff and the project Core Working Team. The directions that emerged from the discussions related to all these questions except for #5 (discussed in **Section 2.3.1** below) have been incorporated into the planning related strategies provided in **Section 9.2**.

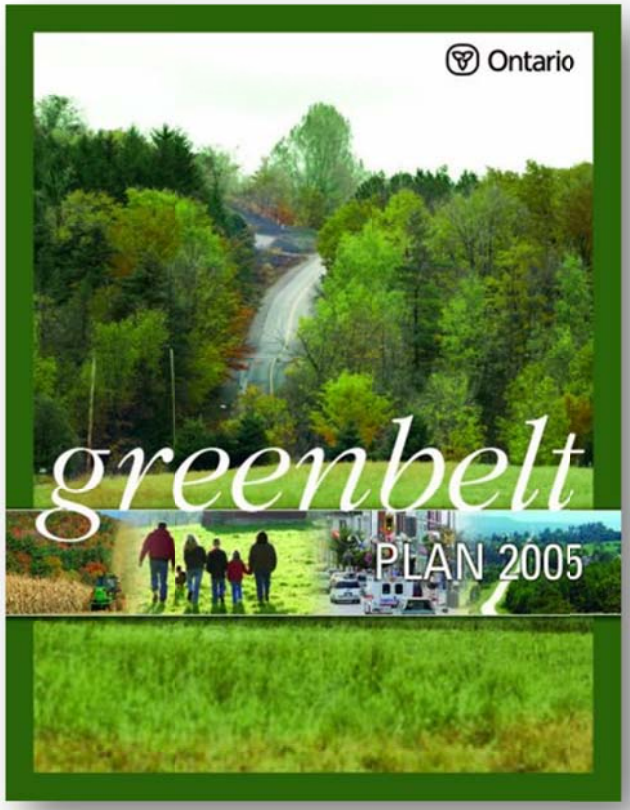
2.3.1 PROVINCIAL GREENBELT EXPANSION FEASIBILITY ASSESSMENT

The question of whether or not the City should approach the Province to expand the Provincial Greenbelt into Mississauga was first brought before Council in April 2010, who instructed staff to conduct a feasibility analysis.

The feasibility analysis was rolled into the NH&UFS work plan, and owing to the timing of this Strategy was also able to consider Amendment 1 to the Greenbelt Plan (approved in January 2013) which introduced the Urban River Valley (URV) land designation.

Because this component of the project needed to address a specific directive from Council, and required a number of stand-alone consultations [15], a comprehensive feasibility study was developed as a separate deliverable made available as a public document on the City's NH&UFS website.

This assessment considered the relevant policies in the context of Mississauga from a planning perspective, and also considered the input received from the various consultations. The key findings and final recommended direction are summarized in **Section 5.2**.



[15] Consultations focusing on the Provincial Greenbelt issue were undertaken with City staff, the Region, the Province, local conservation authorities, adjacent municipalities, and environmental groups over the summer and fall of 2013.

2.4 STUDY PROCESS

The NH&UFS project was divided into two phases, as illustrated in **Figure 4**.

Phase 1, which was completed between May 2012 and March of 2013, included: review of all relevant background, including data and mapping and best practices and precedents from elsewhere; analysis of current conditions for both the Natural Heritage System and Urban Forest; internal and external consultations; and analysis of opportunities to improve protection, enhancement, restoration and expansion of the Natural Heritage System and urban forest. During Phase 1 scoped field work was also undertaken to build on the existing assessments of identified Natural Heritage System components and examine areas that could be considered as potential additions to the Natural Heritage System.

Phase 2, which began in January of 2013 and was completed by January 2014, included: consideration of various policy options and key policy questions, development of a draft UFMP, development of a draft NH&UFS, Phase 2 consultations, development of a Feasibility Study for Expanding the Provincial Greenbelt into Mississauga, development of implementation guidance for the NH&UFS and UFMP, and finalization of all documents.

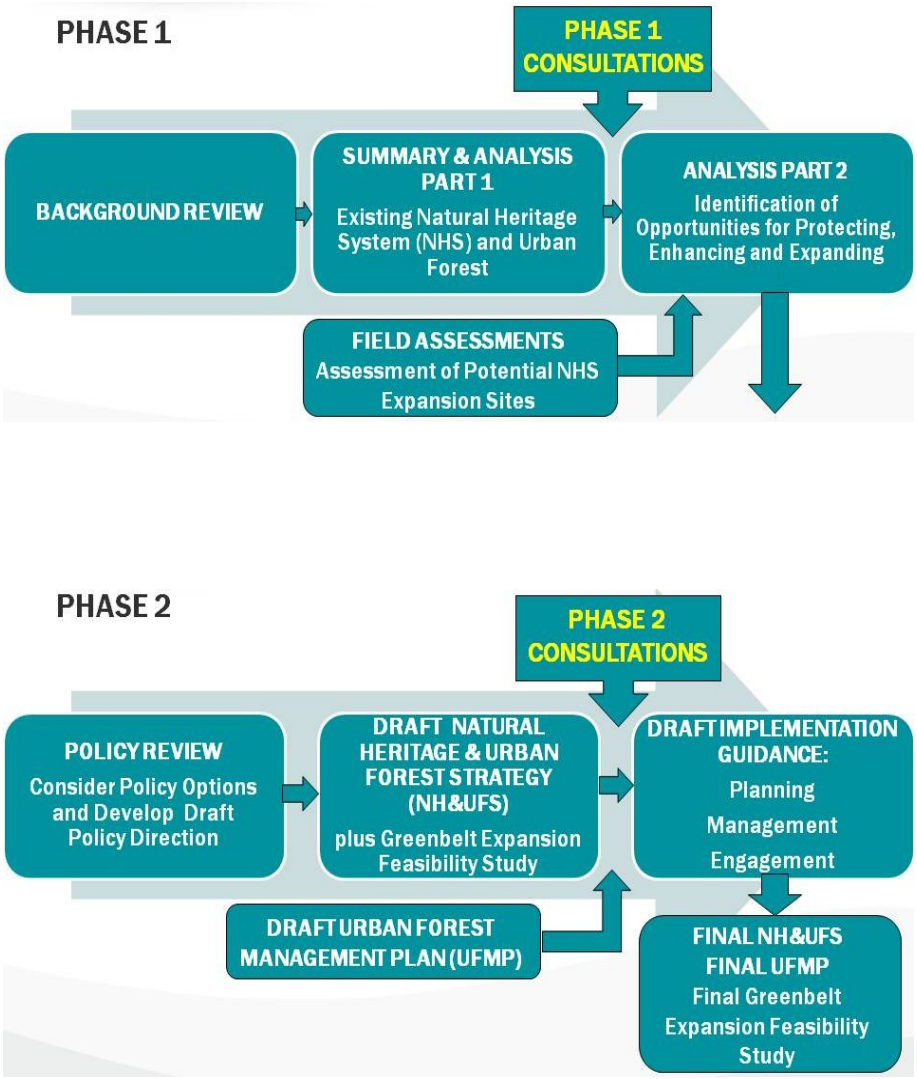


Figure 4. Illustration showing the process for the Natural Heritage & Urban Forest Strategy (NH&UFS) project

2.4.1 CONSULTATIONS

At the outset of this project, both internal consultations with City staff and external consultations with a wide range of stakeholders and the community were identified as important to the development of the NH&UFS. A project Engagement Plan was developed that divided the consultations into two Phases, as follows:

- Phase 1 Consultations: Input on the Strategy vision, guiding principles and objectives, as well as ideas on preliminary directions
- Phase 2 Consultations: Input on the Draft NH&UFS and supporting UFMP

For each phase, representatives from the following key stakeholders groups were invited to facilitated meetings:

- representatives from aboriginal organizations
- government and agencies (including adjacent municipalities and local conservation authorities)
- committees to City Council
- local educational institutions
- environmental groups, community groups and residents associations
- local recreational facilities (including golf courses)
- business and development organizations
- local utility and transit companies, and
- local arboriculture firms.

The Peel Region Urban Forest Working Group was also given a presentation and an opportunity to provide input to both the NH&UFS and the closely related UFMP. This group also provided data, mapping and technical support to facilitate the identification of a canopy cover target for Mississauga.

Two open houses were included in each phase of the consultations and were advertised on the City's website, through newspaper advertisements, mobile signs, and at the local community centres (e.g., on reader boards, the Community Calendar and local library screensavers). Stakeholders were also invited to spread the word about upcoming open houses.

Participants were invited to provide comments verbally at the meetings (all comments were recorded), on feedback forms provided at the meetings or available on-line, or via e-mail directly to the City's Project Manager. Summaries of this feedback are provided in **Appendix A** (Phase 1) and **Appendix B** (Phase 2).

In addition to these external consultations, this project involved:

- regular consultations with the project Core Working Team and Steering Committee
- numerous meetings with various City staff on a variety of technical, policy and communications topics
- presentations to the Environment Network Team and Leadership Team
- presentations to the Environmental Advisory Committee, and
- presentations to General Committee to Council.

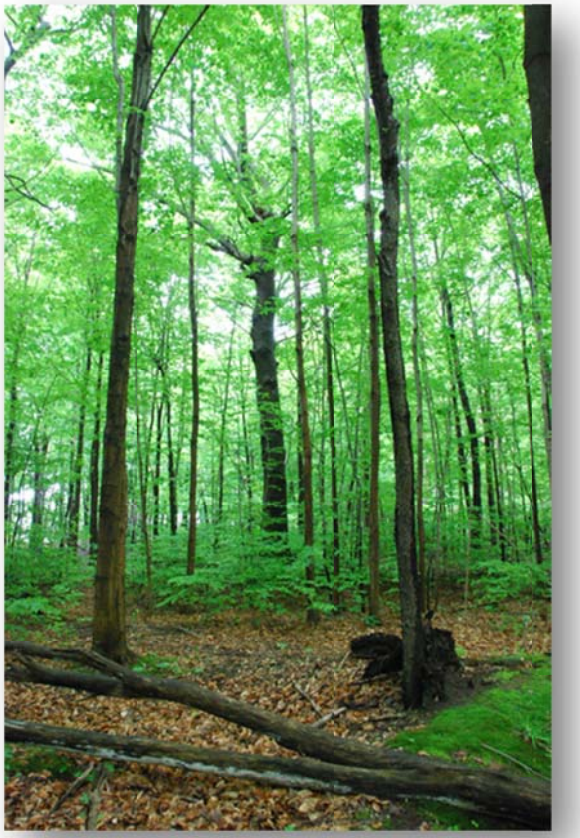
A series of consultations focusing specifically on the feasibility of expanding the Provincial Greenbelt into Mississauga were also undertaken following the release of the Draft NH&UFS and Draft UFMP, as described in **Section 2.3.1** above.

Although one of the main products of the NH&UFS are Strategies related to engaging a wide range of stakeholders and the public, as well as City staff, the meetings undertaken as part of this project were viewed as opportunities for outreach as well as for soliciting feedback, and were considered starting points to both inform and engage participants on the topic of this Strategy. A long list of interested parties has been generated through these consultations which can be used for future outreach and stewardship related to this Strategy.

3 STATE OF MISSISSAUGA'S NATURAL HERITAGE

3.1 THE EVOLUTION OF MISSISSAUGA'S NATURAL HERITAGE

Like most of southern Ontario, the area now occupied by the City of Mississauga was once primarily covered in forests dominated by sugar maple, beech, red oak and white pine trees. However, owing to the moderating influence of Lake Ontario, fertile soils and their location, these forests also supported tree species typically found further south, and thus the area is considered to be part of the "Carolinian Zone" of southern Ontario. There were also likely some open oak woodlands, savannah and perhaps prairie remnants in the southwest of what is now known as Mississauga.



Most of the city is located on the Peel Plain; a broad clay plain that stretches between York Region to the east and across Halton Region to the west. Apart from the valleys of the main drainage systems, there are no major topographical features; the plain being gently undulating and generally sloping south toward the lake. However, a ridge created by the glacial Lake Iroquois shoreline provides a noticeable east-west break in topography parallel to, and a few kilometres north of, the Lake Ontario Shoreline.

The city is dissected by numerous watercourses, the principal ones being the Credit River and Etobicoke Creek, but including many smaller streams such as Joshua Creek, Cooksville Creek, Mary Fix Creek, Mimico Creek, Sawmill Creek, Mullet Creek, Sheridan Creek, Birchwood Creek, Lornewood Creek, Applewood Creek, Clearview Creek, Fletcher's Creek, Loyalist Creek and Turtle Creek (as shown in **Figure 7**). All of these drain southward directly or indirectly into Lake Ontario.

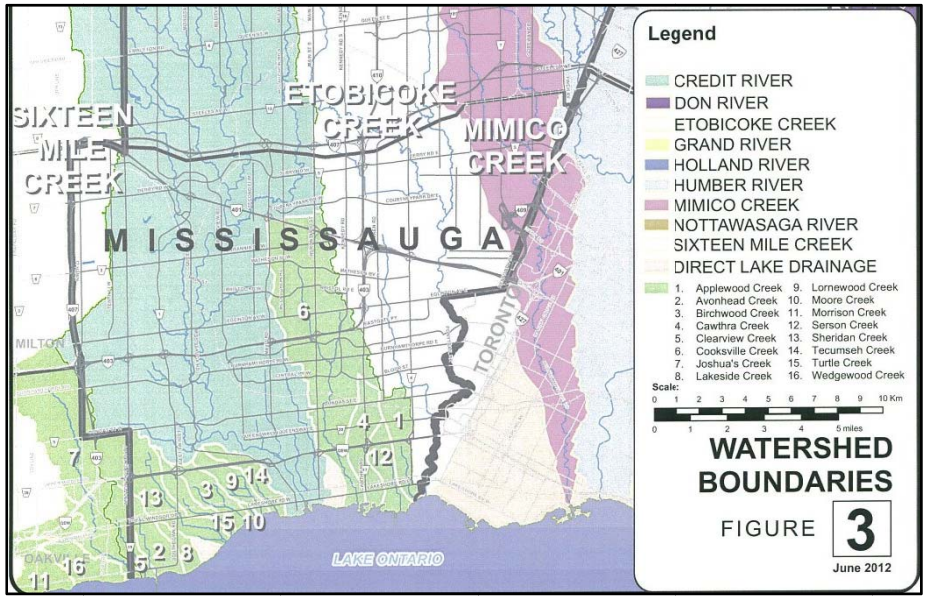


Figure 7. Map of the major and minor watersheds in the City of Mississauga (from the Region of Peel Official Plan, 2013 consolidation).

The major wetland areas were, and still are, associated with watercourses, with Rattray Marsh and the Credit River marshes being the principal ones. Owing to the relatively impervious clay soils, there were likely smaller, isolated, internally-drained wetlands spread across the tablelands, but many of these probably disappeared with the conversion to agriculture and the few that remain are valued owing to their scarcity in the city.

The rich, deciduous and mixed forests, along with the numerous streams and wetlands provided abundant game and other resources for the First Nations that inhabited the area prior to the arrival of European settlers. At the time of European settlement, the area was occupied by the Mississaugas of the New Credit. They fished, hunted, harvested forest products and practiced limited agriculture along the north shore of Lake Ontario and beyond. Their management of the landscape substantially shaped the environment viewed by the first Europeans to visit the area. Early French fur traders extended credit to the native inhabitants, thus providing the name for the principal watercourse in the area, the Credit River. The area was settled by Europeans, primarily during the early 1800s, and the forests were rapidly cleared. Wheat was initially the principal crop, the main market being Toronto as well as exports to the United States through Port Credit. This eventually shifted to mixed farming, with some specialty crops including orchards, small fruit and vegetables. As late as 1940, practically all the land in the current city was still used for agriculture, and settlements were confined to a number of small towns and hamlets including Port Credit, Clarkson, Cooksville, Dixie, Lorne Park, Malton, Meadowville and Streetsville. These were eventually amalgamated into the City of Mississauga and the City is now almost entirely built out.

Owing to its strategic location on the north shore of Lake Ontario and proximity to other major urban areas such as Toronto, Oakville, Burlington and Hamilton, the city is traversed with major highways (Queen Elizabeth Way, Hwy 401 and Hwy 403). These have provided favourable conditions for the establishment of commercial and industrial business.

Today, Mississauga's natural heritage is represented in the remnant woodlands, wetlands and watercourses contained the Natural Heritage System (as shown in **Figure 3**). None of the remaining natural areas are pristine, all of them having been impacted to varying degrees by agricultural or urban development. Nonetheless, they are important examples of the landscape in which the city was established, and continue to support ecological functions, provide habitat for native biodiversity, and provide valuable ecological services that benefit all residents of Mississauga (as described in **Section 4**).

3.2 NATURAL HERITAGE SYSTEMS IN AN URBAN CONTEXT

Protecting biodiversity and a full range of ecological functions in natural features in urban environments is challenging. Urban natural areas, especially those on tablelands, tend to be small and isolated and lack ecologically functional linkages to other features. They are also subject to a host of stresses associated with urban land uses. Guidelines for establishing ecologically-based natural heritage systems generally assume there is opportunity for identifying core areas and linkages based primarily on ecological principles (see **Figure 2**). However, once an area is essentially built-out, as in Mississauga, there are very limited opportunities to identify new cores or dedicated ecological linkages.

In Mississauga, all remaining major natural features have been captured within the existing Natural Heritage System (**Figure 3**). Future refinements will be mainly restricted to relatively minor additions to the system through boundary revisions and potential restoration of undeveloped open space. Opportunities for major additions (as provided by the recent addition of the Ninth Line Corridor lands to the City) are expected to be very infrequent. However, in the context of

Mississauga, opportunities for even minor gains are important and should not be overlooked or dismissed.

Human activities have such a dominant influence in urban landscapes, that ongoing management and creative approaches are required to sustain existing natural heritage areas. One such approach is the recognition of "green" sites in the landscape which may lack sufficient natural characteristics to qualify as remnant natural areas, but which provide supporting functions to the Natural Heritage System. For example, there are many urban-adapted wildlife species (e.g., coyote, skunks, raccoons, deer, etc.) that utilize parks, sports fields, cemeteries, golf courses and other open spaces to move and disperse among remnant natural features. These same open spaces also provide for opportunities for surface water infiltration and groundwater recharge, ameliorate the urban heat sink effect (particularly if they have some trees), and may support insect populations that provide a food source for some birds as well as a pollination function.

> *While it is understood that the open space portions of these lands must be maintained in a manner that accommodates their primary function, [park and open space] lands can make a significant contribution to a healthy environment by employing environmentally sensitive management techniques and practices.*
> *Mississauga Official Plan (2011)*

In Mississauga, owing to the built-out nature of the city, the focus for future expansion is necessarily on opportunistic approaches that seek to maximize the ecological functions and ecosystem services of remaining natural and open spaces, both public and privately-owned, within the broader Green System (as illustrated in **Figure 1**). These approaches may include, for example:

- minimizing impermeable surfaces for new development or areas that are re-developed
- developing partnerships with owners of major private open spaces to undertake stewardship initiatives
- implementing low-maintenance landscaping using primarily native species in public spaces, and
- continuing and expanding programs that support naturalization of portions of lands not owned by the City or conservation authorities, such as school yards, residences, business parks, commercial plazas, and health centre lands.

3.3 MISSISSAUGA'S CURRENT NATURAL HERITAGE SYSTEM

Mississauga's Natural Heritage System was originally conceived in 1996. Since that time it has evolved and been refined in response to changes in Provincial and City policy direction, increased involvement of the conservation authorities in natural heritage planning, an increase in the availability and accuracy of information related to the natural environment, and changes in the approach taken to protect natural heritage.

Currently, Mississauga's Natural Heritage System comprises 2737 ha including woodlands, wetlands, watercourses, valleylands, and covers more than 9% of the city (excluding the recently acquired Ninth Line Corridor lands). The system consists of: remnant natural areas, linkages, residential woodlands and special management areas. The breakdown of the area within each category, and its relative proportion of the system and the City, is provided in **Table 1**.

Table 1. Current and recommended components of Mississauga's Current Natural Heritage System (NHS)

	2012 NHS Area ha (acres)	2013 Recommended Additions ha (acres)	2013 Recommended NHS Area ha (acres)	2013 Updated NHS % of City*
Natural Areas**	2147 (5303)	287 (709)	2434 (6012)	8.32%
Residential Woodlands	232 (573)	0 (0)	232 (573)	0.79%
Linkages	186 (459)	- 6 (- 15)	180 (444)	0.62%
Special Management Areas	172 (426)	476 (1176)	648 (1601)	2.22%
TOTALS	*2737 (6760)*	*757 (1870)*	*3494 (8630)*	*11.95%*

* Percentages based on an area of 29,213 ha, which includes the recently acquired Ninth Line Corridor lands

** Includes Significant Natural Areas and Natural Green Spaces under the recommended revised framework

The City's primary resources related to the Natural Heritage System are the Natural Areas Survey database and the Natural Area Factsheets. The database is a comprehensive assemblage of all the information related to the City's natural features and can be used to search for and generate information on:

- vegetation communities and species of plants and wildlife that occur in each identified Natural Area, as well as related information on threats and management needs
- the provincial and regional status of both vegetation communities and/or species
- the presence or absence of regionally rare, or Provincially endangered or threatened species of plants and animals .

This information, which is summarized in each Natural Area Factsheet, is considered during the planning process to help assess the appropriateness of new development proposed within or adjacent to Natural Areas, and is also used to help guide management of publicly owned Natural Areas.

The database can also be used to provide trends related to the overall size and condition of the Natural Heritage System. The data that have been collected since its inception in 1996 provide a valuable record and monitoring tool. These data are currently used to some extent, but could be used more widely to facilitate many aspects of planning and management in the City. A range of current and potential uses includes:

- monitoring for input to adaptive management
- review of development applications (e.g., provides triggers for Environmental Impact Studies and data to be considered)
- verification of appropriate land-use designations
- priority-setting for the acquisition of Natural Heritage System components
- identifying priority management needs (e.g., areas for invasive plant species removal, trail needs including the removal of *ad hoc* trails)
- informing restoration and enhancement initiatives
- confirming areas requiring removals of encroachments
- assisting in developing site-specific forest management prescriptions
- facilitating the development of management and maintenance schedules (e.g., designation of no mow zones, identifying potential naturalization sites, etc.), and
- tracking the effectiveness of natural heritage policies in achieving established objectives.

The Natural Heritage System Fact Sheets are also a potential outreach and educational tool. A map of all the Natural Areas, along with the Factsheets for each, are all posted on the City's website where they can be readily accessed by City staff, residents, or other interested parties.

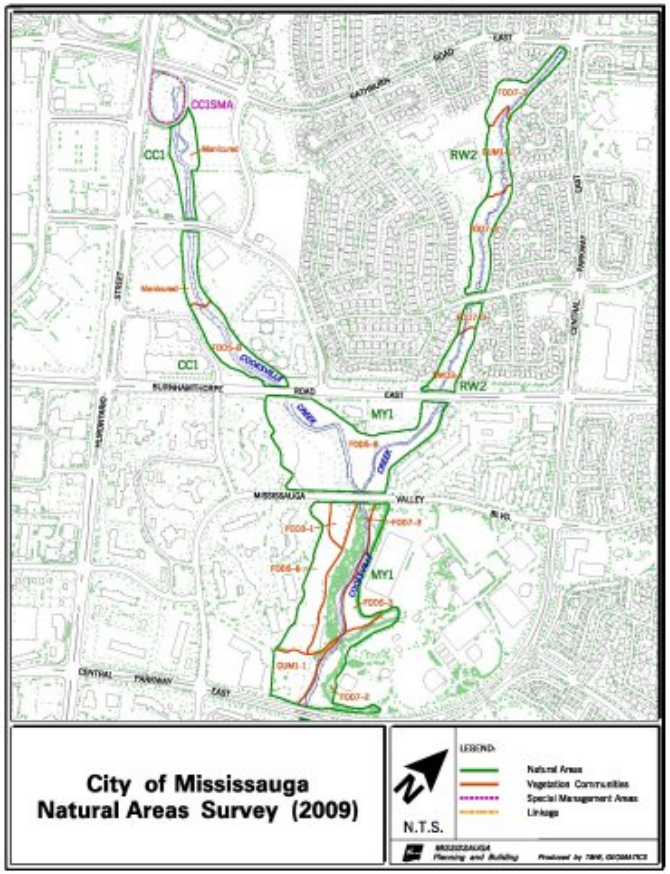


Figure 8. Sample Natural Areas Survey factsheet map

Major trends identified through the annual update reports since 1996 include:

- an increase of 49.8 ha (122.9 ac) in the overall area of the Natural Heritage System since its inception (largely as a result of inclusion of areas naturalized by the City)
- a decrease in the area of tableland and wetland natural areas in the City
- a gradual decrease in the quality of the vegetation communities
- a City-wide decline in the diversity and abundance of amphibian species, and
- an increase in naturalization projects undertaken by the City, usually as part of community based stewardship initiatives[16].

The overall increase in area is attributable to a combination of factors, including the addition of new sites, inclusion of additional area to existing natural sites, and adjustments to boundaries of existing natural sites. However, there has also been the complete removal of one site and reductions in others since the Natural Heritage System was first established. Most of the reductions have occurred on tableland woodlands, as the Natural Heritage System within valleys tends to have additional restrictive policies because these areas are also considered hazard lands.

As shown in **Table 1**, approximately 757 additional ha (1870 ac) have been identified for potential addition to the City's Natural Heritage System through this Strategy. These additions, if fully implemented, would increase the Natural Heritage System cover to just under 12% of the city (see **Map 1**).

3.4 MISSISSAUGA'S URBAN FOREST

Mississauga's urban forest includes all the wooded areas within the Natural Heritage System, plus all the trees outside this system, within the city's boundaries (e.g., street trees, trees in manicured parks, and trees in residential yards, business parks, commercial lots, school grounds, hospital grounds, golf courses, cemeteries, rights-of-way, etc.). A more detailed description of the Urban Forest is provided in the UFMP, but an overview is provided here for context.

In addition to the comprehensive data that have been collected on Mississauga's wooded natural areas through the Natural Areas Surveys (see **Section 3.3**), recent urban forest studies led by TRCA in partnership with the other members of the Peel Region Urban Forest Working Group[17] (*Peel Region Urban Forest Strategy* (2011) and *Mississauga Urban Forest Study* (2011)), along with subsequent more detailed canopy cover analyses have provided additional useful data about Mississauga's urban forest as a whole. Key findings of these studies include:

- there are approximately 2.1 million trees in Mississauga
- Mississauga's urban forest canopy cover is approximately 15%, and is not evenly distributed across the city, with many of the higher canopy cover areas associated with the older residential neighbourhoods by the lakeshore and the shores of the Credit River valley
- most of Mississauga's trees are in relatively good health, but small in stature (e.g., about 60% are 15 cm in diameter or less)
- the dominant trees in the city are maple and ash, with ash accounting for about 18% of the trees in residential areas and 10% of the street trees, and
- more than half of the city's canopy cover (about 8%) is located in residential areas and almost a third of this canopy cover (about 5%) is found in woodlands in the City's natural areas and open spaces, with the remaining scattered within institutional, commercial, industrial and other land uses.

These facts point to: (1) the important role of residential areas and the remaining natural areas in sustaining the current canopy cover, (2) the importance of maintaining recently planted trees so that they are able to mature to canopy producing stature, and (3) the need to increase the diversity of tree species being planted on public and private lands so that the urban forest is more resilient to the next invasive pest or pathogen that arrives. Details on the structure, diversity and condition of Mississauga's urban forest cover are provided in the City's UFMP.

[16] Notably, this work has contributed to some sites being re-classified to "Natural Site" from "Natural Green Space" as a result of the improved quality of the vegetation community,

[17] The Peel Region Urban Forest Working Group is comprised of the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC).

4 ECOSYSTEM SERVICES PROVIDED BY MISSISSAUGA'S GREEN SYSTEM

In Ontario, and around the world, there is increasing recognition of the many benefits and services afforded to people by natural areas and green spaces[18], and of the fact that our survival on this planet depends on sustaining the natural features and areas that provide these services. There are a number of different terms used to capture this concept, but "ecosystem services" (defined below) has been adopted for this Strategy. Other terms such as "green infrastructure" and "natural capital" are used to describe the natural features and areas, as well as other "green" system elements (like green roofs), that provide ecosystem services.

What are Ecosystem Services?

"Ecosystem services" is a term used to describe the processes of nature needed to support the health and survival of humans. Ecological services are required and used by all living organisms, but the term typically refers to their direct value (quantified or not) to humans.

Ecosystem services include processes such as air and water purification, flood and drought mitigation, waste detoxification and decomposition, pollination of crops and other vegetation, carbon storage and sequestration, and maintenance of biodiversity. Less tangible services that have also been associated with natural areas and green spaces include the provision of mental health and spiritual well-being.

"Ecosystem goods" are products provided by nature such as food, fibre, timber and medicines that are readily valued as recognizable products that can be bought and sold, unlike ecosystem services which are harder to value and in our current market economy are considered "free".

[18] Current thinking on this topic can be found at the European Commission website at http://ec.europa.eu/environment/nature/biodiversity/economics/, the Ontario Network on Ecosystem Services (ONES) website at http://www.onecosystemservices.ca/ and in the recently released "*The Economics of Ecosystem Services and Biodiversity in Ontario*" available on the OMNR's website.

Figure 9. Cartoon illustrating attempts to put dollar values onto ecosystem services (image source: Pacific Standard at http://www.psmag.com/business-economics/mother-nature-s-sum-4226/)

Even though it is widely recognized that ecosystem services are essential to human survival, because they are generally not assigned a monetary or market value, the natural capital required to generate these essential services continues to be lost or degraded at the expense of other goods and services for which market values can be assigned. There continues to be debate about the pros and cons about assigning a monetary value to ecosystem services (some argue doing this diminishes their true value), and how to assign an appropriate value, however, all sides agree that unless ecosystem services are somehow valued in land use decision making processes, they will continue to be degraded and lost.

Even though Mississauga is highly urbanized, there are many natural areas and green spaces which provide important ecosystem services. One of the fundamental reasons for protecting, enhancing, restoring and expanding the City's Natural Heritage System and Urban Forest within the context of the broader Green System is to maximize the provision of ecosystem services to all those who live and work within Mississauga.

The Natural Heritage System and Urban Forest, along with natural hazard lands, parks and open spaces (including institutional lands associated with schools and health facilities and utility rights-of-way), and other "green infrastructure" elements (e.g., green roofs, vegetated infiltration swales), provide the following essential ecological services:

- flood and drought management
- air and water purification
- temperature moderation
- local adaptation to climate change
- pollination of crops and other vegetation
- safer cities
- human physical health
- human mental health and spiritual well-being
- social networking opportunities
- habitat for native biodiversity, and
- ecological connectivity.

Brief discussions of each of these services in the context of Mississauga are provided in the following sections.

> *There should also be recognition of the role that green parkland, whether naturally vegetated or not, plays in shading/cooling, increasing permeable surface area, and filtering run-off, providing that the parks are managed in a sustainable manner.*
>
> *Mississauga Future Directions: Parks and Natural Areas Master Plan (2009)*

4.1 FLOOD MANAGEMENT

The main transformation that occurs on the landscape as a result of urbanization is that the extent of permeable surface is greatly reduced by the introduction of extensive areas of paved surfaces and numerous buildings of various sizes. As a result, rain water rapidly drains off the paved surfaces and structures (hence the term "storm water runoff") and is directed to nearby water bodies. Conventional practices for directing surface water runoff to nearby water bodies (typically via drains and pipes) may create a couple of problems: (1) directing all rainwater to a nearby watercourse during a storm event can suddenly increase the volume of water and the speed at which it is travelling, resulting in local or downstream erosion and/or flooding, and (2) urban storm water runoff carries a variety of contaminants as well as sediments from the urban landscape, thereby degrading the quality of the receiving water body, and potentially associated groundwater resources as well.

In response to these two fundamental issues, water resource engineers have developed a variety of techniques and approaches to (a) manage the volume of water coming off of urban areas, as well as the speed at which it is transported, and (b) reduce the amount of contaminants reaching local wetlands and watercourses (and being transported downstream). Tools include storm water management ponds (for both quantity and quality control) and, more recently, a renewed push to design developments to allow for more infiltration and treatment of water at the lot level (e.g., vegetated swales behind or in front of buildings, green roofs), and integration of natural features on-site .

These more recently used approaches recognize the natural ability of green spaces to infiltrate water on site (thereby reducing the volume and speed of flows downstream), and attenuate (and, in some cases transform) pollutants and contaminants into benign elements. These functions are generally not appreciated or properly valued in any conventional terms, although their value, particularly in urban areas, is being increasingly recognized.

CVC has recently updated its *Credit River Water Management Strategy* and also has storm water policies and programs intended to support aquatic natural heritage in the watershed as a whole.

In December, 2012, Mississauga City Council approved in principle a staff report to shift the funding of the City's storm water program from property taxes to a dedicated storm water rate. When implemented, the storm water charge levied to a property owner will be related to the area of impermeable surface on their property, thus promoting a "user-pays" approach. Further, with a storm water rate system in place, tools such as credits and incentives can be utilized to encourage landowners to reduce impermeable surface area and implement measures to better manage storm water runoff. The value of such activities increases further in the context of climate change where the incidence of extreme weather events, such as intense rain storms, is expected to increase with climate change.

4.2 AIR AND WATER PURIFICATION

Air pollution is caused by emissions from a wide range of sources, but is primarily associated with certain industries and vehicle exhaust. Primary sources of water pollution include fertilizers, pesticides, sediment (and associated contaminants), industrial waste, oil and gas, and sewage. Plants attenuate some of these pollutants by filtering out particulates from the air and absorbing carbon dioxide (and transforming it into fibre and/or oxygen). Plant roots have also been shown to filter out, and in some cases neutralize, contaminants from water.

Mississauga's trees are estimated to remove 292 tonnes of atmospheric pollutants annually, an ecosystem service valued at $4.8 million[19]. This does not include the water purification functions provided by these trees, or the air and water purification services provided by other natural and green spaces in the city.

Air and water pollution in Mississauga are created locally, but also arrive from elsewhere in the airshed or watershed via pathways that are outside the City's control. However, having trees and other vegetation in the city has immediate and measurable local benefits. These include reduced incidence of respiratory and cardiovascular diseases (many of which are linked to or exacerbated by air pollution) and cleaner local water sources (which reduces the need for local treatment to clean it and supports local fisheries).

4.3 LOCAL ADAPTATION TO CLIMATE CHANGE

It is now well-known that the planet is undergoing a period of rapid climate change, and it is generally agreed that human actions are the principal cause of this change, primarily because of the ever increasing volumes of greenhouse gases (e.g., carbon dioxide, methane and nitrous oxides) being emitted into the atmosphere. The effects of climate change are expected to result in warmer winters, hotter summers and increased frequency and severity of extreme weather events (major storms, tornadoes, hurricanes, etc.). These effects will place additional stress on built structures and infrastructure; requiring more frequent repairs, replacement and upgrades that will place a financial burden on the public and private sectors alike[20].

Sustaining natural areas, and trees in particular, is widely recognized as one of the most effective approaches to helping communities adapt to many of the impacts associated with climate change.

Trees and other plants, transform carbon dioxide into oxygen through the process of photosynthesis during the day, and release carbon dioxide through respiration at night (see **Figure 10**). In Mississauga, the carbon "absorbed" by trees is currently estimated at 7,400 tonnes (valued at $220,000) annually. Some of this carbon is stored long term as woody biomass in the stems, trunks and roots of trees (and other plants), as well as the soils associated with natural areas. Mississauga's more than two million trees store about 203 tonnes of carbon, an ecosystem service valued at $5.8 million.

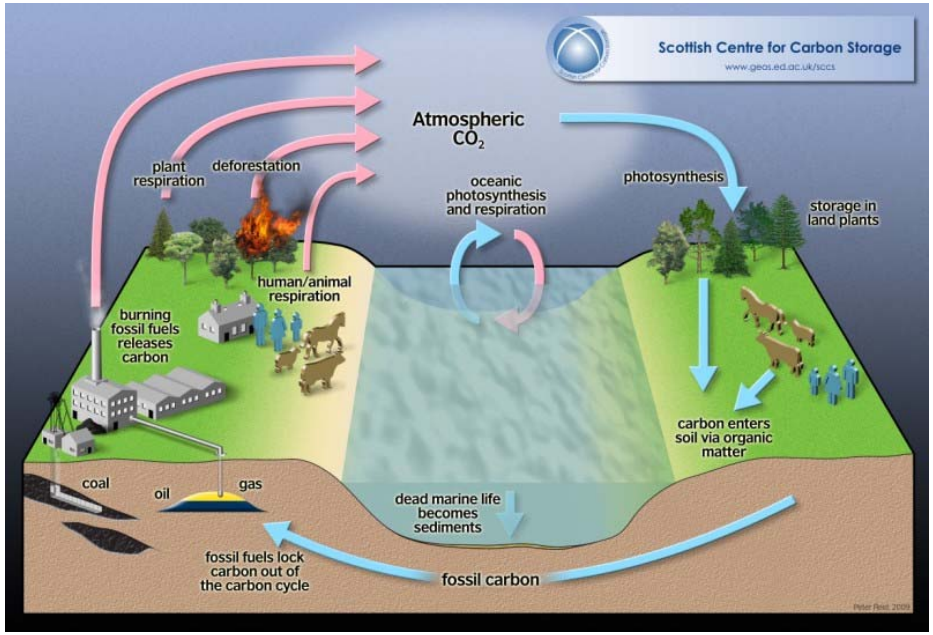


Figure 10. Illustration of the global carbon cycle (image source: Scottish Centre for Carbon Storage at http://www.geas.ed.ac.uk/sccs)

[19] This Mississauga-specific estimate, and others in **Section 3**, are from the *Mississauga Urban Forest Study* (2011) undertaken by the Peel Urban Forest Working Group.

[20] More information is available on the Peel Region climate change website (http://www.peelregion.ca/planning/climatechange/) and in the Peel Climate Change Strategy and Background Reports posted on this website, as well as Credit Valley Conservation's (CVC's) Ecological Goods & Services Fact Sheet on Carbon Storage in the Credit River Watershed posted on their website's Ecological Goods & Services page.

Native grasslands have also been shown to store considerable amounts of carbon by depositing it deep into the soil profile through extensive root networks[21]. Thus, the preservation of trees (particularly large statured trees) as well as naturalized meadows and other green spaces can make significant contributions to mitigating the effects of climate change.

Trees and other vegetation located around wetlands and along watercourses are also known to cool water temperatures. Similarly, trees and shrubs in urban areas, particularly where there are extensive paved surfaces, are able to reduce air temperatures by between 2°C and 5°C. The shade provided by trees in public spaces also contributes to human health by reducing heat stress and protecting people from exposure to excessive ultraviolet radiation.

Trees, particularly evergreens, located close to one or two story buildings or residences have also been shown to reduce cooling costs in the summer and reduce heating costs in the winter. In Mississauga these savings are currently estimated at 79,000 MBTUS and 7,300 MWH annually (valued at $1.2 million), but could be much greater with more widespread and strategic tree planting. These savings also reduce carbon emissions, and contribute to improving air quality, by reducing the consumption of energy.

4.4 POLLINATION OF CROPS AND OTHER VEGETATION

Insects are an important component of Mississauga's biodiversity and an essential food source for birds and amphibians. Many insects (e.g., bees) also contribute directly to human survival by pollinating fruit and grain crops.

> ***The most important pollinator for agricultural purposes is the honeybee. One estimate of the annual benefit of managed honeybees to American consumers — when they supplement the services provided by native pollinators — is $1.6 billion. When native pollinators are not available to service crops, the estimated value of managed honeybees rises to $8.3 billion. The benefit of all other pollinators to US agriculture is estimated between $4.1 and $6.7 billion annually.***
>
> *Ecological Society of America Pollination Fact Sheet (2013)*

[21] See "*Links between grasslands and carbon storage*" at http://www.albertapcf.org/rsu_docs/links_between_grasslands_and_carbon_storage.pdf and Koteen, L. E., D. D. Baldocchi and J. Harte. 2011. *Invasion of non-native grasses causes a drop in soil carbon storage in California grasslands*. Environ. Res. Lett. 6

4.5 SAFER CITIES

Treed and vegetated areas in urban centres are seen by some as good screens and likely locations for criminal activities. While some crimes do occur in treed and vegetated areas, a recent review into this topic in a range of American cities indicates that incidences of criminal activity are actually lower in neighborhoods with more green spaces[22]. Notably, vegetation can also be managed using "Principles of Crime Prevention Through Environmental Design" (rather than removing it) to improve sight lines and reduce community concerns.

Similarly, there has been a long-standing perception that roads with a clear zone along either side are safer, and yet in urban settings recent data indicate that trees (and other vegetation) in urban roadsides may actually reduce the incidence of crashes, probably through a "traffic-calming" effect.

> **One research paper reported a 46% decrease in crash rates across urban arterial roads and highways after landscape improvements were installed.**
>
> *Naderi, J. R. (2003)*[23]
>
> **Another study found that placing trees in planters along urban arterial roadsides reduced mid-block crashes by 5% to 20%.**
>
> *Mok, J.-H., H. C. Ladphair and J. R. Naderi (2003)*[24]

[22] Wolf, K. L. 2010. *Crime and Fear – A Literature Review. In Green Cities: Good Health* (www. greenhealth.washington.edu).

[23] *Landscape design in the clear zone: Effect of landscape variables on pedestrian health and driver safety*. Transportation Research Record 1851: 119-130.

[24] *Landscape improvement impacts on roadside safety in Texas*. Landscape and Urban Planning 78: 263-274.

4.6 ECONOMIC SPIN-OFFS

The economic spin-offs of having nature, and natural elements, in cities are often overlooked, and yet these benefits translate into tangible financial gains. The presence of trees and other green spaces in neighborhoods is known to increase the value of homes (even if the vegetation is on the adjacent lands), and in commercial areas has been shown to result in customers spending more time browsing and being willing to spend more on goods purchased (see more details in the UFMP).

CVC studied real estate values in Mississauga in an effort to quantify the monetary value residents place on living near green space[25]. They found that, on average, proximity to natural features increased property values by between $8,010 and $10,273.

Research in Portland Oregon found that the presence of street trees, on average, added $8,870 to the sales price of the house and reduced the time on the market by 1.7 days.

Donovan, G. H. and D. T. Butry. 2010. "Trees in the city: Valuing street trees in Portland, Oregon". Landscape and Urban Planning 94: 77-83.

Natural areas in cities are also increasingly recognized as a draw for visitors, bringing in tourism dollars. These direct economic spin-offs are in addition to the savings associated with storm water management, pollution filtration, improved safety and improved human health.

[25]DSS Management Consultants 2009. The Credit River Watershed – Property Value Appreciation: Impacts of Natural Areas. Available at http://www.creditvalleycons.com/bulletin/resources.htm.

4.7 HUMAN PHYSICAL HEALTH

Human physical health is linked directly and indirectly to the health and extent of natural areas and green spaces in a given municipality. Air pollution has been linked to greater incidence of respiratory disease, heart attacks and strokes. Therefore, the presence of natural elements in the landscape that reduce air pollution provides a direct health benefit.

Researchers at Columbia University have found that for every additional 343 trees per square kilometer, asthma rates drop by 25% in young children.

... [P]hytonicides (essential oils derives from trees) have been suggested to exert a preventative effect on cancer generation and development.

A Healthy Dose of Green (Trees Ontario 2012)

In addition to the fundamental services of air and water purification, and food production (as described in **Sections 3.2 through 3.4**), treed areas provide shade that both cools and protects people from harmful ultraviolet radiation. The presence of accessible, and connected, public green spaces in urban centres also encourages people to go outside more often and for longer periods to engage in outdoor active living, which is a basic contributor to physical health and well-being.

In Ontario, the government spends billions of dollars dealing with various health issues and conditions that are either caused or exacerbated by air pollution and the increasingly sedentary lifestyles people lead. Cardiovascular diseases alone cost the government (and the taxpayers) more than $5 billion annually, and respiratory disease is estimated to cost more than $12 billion in direct and indirect medical expenses each year, and these amounts are increasing every year[26]. The frequency of skin cancer is also on the rise.

In contrast, investing in a community's urban forest and natural areas to ensure that an abundance of trees and other vegetation are protected and managed so that they can reach maturity (when they provide the most value in terms of health benefits related to air pollution control and well-shaded outdoor spaces) seems like a small price to pay for some preventative medicine.

[26] Trees Ontario. 2012. A Healthy Dose of Green: A prescription for a healthy population. 21 p. Available at http://www.treesontario.ca

4.8 HUMAN MENTAL HEALTH AND SPIRITUAL WELL-BEING

An increasing number of studies are showing links between the presence of green spaces and the reduction of stress and depression, as well improvements in learning and memory. In children, concentration and creativity has been shown to increase in natural settings, and developing connections with nature has been found to support their intellectual and social development. In particular, working with children that have Attention Deficit Disorders in green settings has proven to be an effective supplement to traditional therapies[27].

In addition to these direct experimental links, evidence of reduced recovery times among patients who can see trees and/or green spaces from their windows, as opposed to those overlooking concrete landscapes, suggests the human connection to the natural world remains whether it is acknowledged or not[28]. Indeed, ecotherapy (or nature therapy) is now a recognized and prescribed form of therapy based on the understanding that people are part of the web of life, and that humans are not isolated from the environment. Aboriginal communities have long understood their existence in this context, per the vision below.

> *The Mississaugas of the New Credit First Nation look to our Anishinabe roots to guide our vision for the future as a strong, caring, connected community who respects the earth's gifts and protects the environment for future generations.*
>
> Mississaugas of the New Credit First Nation Vision Statement

Interestingly, recent surveys in Canada (and around the globe) show that many people already understand that green spaces are effective at improving concentration and reducing stress and anxiety, even though time spent in green spaces is on the decline[29].

[27] A number of research papers supporting these findings can be found in Wolf, K. L. and K. Flora. 2010. *Mental Health and Function – A Literature Review*. In Green Cities: Good Health (www. greenhealth.washington.edu).

[28] Ulrich, R. 2000. *Effects of healthcare environmental design on medical outcomes.* Proceedings of the 2nd International Congress on Design and Health, Karolinska Institute, Stockholm, Sweden, pp. 51-52.

[29] Husqvarna's *2013 Global Green Spaces Report* available at http://www.husqvarna.com/ca/en/forest/news-listing/

4.9 SOCIAL NETWORKING OPPORTUNITIES

Green spaces, ranging from large shade trees and community gardens, have been found to encourage social contact by serving as informal meeting places. Community parks and gardens, and joint activities undertaken within them, can also help foster a local sense of place and community[30].

> *Researchers in Chicago conducted a study in a deprived neighborhood in the city and observed that the amount of trees and grass in playgrounds is directly correlated with a higher frequency of play.*
>
> *A Healthy Dose of Green (Trees Ontario 2012)*
>
> *Mississauga's natural [heritage] system … [is] integral to clean air, land and water, supports vital ecological functions and contributes to the health and spiritual well-being of Mississauga's residents.*
>
> *Mississauga Living Green Master Plan (2012)*

Socializing, face-to-face, in public green spaces and natural settings that takes place among children has developmental benefits that can extend into adulthood[31]. It also provides a very different type of social networking than digital alternatives that are increasingly dominating people's daily interactions, and whose effects (good and bad) we have yet to fully assess or understand.

[30] Burls, A. 2007. *People and green spaces: Promoting health and mental well-being through ecotherapy*. Journal of Public Mental Health 6(3): 24-39.

[31] Wolf, K. L. and K. Flora. 2010. *Mental Health and Function – A Literature Review*. In Green Cities: Good Health (www. greenhealth.washington.edu).

4.10 HABITAT FOR NATIVE BIODIVERSITY AND ECOLOGICAL CONNECTIVITY

In addition to the variety of ecosystem services that either provide direct and measurable benefits to people, or to their health and well-being (as described in Section **4.1 through 4.9**), nature and green spaces in cities also support native biodiversity and ecological connectivity on both a local scale (i.e., city-wide) and on a broader scale across southern Ontario.

On a local scale, Mississauga's natural areas are known to support 706 species of native plants (as well as an additional 464 species of non-native plants) and 227 species of native birds, as well as 16 species of amphibians and 33 species of mammals. Of these species, 23 are considered "at risk"(i.e. listed as endangered, threatened or of special concern in the Province).

The City's Natural Heritage System, and its broader Green System (as illustrated in **Figures 1 and 3**), also provide important landscape-scale linkages. Primary landscape-scale linkages include:

- north-south linkages between Lake Ontario and the headwaters within the Provincial Greenbelt in the northern part of the Region of Peel (comprised primarily of the Oak Ridges Moraine Conservation Plan and the Niagara Escarpment Plan areas)
- east-west linkages between the Town of Oakville and the City of Toronto along the lakeshore, and
- additional north-south linkages between Mississauga and the watersheds shared with the adjacent municipalities of Oakville, Milton, Brampton and Toronto.

These linkages are of different types and include landscape, linear and stepping stone linkages or corridors, as illustrated in **Map 2**.

5 PLANNING CONTEXT AND PRECEDENTS

There are a number of documents at the Federal, Provincial, Regional and local (i.e., City-wide) levels that provide important planning direction and guidance for this Strategy. An overview of this planning context is provided in this section.

5.1 FEDERAL DIRECTION

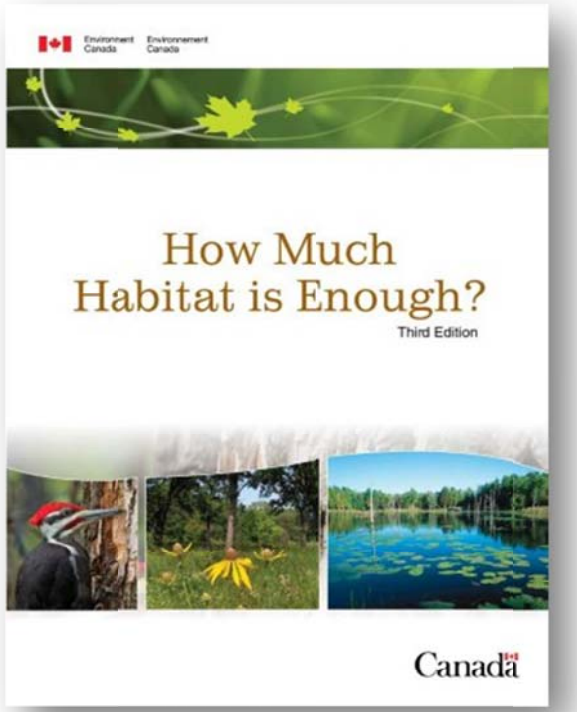
The primary source of upper-level policy direction with respect to planning is provided by the Province, however, there are some important Federal pieces of legislation and sources of guidance that relate to natural heritage and the urban forest.

Protection for Federally listed flora and fauna Species at Risk on federal lands in Mississauga is provided through the *Species at Risk Act* (2002). Notably, habitat for federally listed Species at Risk is also protected within Core Areas and Natural Areas and Corridors of Peel Region's Greenlands System (which are also protected within the City of Mississauga).

Other pieces of Federal legislation that have some bearing on natural heritage in Mississauga include the *Fisheries Act* (1985), which is the primary piece of legislation governing fisheries, and the *Migratory Birds Convention Act* (1994), which prohibits the damage or disturbance of many birds (and their nests) during breeding season. Both of these pieces of legislation are used to ensure that development activities that may affect fish or birds is conducted outside of the breeding timing windows for these groups, or that due diligence is undertaken to ensure no breeding habitats are being disturbed.

A primary source of natural heritage planning guidance produced by the Federal government is the *How Much Habitat is Enough?* document produced by the Canadian Wildlife Service branch of Environment Canada. This was recently updated and released in its third edition in April 2013. This document is relevant to Mississauga in that it provides science-based and habitat-specific guidance intended to sustain functional wetlands, riparian areas, forests and grasslands in the fragmented land use context of southern Ontario. However, it is targeted primarily at "greenfield" situations, and as discussed in **Section 7**, its application in Mississauga is somewhat limited by the extent of urbanization which the city has already undergone. Nonetheless, the document still includes guidance related to landscape ecology principles as well as habitat diversity and quality that can help manage natural cover. The Environment Canada publication *Area-Sensitive Forest Birds in Urban Areas* (2007) provides more urban-specific guidance.

Federal involvement in urban forestry has been, to date, limited to the efforts of the Canadian Food Inspection Agency (CFIA) and Canadian Forest Service (CFS) to monitor and control the spread of current high risk invasive urban forest pests (most notably Asian long-horned beetle and emerald ash borer). There is also the Canadian Urban Forest Network that is a national network of Canadian urban forest professionals that has developed a Canadian Urban Forest Strategy, however this organization has no formal ties to or status within the Federal government. This gap in Federal support for municipal urban forestry initiatives is recognized in the *Peel Region Urban Forest Strategy* (2011) which identifies the need to "*gain formal support from upper level government for sustainable management of the urban forest as natural infrastructure*" as one of its eight goals.



5.2 PROVINCIAL DIRECTION

At the Provincial level there are a number of pieces of legislation and policy direction, as well as guidance strategies, which relate to natural heritage, which are described in this sub-section.

With respect to the urban forest, particularly those components of it that are outside of protected natural areas, the Province's role is limited to the *Municipal Act* (2001) and the *Forestry Act* (1990), which provide municipalities with the ability to implement by-laws regulating the removal of trees on public or private lands, and some legal definitions to support this legislation. This gap in Provincial support for municipal urban forestry is recognized in the *Peel Region Urban Forest Strategy* (2011) which identifies the need to "*gain formal support from upper level government for sustainable management of the urban forest as natural infrastructure*" as one of its eight goals. More details about links between various provincial statutes and policies, and municipal urban forestry, are provided in the City's UFMP.

Provincial Policy Statement (2005)

The Provincial Policy Statement sets out the overarching policy framework for natural heritage feature and areas protection in Ontario for development applications under the Planning Act. It provides for two levels of protection for natural heritage features and areas. The first category includes those natural heritage features and areas where development and site alteration is simply not permitted (e.g., significant wetlands). The second category includes those natural heritage features and areas (e.g., significant woodlands) in which development and site alteration is not permitted in the feature or on adjacent lands unless it has been demonstrated that there are no negative impacts on the natural features or their ecological functions.

This categorization of natural heritage features and areas has formed the primary organizing framework for natural feature protection in most municipal official plans. One of the challenges of this policy framework is that it requires the interpretation of significance for many of the natural heritage features to be made in the context of the area in which the feature is located. "Significance" thereby must be determined separately for each municipality, although the Province provides varying degrees of guidance for achieving this.

The Provincial Policy Statement also encourages a policy framework that utilizes natural heritage systems planning by requiring that the long-term ecological function and biodiversity of natural heritage systems "*should be maintained, restored or where possible improved*". However, there is no detailed policy direction outlining how a natural heritage system is to be delineated or maintained. That responsibility falls to the regional and / or local municipality.

> ***The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features.***
>
> *Section 2.1.2 , Provincial Policy Statement (2005)*

Natural Heritage Reference Manual (2010)

The Natural Heritage Reference Manual, last updated in 2010, provides municipalities with guidance on how to implement the natural heritage policies of the Provincial Policy Statement (2005), including determination of the significance of natural heritage features and areas. It also provides guidance on how to delineate a natural heritage system, how to use available municipal planning tools to protect natural heritage, how to address impacts of development and site alteration (including some guidance on buffers) and some limited guidance on performance indicators.

The Manual clearly distinguishes between the natural heritage features that are the Province's responsibility to identify (i.e., significant habitat of endangered and threatened species, significant wetlands, and Areas of Natural and Scientific Interest (ANSIs)), and those that are the responsibility of municipalities (i.e., significant woodlands, significant valleylands, and significant wildlife habitat).

The Manual also provides some guidance on how to reconcile significant habitat of endangered and threatened species, per the Provincial Policy Statement, and the regulations of Ontario's *Endangered Species Act* (2007) which apply to species listed as endangered and threatened.

Endangered Species Act (2007)

The *Endangered Species Act* (2007) for Ontario regulates the protection of all species in the Province listed as extirpated, endangered or threatened. All species, and either their general or regulated habitats (where species-specific regulations have been developed), are protected on public and private lands

according to this legislation, with guidance from Recovery Strategies (where these have been completed). Existing and recently adopted regulations related to this Act require screening for regulated species as part of virtually any development proposal, whether it be by public or private sector, and can involve compensation for some types of critical habitat for certain species.

Greenbelt Plan (2005)

Ontario's Greenbelt Plan identifies a large area that spans the Greater Golden Horseshoe Area where urbanization is to be restricted in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on the landscape within the Plan area. This Plan builds on the Niagara Escarpment Plan and the Oak Ridges Moraine Conservation Plan by encompassing those two plan areas within a broader Greenbelt Plan framework. The Greenbelt Plan sets out a Natural System policy framework comprised of a Natural Heritage System and Water Resource System, which in turn are comprised of key natural heritage features and key hydrologic features, respectively. Notably these two systems can, and do, overlap quite extensively.

The Greenbelt Natural Heritage System broadly applies to a large geographic area. However, it is not a designation in and of itself, nor is it to be entirely protected or restored. The Natural Heritage System functions as an overlay, with designations of municipal official plans applying to the same area along with the added constraints of the Natural Heritage System policies.

Currently, no portions of the Greenbelt Plan extend into the City of Mississauga, although the Greenbelt does capture significant portions of the Town of Caledon and a small part of the City of Brampton in the northern part of the Region of Peel. Linkages to Lake Ontario are identified with green dotted lines along the major watercourses between the Greenbelt and the lake, but there are no formal policies associated with these linkages.

The Greenbelt Plan was recently amended (January 2013) to provide the additional designation of Urban River Valleys to the Natural Heritage System. This designation is intended to include only publicly owned lands located in the urban river valleys extending south from the Greenbelt Plan Area towards Lake Ontario. The lands within this designation, although included in the Greenbelt Plan, are to be governed by the applicable municipal official plan policies, but must have regard for the objectives of the Greenbelt Plan.

Other Provincial Guidance Documents

Other relevant documents include: *Ontario's Biodiversity Strategy* (2011), which sets out a framework for engaging people, reducing threats, enhancing resilience and improving knowledge in relation to native biodiversity and ecosystems in the Province; and the *Ontario Invasive Species Strategic Plan* (2012) which highlights some of the important work that has been undertaken by stakeholders and members of the public, and suggests further ways these partners can help fight invasive species.

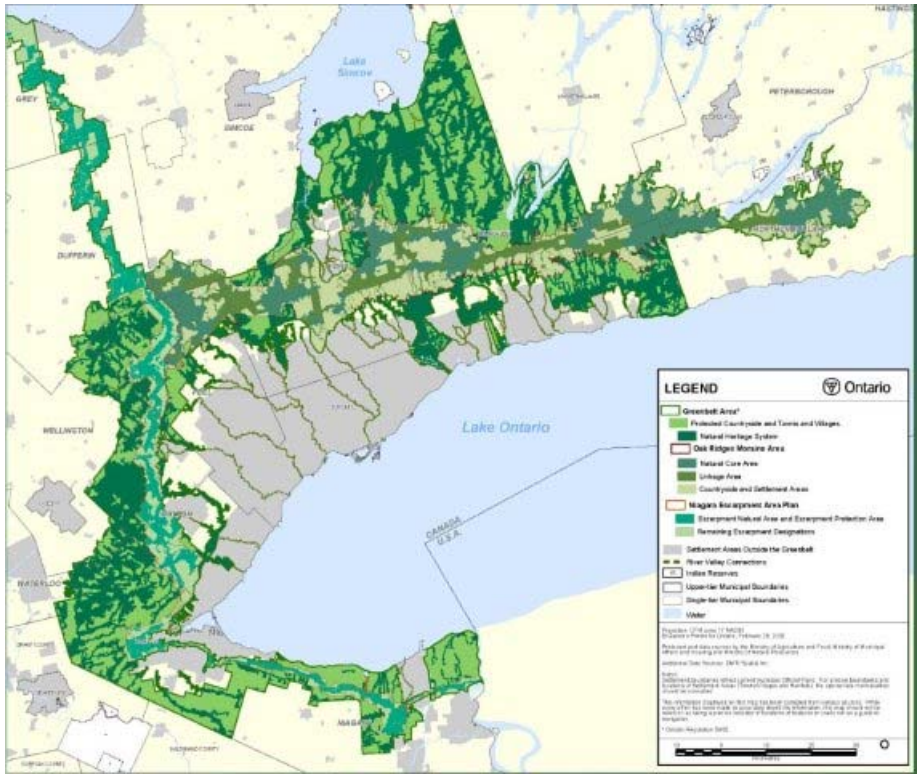


Figure 11. Context map showing the Greenbelt Plan Area in the context of the Greater Toronto Area (from the Provincial Greenbelt Plan, 2005)

5.2.1 FEASIBILITY OF EXTENDING THE PROVINCIAL GREENBELT INTO MISSISSAUGA

On April 28, 2010, Mississauga City Council supported the addition of public lands in the Credit River Valley to the Provincial Greenbelt in principle, and directed staff to complete a feasibility analysis. This analysis was deferred for about a year and identified as a task within the NH&UFS project. A comprehensive analysis has been provided in a separate discussion paper, including consideration of the new Urban River Valleys designation in the Greenbelt Plan. The discussion paper was released in draft and was subject to consultations (with the Region, Province, local conservation authorities, adjacent municipalities, and interested environmental organizations) in August 2013.

The analysis concluded that the expansion is feasible, although there are no clear policy-related benefits from including publicly owned lands as Urban River Valleys within the Greenbelt Plan (because it will not result in any greater level of protection of natural heritage features beyond what the City already provides through its Official Plan policies). However, the analysis also recognized that including the lands in the Greenbelt Plan would have other benefits such as:

- raising awareness of the role of the urban river valleys in connection to a larger, regional natural heritage system;
- increasing the profile of the lands subject to the Urban River Valley designation in the Greenbelt Plan, and
- providing educational and stewardship opportunities.

In addition, pursuing this designation locally would offer an opportunity for the City to show leadership in being the first GTA municipality undertaking the Greenbelt Plan Area expansion through this new designation.

Given all these considerations, in conjunction with the feedback received through the various consultations, City staff are recommending that the City pursue including suitable public lands within the Credit River and Etobicoke Creek Valleys into the Greenbelt Plan Area under the Urban River Valleys designation with the Region, and ultimately the Province.

More details are provided in the *Feasibility Analysis for Expanding the Provincial Greenbelt Plan Area into Mississauga, Final Report* (2013) available under separate cover.

5.3 REGIONAL SCALE DIRECTION

Region of Peel

The Region of Peel Official Plan, recently updated through Regional Official Plan Amendment (ROPA) 21b, contains policies identifying three categories of natural heritage features and areas within its Greenlands System (see **Figure 12**):

- Core Areas
- Natural Areas and Corridors (NACs), and
- Potential Natural Areas and Corridors (PNACs).

Core Areas are designated in the Regional Official Plan, whereas the latter two categories are to be identified through the lower tier official plans, although specific criteria for their identification are provided (in Table 1 of ROPA 21b). Development and site alteration are largely prohibited in Core Areas with some exceptions including minor development and minor site alteration.

Area municipalities (i.e., the City of Mississauga, City of Brampton and Town of Caledon) are required to define and incorporate the Core Areas in their Official Plans, and may adopt the Region's minor permitted exceptions related to these features. ROPA 21b also directs area municipalities to include objectives and policies in their Official Plans for the protection, restoration, enhancement and stewardship of NACs and PNACs. Recommendations in **Section 8.1** of this Strategy address how Mississauga can be consistent with and, where appropriate for the City, go beyond the Regional policy direction related to natural heritage and the urban forest.

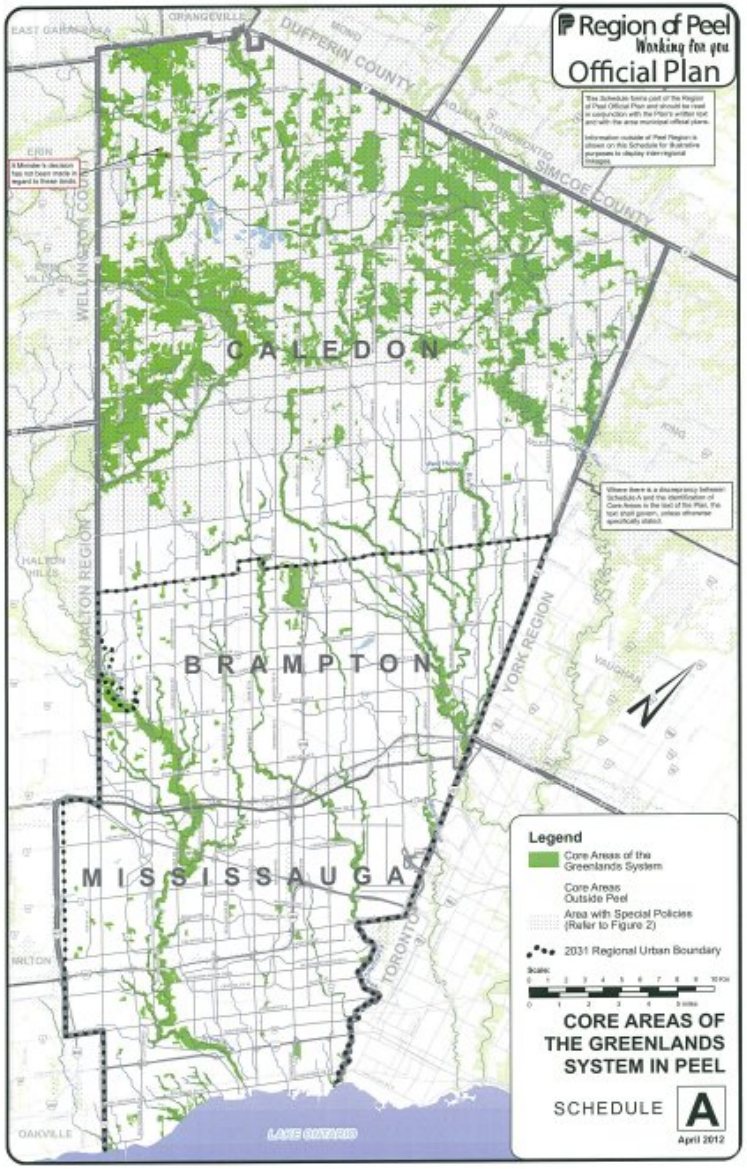


Figure 12. Regional Greenlands System (from the Region of Peel Official Plan, 2013 consolidation)

The *Peel Climate Change Strategy* (2011) is the strategic framework of all municipalities in the Region (i.e., Cities of Mississauga and Brampton, Town of Caledon, and Region of Peel) and conservation authorities (CVC, TRCA, CH, Nottawasaga Valley Conservation Authority and Lake Simcoe Region Conservation Authority) within the geographic area of Peel Region. This document guides climate change mitigation and adaptation in the Region and, among other things, recognizes the importance of the urban forest in both of these endeavours. The Peel Strategy directs regional partners to, on an ongoing basis, "*undertake specific initiatives … within the urban system*." The Region supports its partners in this regard and through the Peel Urban Forest Working Group, which includes all these partners and meets on a regular basis.

The *Peel Road Characterization Study* (2013) explicitly supports the urban forest and natural heritage connectivity by ensuring that "*…all [road] designs, with the exception of rural Roads, contain space for landscaping and street trees within the [right-of-way]*", including "Green Zones" between roadways and pedestrian zones, and identifying the need to work with utility providers to integrate trees where feasible without compromising safety related to overhead lines.

Conservation Authorities

Mississauga's boundaries overlap with three conservation authorities: CH, CVC and TRCA, with CVC being the authority covering the greatest area of the city. The conservation authorities provide a wide range of environmental services to the municipalities in their jurisdictions, including regulating development and site alteration within and adjacent to wetlands, watercourses, and hazard lands, including the lakeshore, under the *Conservation Authorities Act* (2006). The policies, procedures and guidelines for implementation of this regulation include direction on minimum buffers to different types of regulated features, as well as exceptions as to what types of activities may be permitted within set buffers.

In addition to the regulation of the features listed above, the conservation authorities provide technical review and guidance to the City of Mississauga with respect to various natural heritage planning issues. This technical support is of value to the City, and recommendations made by the respective conservation authorities are considered in all cases.

The conservation authorities have also:

- conducted regional-scale studies to guide natural heritage planning and identify potential restoration opportunities in their watersheds with

consideration for the current science and technical knowledge (e.g., *TRCA Natural Heritage System Strategy* 2007, *CVC Terrestrial Ecosystem Enhancement Model* 2011)
- developed strategies and management plans targeting aquatic resources in their jurisdictions (e.g., *Credit River Fisheries Management Plan*, *Wetland Restoration Strategy*, *Lake Ontario Shoreline Strategy*)
- developed guidelines to encourage consideration and incorporation of progressive practices into development (e.g., Low Impact Development Guidelines, Headwater Drainage Feature evaluation guidelines), and
- continued to develop and implement a wide range of outreach tools and stewardship programs targeted at various sectors.

5.4 CITY-WIDE DIRECTION

There are a number of city-wide planning documents that provide context and guidance for this Strategy (as illustrated in **Figure 5**). Key documents include Mississauga's:

- *Strategic Plan* (2009)
- *Official Plan* (2011)
- *Future Directions: Master Plan for Parks and Natural Areas* (2009)
- *Living Green Master Plan* (2012)

The relevant components from each of these are summarized below, particularly as they relate to natural heritage. A specific review of each of these documents from a strictly urban forestry perspective is provided in the City's UFMP.

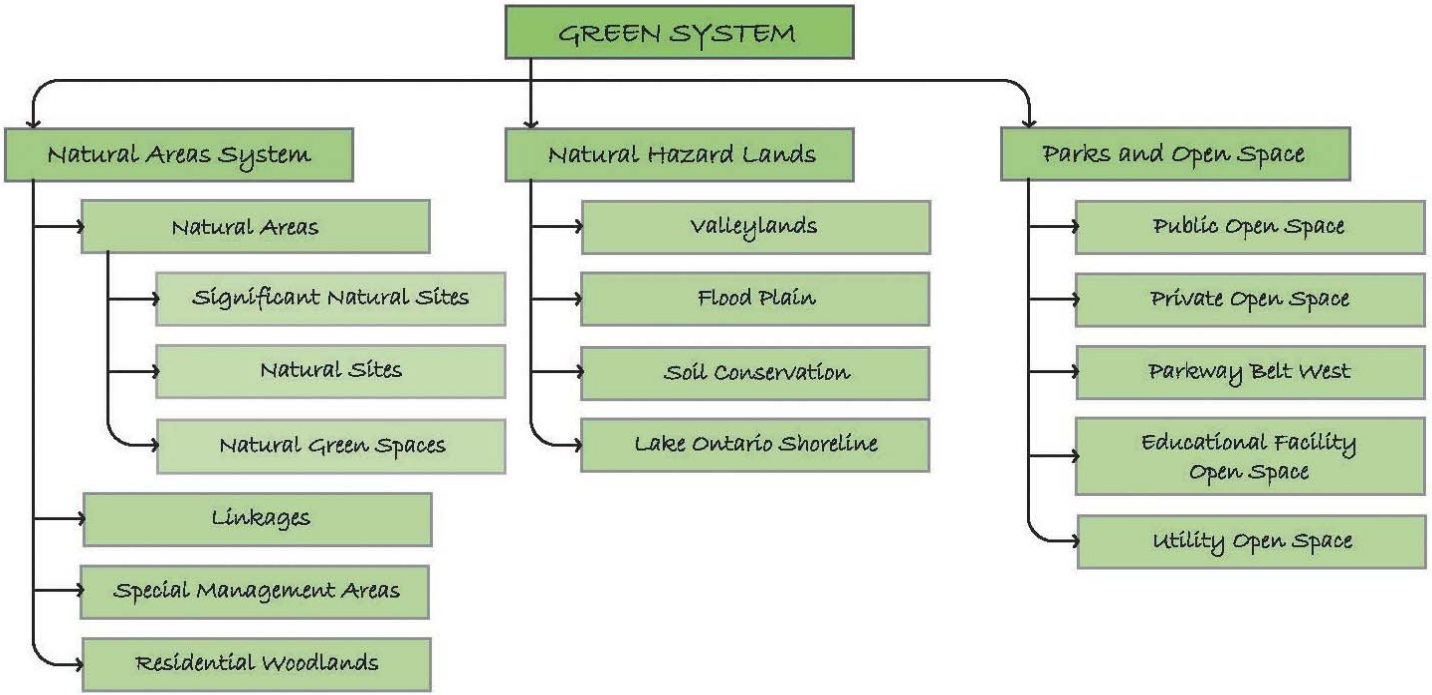
Strategic Plan (2009)

The City's *Strategic Plan* identifies five pillars for change with the one most relevant to this NH&UFS being the "living green" pillar. The vision for the "green" pillar states: *"Our Future Mississauga is a city that co-exists in harmony with its ecosystems, where natural areas are enhanced, forests and valleys are protected, the waterfront connects people to Lake Ontario, and communities are nurtured so that future generations enjoy a clean, healthy lifestyle".* The vision, guiding principles and objectives of this Strategy (as presented in **Section 5**) have been closely aligned with this pillar. The three "green" strategic goals (i.e., (1) lead and encourage environmentally responsible approaches, (2) conserve, enhance and connect natural environments; and (3) promote a green culture) are also embedded within the guiding principles and objectives, and implemented through the various strategies in this document (see **Section 9**), as well as the more detailed Actions outlined in the City's UFMP.

Official Plan (2011)

The City's *Official Plan* (2011) recognizes the city is entering a new stage in its evolution, "*one of intensification and urbanization*", and in this context "*provides a new policy framework to protect, enhance, restore and expand the Natural Areas System*" in order to create a place "*where people, businesses and the natural environment thrive*".

This policy framework seeks to balance natural heritage protection and the pressures of urban development by providing general policies that avoid negative impacts to natural heritage and the urban forest, in conjunction with some more detailed policies that allow for some flexibility in accommodating growth in a predominantly urban environment. For example, a general objective is to "protect, enhance and restore" the Natural Heritage System (policy 6.1.1), however, the more detailed policies encourage (but do not require) expansion of the system (policy 6.3.1.7) and also allow for public works and services within the Natural Heritage System where these are considered essential and no other feasible alternatives exist (policy 6.3.1.14). Notably, mitigation and/or compensation for any impacts to the Natural Heritage System as a result of these works are required.



NOTE: While illustrated as separate elements, many components of the Green System fall within all three categories, i.e. the Credit River, which is a significant natural site, subject to valleyland and flood plain policies, and can be either public or private open space.

Figure 13. The Green System policy Framework in the current Official Plan (2011)

Section 6 of the Official Plan, called "Value the Environment", sets out a framework for the City's Green System, as illustrated in **Figure 13** above. This framework breaks the Green System into three distinct categories, with policies that apply to each: (1) the Natural Area System, (2) Natural Hazard Lands, and (3) Parks and Open Space Lands. It is noted that many sub-components within each of these categories may overlap. Section 6 also includes a set of policies specifically addressing the Urban Forest, but does not include this component in the green System framework because it cannot be readily mapped in its' entirety since it encompasses all trees in the city.

The City's Natural Areas System (herein referred to as the Natural Heritage System) consists of four components: Natural Areas, Linkages, Special Management Areas, and Residential Woodlands. Natural Areas are further divided into three sub-categories (Significant Natural Sites, Natural Sites and Natural Green Spaces). It also recognizes that linkages are "*necessary to connect natural areas to maintain biodiversity and support ecological functions*", (policy 6.3.1.2) and encourages connectivity, as well as the restoration of Linkages to become Natural Areas.

Section 6 of the Official Plan also makes some connections between the Natural Areas System, the urban forest and opportunities to support those areas through the broader Green System (e.g., storm water management pond naturalization, sensitive management of parks), and between the protection of these components of the Green System and the provision of ecosystem services such as air quality.

Future Directions: Master Plan for Parks and Natural Areas (2009)

This entire master plan implicitly and explicitly acknowledges the interrelatedness of parks and natural areas, particularly in urban settings, and also highlights the joint benefits to the community provided by these areas (e.g., physical and psychological health - particularly for youth, environmental services, community building, and direct economic benefits such as increased real estate and tourism value).

> ***The trends emerging from the review of issues of Natural Areas in Mississauga … suggest that there is a strong need for continued and increased efforts to protect and increase the proportion of the City occupied by natural habitats.***
> *Future Directions: Master Plan for Parks and Natural Areas (2009)*

Key issues and opportunities identified in this master plan include the need to:

- expand inter-departmental cooperation for planning
- increase protection of existing natural areas
- identify or create additional natural areas in the City
- better manage increasing demands for accessible natural areas
- use parks to help support natural areas connectivity
- manage parks more sustainably, and explain/promote the use of such practices to the community
- balance naturalization / reforestation with community gardening
- balance reforestation with other types of habitat restoration
- continue to prioritize natural areas acquisition as part of the Parklands Acquisition Strategy
- better promote the proper use of natural areas

Notably, the plan also includes a specific recommendation to undertake this Natural Heritage Strategy (#50).

Living Green Master Plan (LGMP) (2012)

Research conducted in support of the LGMP found that established policies are moving in the right direction to enhance, restore and expand Mississauga's Natural Heritage System, but acknowledges the ongoing challenges of dealing with competing land uses as the city continues to grow, and of planting, maintaining and protecting 1 million trees.

The LGMP identifies 49 actions within three categories. Key actions related to the NH&UFS are listed below under their respective category:

ACTIONS TO SET AN EXAMPLE

Action 8: Include guidelines in the Natural Heritage Strategy to develop targets related to the Green System and naturalization, engage a wide range of stakeholders, develop a restoration strategy, implement relevant recommendations from existing studies, develop an invasive species management plan, and increase vegetation protection zone setbacks.

ACTIONS TO ENCOURAGE OTHERS

Action 28: Develop an Environmental Grants Program
Action 29: Expand the SNAP[32] program to other neighbourhoods
Action 31: Develop an Environmental Design Award
Action 32: Build on the Partners in Project Green model to develop more Eco-Industrial Parks
Action 42: Launch a Living Green Education Campaign

[32] "SNAP" stands for Sustainable Neighbourhood Retrofit Action Plan, a program led by TRCA to help selected communities become more environmentally responsible.

ACTIONS TO COMPEL OTHERS

Action 46: Amend the Street Tree By-law (91-75) and Tree Permit By-law (475-05) to be more restrictive and consistent with the *Official Plan*[33]
Action 47: Consider introducing a regulatory tool to protect and enhance the green system (e.g., Toronto's Ravine by-law)
Action 48: Modify the Nuisance Weeds By-law (0267-2003) and Property Standards By-law (654-98) to support naturalization (Action 48)
Action 49: Increase monitoring and enforcement of the Erosion and Sediment Control By-law (512-91)

In addition, the LGMP includes "tree canopy intensity" and "natural heritage system coverage" as the two natural environment performance monitoring indicators. This Strategy adopts and builds on these indicators (see **Section 7**).

Other Key Sources of Information and Guidance

The *Credit River Parks Strategy (in draft)* is another document with many goals and objectives that compliment those identified in this Strategy. Although this document is currently draft, major directions from it have been considered in the development of this Strategy.

The *Peel Region Urban Forest Strategy (2011)* and *City of Mississauga Urban Forest Study* (2011), which were developed by the TRCA in collaboration with the Region, Area Municipalities (Mississauga, Brampton and Caledon), and CVC, are also key sources of data and recommendations for this Strategy, and particularly for the UFMP, which presents their key findings in more detail.

The *Green Development Strategy* (2009) for Mississauga is a progressive document has many synergies with this Strategy. Among the five "drivers" identified as being most relevant to Mississauga in this report are three that relate directly to this Strategy: "Protect, enhance and restore natural areas", "Provide Green Space", and "Manage Stormwater". The *Green Development Strategy* provides 36 recommendations to be reviewed over a five year period prior to implementation, and identifies a number of incentives to encourage more "green" development (e.g., awards, fee-bates, tiered tracking approval process, bonusing opportunities, and green loans). It emphasizes the importance of enforcement of existing policies combined with targeted education and incentives for promoting changes in practices.

[33] Note the Street Tree By-law (91-75) is in the process of being updated and the Tree Permit By-law has already been updated by City staff and went into effect March 2013.

5.4.1 KEY GAPS IDENTIFIED IN THE OFFICIAL PLAN (2011)

Although the Green System policy framework is fairly comprehensive and includes a number of policies that are both appropriate and progressive, the policy analysis conducted as part of this project identified several gaps:

- THE URBAN FOREST IS NOT INCLUDED IN THE GREEN SYSTEM FRAMEWORK, EVEN THOUGH IT IS PART OF THE GREEN SYSTEM
- THE TERM "NATURAL AREAS SYSTEM" CONTINUES TO BE USED INSTEAD OF THE MORE WIDELY ACCEPTED PROVINCIAL STANDARD "NATURAL HERITAGE SYSTEM"; "Natural Areas System" is a carry-over from the original work undertaken in the 1995-6; and as mentioned earlier, the change in terminology has been made as part of this Strategy
- THERE IS A LACK OF POLICY DISTINCTION BETWEEN THE THREE SUB-CATEGORIES OF THE NATURAL AREAS SYSTEM: Although the three sub-categories of natural areas are generally differentiated on the basis of criteria identified in the Official Plan, and appear to be grouped into three categories based on different levels of significance, the Official Plan does not explicitly provide different levels of protection or different permitted uses for the three Natural Areas categories.
- EXPLICIT LINKS BETWEEN THE NATURAL AREAS SYSTEM, AND REGIONAL AND POLICY DIRECTION REGARDING NATURAL HERITAGE ARE LACKING
- THE CRITERIA FOR IDENTIFICATION OF SOME OF THE COMPONENTS OF THE NATURAL AREAS SYSTEM REQUIRE CLARIFICATION: The inclusion of criteria based on the Floristic Quality Index (which is a measure of the quality of a natural area) provides useful indicators from a management perspective, but is a technical concept that is difficult to apply to a policy context.
- NOT ALL SIGNIFICANT NATURAL SITES AND NATURAL SITES ARE DESIGNATED AS GREENBELT OR OPEN SPACE LANDS
- NOT ALL NATURAL AREAS OR RESIDENTIAL WOODLANDS ARE CAPTURED BY THE SITE PLAN CONTROL BY-LAW
- SOME TERMS USED IN THE OFFICIAL PLAN WOULD BENEFIT FROM HAVING DEFINITIONS

Recommendations for addressing these gaps are provided in the Strategies in **Section 9.1**.

6 VISION, GUIDING PRINCIPLES AND OBJECTIVES

The following vision, guiding principles and objectives are intended to provide the "big picture" direction for this Strategy over the document's 20 year lifespan. This direction has been developed with consideration for:

- Mississauga's biophysical and land use context (see **Section 3**)
- the value of ecosystem services provided by Mississauga's Natural Heritage System and urban forest in the context of the broader Green System (see **Section 4**)
- Mississauga's planning context and guiding documents (see **Section 5**), and
- Input from the City, a broad cross-section of stakeholders and members of the public (see **Appendices A and B**).

The vision provides long-term direction for the City, and is intended to provide direction for this Strategy, as well as subsequent natural heritage and urban forest strategies designed to support the City's broader strategic vision for 2050. This vision should be a basis for refining and, if needed, revising objectives and targets to ensure Mississauga's Natural Heritage System and Urban Forest are healthy and sustainable.

The guiding principles are the key considerations for the development and implementation of all Strategies identified in the NH&UFS (as well as for the more specific supporting Actions identified in the UFMP).

The objectives are intended to provide achievable milestones for the long-term implementation and evaluation of the Strategies Identified in the NH&UFS (and the related Actions identified in the UFMP), and for meeting the established targets (see **Section 7**). To enable their evaluation, the objectives are intended to be achievable and are to be assessed through the monitoring to be undertaken as part of the four year NH&UFS performance reviews.

The NH&UFS includes city-wide Strategies directed to both public and private lands. It is understood that while some approaches may be applied equally irrespective of landownership, in many cases distinct approaches are required for lands that are public versus those that are not. Therefore, the objectives have been organized into categories that reflect this distinction, as have some of the related Strategies.

Vision

Together we will protect, enhance, restore, expand and connect Mississauga's Natural Heritage System and Urban Forest to sustain a healthy community for present and future generations.

Distinguishing between "enhance", "restore" and "expand"

The term "enhance" is defined in Mississauga's *Official Plan* (2011) as "intensifying components of a natural area through management measures to increase stability, biodiversity and long-term viability", while "restore" is defined as "developing components of a natural area through the re-creation or reinstatement of conditions previously associated with stability, biodiversity and long-term viability".

While "enhance" and "restore" generally refer to activities within the identified natural area, "expand" is different in that it implies actual physical increases to the Natural Heritage System with the addition of new lands.

Guiding Principles

1. ACT NOW: Mississauga is now almost entirely built out; and most new growth will be in the form of infill and intensification. The City's Natural Heritage System and Urban Forest will be under increasing pressure from this new growth (as well as other stressors related to urbanization and climate change) while they become increasingly valuable for the numerous ecological services they provide. An urgent and sustained commitment to active protection and management of these valuable assets is needed if they are to be sustained.

2. FIRST PROTECT - THEN ENHANCE, RESTORE AND EXPAND: Woodlands, wetlands, grasslands and valleylands are complex ecosystems. Mature deciduous trees take decades, and sometimes centuries, to develop their broad canopies. These components of the city's natural heritage are unique, precious, and not easily replaced (if they can be replaced at all). Therefore it is important to conserve what is most significant first, and then focus on enhancing, restoring and expanding.

3. MAXIMIZE NATIVE BIODIVERSITY: Species native to the ecosystems of southern Ontario have evolved over many thousands of years, are adapted to the local climate and conditions, and have developed strategies and interrelationships to enhance their survival. There is much that is not understood about these species and their relationships to each other, but it is understood that maximizing native biodiversity is one way to build resilience to future climate shifts and other changes in the environment. This includes maximizing the diversity of both species and habitat types (i.e., woodlands, wetlands and grasslands) in the city.

4. RECOGNIZE AND BUILD ON PAST AND CURRENT SUCCESSES: The city's achievements (as described in **Section 2.1**) need to be recognized and used as a basis for moving the City forward in the next evolution of its natural heritage and urban forest planning.

5. LEARN FROM OUR PAST AND FROM OTHERS: Mississauga is unique in many regards, but also shares many of the same challenges as other urban and urbanizing jurisdictions trying to maintain and enhance their natural heritage and urban forest, while still accommodating growth. The City is also fortunate to have its own local experts in a holistic world view – the local aboriginal groups. There is much to be learned from Mississauga's aboriginal roots, its more recent past, and other urbanizing areas.

6. VIEW THE NATURAL HERITAGE SYSTEM AND URBAN FOREST AS PART OF THE CITY'S BROADER GREEN SYSTEM: The City's Natural Heritage System and urban forest are not isolated components, but rather living entities that are responding and adapting to their urban environment and the human activities that influence its form and functions. In what is, fundamentally, an unnatural context, creative opportunities for helping to sustain the Natural Heritage System and Urban Forest must be identified if the natural components are to survive, and potentially thrive.

7. UNDERSTAND THE VALUE OF THE CITY'S GREEN SYSTEM AND THE ESSENTIAL ECOLOGICAL SERVICES IT PROVIDES: Despite our increasingly urban existence, humans are still part of the natural world and require the air, water and nutrients that the natural world provides to survive. In our market-based society it will be critical to find ways of recognizing, and valuing, the essential services nature provides.

8. MAKE STEWARDSHIP ON PUBLIC AND PRIVATE LANDS PART OF DAILY LIVING: Part of the shift towards seeing ourselves as part of the natural world, and fully valuing the services nature provides, is understanding that in an urban environment where human influences tend to dominate, nature requires assistance to sustain itself. To be effective, caring for nature through management needs to become part of our daily existence.

9. INTEGRATE CLIMATE CHANGE CONSIDERATIONS IN NATURAL HERITAGE AND URBAN FOREST PLANNING: Climate change is no longer a theory, but a well-established reality. Although there is much uncertainty in the nature and extent of the anticipated changes, planning must start to build in greater resilience to hotter summers, warmer winters, and more frequent and severe weather events.

10. PROTECT, ENHANCE, RESTORE, AND IMPROVE NATURAL CONNECTIONS: Maintaining and improving natural connections is key to supporting the ecological functions of Natural Heritage Systems, and although it is challenging in an urban setting, it needs to be considered and pursued at local, watershed and regional scales.

11. TRACK THE STATE OF THE NATURAL HERITAGE SYSTEM AND URBAN FOREST, AND PRACTICE ADAPTIVE MANAGEMENT[34]: Tracking the state of the Natural Heritage System and Urban Forest provides measures for assessing the effectiveness of strategies. It also provides statistics to keep people engaged and informed. Natural systems are complex, particularly when they are embedded in urban areas, and their responses to changes in the environment are hard to predict. Adaptive management recognizes this reality and provides an approach that facilitates the refinement of strategies to respond to environmental changes or unexpected events.

12. RECOGNIZE NATURAL AREAS AND THE URBAN FOREST AS CRITICAL COMPONENTS OF THE CITY'S INFRASTRUCTURE: Ultimately, fully valuing Mississauga's natural areas and urban forest will mean recognizing that managing their protection, enhancement, restoration and expansion is a key part of sustaining them as a vital infrastructure component. This will mean making considerations related to the Natural Heritage System and Urban Forest priorities in the land use planning process and with respect to budgetary allocations.

Strategic Objectives

General Objectives

1. Increase internal (within the City) and external (among the community and other stakeholders) awareness of the value and need to protect, enhance, expand and restore the Natural Heritage System and the Urban Forest.
2. Expand the Natural Heritage System and Urban Forest by pursuing opportunities through the development application process, in-filling and re-development of public and private lands, and public acquisition.
3. Build on existing, and develop new, public and private sector partnerships to help pursue and implement the vision and targets for the Natural Heritage System and Urban Forest.
4. Undertake regular monitoring of the Natural Heritage System and Urban Forest to evaluate performance and identify trends or changes that may require a shift in management approaches or practices.

Objectives for Public Lands

5. Protect the Natural Heritage System and Urban Forest on public lands through proactive management, enforcement of applicable regulations, and education.
6. Enhance and restore the Natural Heritage System and Urban Forest on public lands by establishing service levels to improve: the condition of natural areas, linkages among protected natural areas, and tree establishment practices.
7. Support the Natural Heritage System and the Urban Forest by managing public open spaces to maximize their ecological functions (while maintaining their existing uses).

Objectives for Private Lands

8. Protect the Natural Heritage System and Urban Forest on private lands through education, implementation of applicable policies and regulations, the development review process and enforcement.
9. Enhance and restore the Natural Heritage System and Urban Forest on private lands by promoting stewardship, naturalization, restoration, tree planting and proactive tree care with creative outreach and incentives.

[34] "Adaptive management" is a systematic process for continually improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for the purpose of learning (United Nations Millennium Ecosystem Assessment, 2005).

7 NATURAL HERITAGE SYSTEM (NHS) AND URBAN FOREST (UF) TARGETS

Indicators and targets are recognized as useful tools in measuring performance in relation to established objectives. The Mississauga *Strategic Plan* (2009) identifies "hectares of natural areas" as an indicator for the natural environment. The *Living Green Master Plan* (LGMP) (2012) builds on this direction and sets out three indicators to measure the City's environmental performance with respect to the Natural Heritage System and the Urban Forest, as follows:

- Indicator 6: Natural area proximity (i.e., to neighbourhoods)
- Indicator 8: Tree canopy intensity (i.e., % tree canopy cover City-wide)
- Indicator 9: Natural Heritage System coverage (% area of Natural Heritage System City-wide)

This Strategy further builds on the direction provided in these two City plans, and in response to this direction, has developed six targets (three for the Natural Heritage System and three for the Urban Forest) to measure progress in over the next 20 years (from 2014 to 2033).

These targets have been developed based on:

- consideration for direction from higher level City studies, as well as guidance from urban forest studies for the City of Mississauga and Region of Peel
- sound understanding of the extent and condition of the current Natural Heritage System and Urban Forest in Mississauga
- the understanding that Mississauga is an urbanized jurisdiction that will continue to experience population growth and intensification over the next 20 years and beyond
- recognition of the many challenges, as well as the opportunities, for sustaining, enhancing and expanding these assets in an urban context
- recognition of the value of the ecosystem services provided by the Natural Heritage System and Urban Forest, and the need to increase the provision of these services to maintain a high quality of life in this city, and
- input from City staff from various departments, the project Core Working Team, and the project steering committee.

All of the key targets established for the Natural Heritage System (NHS) and Urban Forest (UF) through this Strategy (see **Table 2**) are intended to be achieved over the 20 year period of this Strategy (i.e., by 2033). Additional targets related to more comprehensive monitoring of the status of the Natural Heritage System and Urban Forest are provided in the Monitoring Framework found in Appendix A to the UFMP.

Differentiating Natural Heritage System and Urban Forest targets

The City's Natural Heritage System and Urban Forest share the significant wooded natural areas in the city, but for the purposes of target setting need to be viewed distinctly. The City's Natural Heritage System includes all Significant Natural Areas as well as identified Residential Woodlands, Linkages and Special Management Areas. Although many of these areas are wooded, the NHS also includes un-treed features such as open water, marshes, and meadows. Although these areas may undergo some management (e.g., to enhance their ecological functions or to remove potential hazards), they are not maintained as manicured landscapes.

The Urban Forest includes all trees in Mississauga, both inside and outside the NHS. While wooded areas within the NHS should be managed with ecological considerations in mind, as well as considerations for human safety (especially where these features are open to the public). Trees outside of natural areas tend to be managed more intensively as individuals with arboricultural considerations (e.g., structure, condition) in mind.

Consequently, there is some overlap between the Natural Heritage System and Urban Forest area calculations and targets because the NHS area target include all Natural Heritage System components – including those that are wooded - while the Urban Forest canopy cover target includes all wooded areas in the Natural Heritage System plus all the other tree cover in the city (e.g., in manicured parks, yards, school grounds, etc.).

The targets that speak to "quality" are more distinct because the Natural Heritage System "quality" target focuses on the condition and diversity of Natural Areas within the Natural Heritage System (wooded and otherwise), while the Urban Forest "quality" targets focus on the condition and diversity of City street and park trees (outside of the NHS). Trees outside the Natural Heritage System on private lands have been largely excluded from these Urban Forest targets because the City has no way of collecting baseline or subsequent assessment data on these trees.

City-wide tree canopy (LGMP Indicator 8) and proportion of the City within the Natural Heritage System (LGMP Indicator 9) are both indicators for which the City has baseline data, and which can be assessed on a regular basis with the available tools and at a reasonable cost. These indicators have been carried forward to targets #1 and #4 shown in **Table 2**.

Natural Area proximity (LGMP Indicator 6) is more of a challenge to address. Given the benefits of nature in urban areas (see **Section 4**), it would be beneficial if Natural Areas were more accessible to residents in all parts of the City. Unfortunately this has not been a primary planning consideration in the past, and is very difficult to change now that the city is built-out. Although it is possible to re-create some native ecosystems, there are few, if any, opportunities to undertake restorations substantial enough to meet criteria for inclusion in the Natural Heritage System. Therefore no target has been developed for this specific indicator. However, the provision of ecosystem services by the Urban Forest can be more readily extended to all parts of Mississauga through the establishment and growth of large-stature trees, and is included as one of the targets for the Urban Forest (#6 – Urban Forest Canopy Distribution).

The provision of some type of natural elements in green spaces more evenly distributed across the City can be addressed through (a) the naturalization of portions of public parks and open spaces not needed for active uses, and (b) the priority integration of trees, ideally species that can mature to large-canopied specimens, into parts of the City where there are lower levels of canopy and/or relatively few or no public Natural Areas (per Target #6).

7.1 NATURAL HERITAGE TARGETS DISCUSSION

Setting natural heritage targets in urban environments is challenging, and available guidelines for establishing ecologically-based targets (e.g., *How Much Habitat is Enough?* 3rd Edition) are difficult to apply in urban settings, although many of the landscape ecology principles established in the scientific and technical literature are still relevant and can help guide target setting. Furthermore, guidance from the project Steering Committee was that the targets should be achievable but also science-based, and so the targets have been developed, to the extent possible, with ecological considerations in mind as well as the realities of the urbanized context of Mississauga. The timelines set for these targets are within the 20 year framework for this Strategy.

Table 2. Recommended Natural Heritage System (NHS) and Urban Forest (UF) targets for 2033

Target Type	Current Status	Recommended Target
1. NHS Size	9.5% of the City	12% to 14% of the City
2. NHS Connectivity	a. 62% of the watercourses have vegetation for at least 30 m on either side b. 80% of Significant Natural Areas are linked through the NHS and Green System	a. 75% of the watercourses have vegetation for at least 30 m on either side b. 85% of Significant Natural Areas are linked through the NHS or other Green System components
3. NHS Quality	a. Overall terrestrial and aquatic quality across the city is variable among sites sampled b. Conservation Management Plans have been completed for a few Significant Natural Areas	a. Substantially improve overall terrestrial and aquatic quality across the city using 2013 as a baseline b. Conservation Management Plans developed and in effect for all high priority publicly-owned Significant Natural Areas
4. UF Canopy Cover	approximately 15%	15% to 20%
5. UF Quality (of City Street and Park Trees)	a. Current City tree inventory is not up to date, or comprehensive b. Six species account >40% of the City's street and park trees c. Invasive species account for more than 15% of the City's street and park trees	a. The city tree inventory is comprehensive, up to date, and actively maintained b. No tree species represents >5% of the tree population City-wide or >20% on a given street c. Invasive tree species represent less than 8% of the street and park tree population
6. UF Canopy Distribution	Current canopy cover distribution in the city is very uneven (although analyses by land use have yet to be done)	Canopy cover meets or exceeds 15% (the current city-wide average) in at least 95% of the City's residential areas and in 50% to 75% of the city's other land uses use categories

* Data Source: *City of Mississauga Urban Forest Study* (2011) and subsequent analyses by the Peel Urban Forest Working Group.
** Data are collected and analyzed by the conservation authorities.

> ***In terms of urban forests directly, their inadequacy to support the original palette of area-sensitive forest birds, even after on-site mitigation and restoration, does not preclude their importance for other ecological values and functions... Urban forests must be assessed in terms of realistic expectations and ecological goals within the context of urban 'ecosystems'.***
>
> *Area-sensitive Birds in Urban Areas* (Environment Canada 2006)

1. Size of the Natural Heritage System: The long term health of natural areas is dependent on there being sufficient area to support ecological features and functions. The report *How much habitat is enough?* (Environment Canada 2013, 3rd Edition) provides the following guidelines for the area recommended for protection within a watershed: 30% to 50% forest cover, 6% to 10% wetland cover (or at least 40% of the watershed's historic wetland coverage), and at least 75% of the stream length vegetated with riparian vegetation for at least 30 m on each side. The new guidelines also speak to creating and restoring grassland habitats in existing and potential grassland landscapes.

At present, Mississauga's entire Natural Heritage System covers 9.5% of the City (see **Table 1**), with much of it being wooded, including several swamp wetlands. There are also a few patches of meadow habitats. The lower end of the target range (12%) for the City's Natural Heritage System is considered both achievable and sustainable, assuming the applicable recommended strategies are implemented, while the higher end of the range (14%) is considered ambitious for Mississauga, and close to the maximum that could be achieved in the current land use context.

Between 1996 and 2012 the Natural Heritage System had net gains of 49.76 ha (3.1. ha/yr). If all of the 757 ha of potential expansion areas (see table above) were to be added to the City's Natural Heritage System, then the 12% would basically be achieved. Substantially greater net gains of 15.5 ha/yr would be needed over 20 years to achieve 13% cover, while 30.1 ha/yr would be required over the 20 year lifespan of the Strategy to meet the higher end target of 14%.

Even though the potential expansion areas bring the levels of cover very close to 12%, the target range of 12% to 14% is still considered both pragmatic and progressive because of (a) the limited opportunities for further expansion in Mississauga, and (b) the substantial challenges of ensuring even 12% remains protected. Large increases beyond what have been identified through this Strategy are unlikely, but some small net gains over the next two decades are still possible (e.g., annual Natural Areas updates, updates to the Residential Woodlands mapping, naturalization, and other opportunities to be determined such as possible habitat creation projects).

2. Connectivity of the Natural Heritage System: Analyses conducted for this Strategy indicate that 80% of the Significant Natural Areas within the City's Natural Heritage System are already connected to each other. Most of these connections are along major or minor watercourses, or via components of the Natural Heritage and Green Systems.

Although the opportunities to improve the connectivity of Mississauga's Natural Heritage System are very constrained by the built environment, there remain opportunities to enhance and improve it by:

- recognizing that the entire Natural Heritage System as well as of the broader Green System supports natural connectivity (see **Map 2**)
- continuing to work on a site-specific basis to maintain and enhance natural connections through the planning process
- identifying opportunities to naturalize Green System areas outside the Natural Heritage System where there are direct connections between NHS features (see **Map 2**), and
- identifying and implementing opportunities to mitigate the impacts of roads on natural connectivity (e.g., with warning signs, culverts that can accommodate amphibians and small mammals, etc.).

Mississauga's watercourses represent a significant component of the Natural Heritage System and are especially critical to providing ecological connections within the City. Because of this a separate target is proposed that is directed at maximizing the length of watercourses with riparian vegetation with the intent of improving linkage, and other, functions. Riparian vegetation provides many ecological benefits including cooling and food sources for aquatic habitats, bank stabilization, facilitating movement of plants and wildlife along the stream corridor, and moderating water flows during light to moderate storm events.

According to CVC, in Mississauga at present 76% of the watercourses have some type of riparian vegetation along their edges, and 62% of the watercourses have at least 30 m of riparian vegetation on either side. Therefore, achieving 30 m vegetation zones along 75% of watercourses within this Strategy's timeframe is feasible, even taking account that a number of reaches are within engineered structures. Achieving these targets will require continued work with the conservation authorities as well as City staff in Transportation and Works to identify appropriate opportunities for revegetation that will not interfere with flood prevention measures[35].

Notably, this target includes non-native tree species (e.g., Manitoba maple, several willow species, etc.) that are known to grow in these types of sites in recognition that they also provide many riparian functions.

Outside the riparian areas of watercourses, ecological linkages among natural areas – whether they be landscape, linear or "stepping stone" linkages (as illustrated in **Figure 2**) - are also important to meet the daily, seasonal and long-term movement requirements of many species. For many species, inhospitable habitat and physical barriers such as roads and fences pose formidable barriers to movement. However, with a few exceptions, most of the wildlife that currently occurs in the City is tolerant of urban conditions, and although linkages in urban areas will be less than ideal, urban-adapted wildlife will utilize a variety of linear features and areas. Thus linkages in the urban environment include the grass strips along highways and railways, hydro and other utility corridors, and engineered drainage-ways. They also include other open spaces such as parks, cemeteries and golf courses.

What about grasslands in Mississauga?

There are three principal habitat types in Ontario: woodlands (or forests), wetlands and grasslands (meadows). The natural heritage value of woodlands and wetlands is well-recognized in Provincial policy documents, and therefore these features – where considered significant - are generally protected at the municipal level. However, grasslands, for various reasons, do not have such status and therefore are not well protected (unless they provide habitat for a Species at Risk, or are confirmed as one of the very rare native grassland habitat types (prairies or savannahs) that once occurred sporadically across southern Ontario). Nonetheless, grasslands are ecologically important; providing habitat for a range of species that contribute to biological diversity, provide pollination services, and are food for many other species. Therefore natural heritage protection must include the protection, maintenance and restoration of grassland habitats in the city.

In 2012 the City undertook its first prescribed burn in Jack Darling Prairie to mimic the natural fires that once sustained this habitat type. Other opportunities for establishment and maintenance of un-treed habitats include hydro corridors where vegetation must, for safety reasons, be kept from growing above certain heights. Many of these will be pursued through this Strategy.

[35] It is recognized that in the built environment, watercourses, out of practical necessity, need to convey water efficiently, especially during major precipitation events and/or snowmelt. Riparian vegetation, and particularly accumulation of woody debris in stream "pinch points" can inhibit peak flows and create flooding damage. These factors will need to be taken into consideration when addressing initiatives directed at this target.

3. Quality of the Natural Heritage System: Within urban areas the two factors that most impair the quality of natural areas are infestations of invasive species and uses that are either excessive or inappropriate (e.g., use of dirt bikes), although these areas are also impacted by a host of other urban-related and climate change stressors.

Both CVC and TRCA have programs to collect and assess data from representative aquatic and terrestrial sites across the city. These programs measure the status of key parameters (e.g., fish and benthic populations, extent of riparian vegetation, bird species composition, plant species composition, vegetative structure) that provide useful indicators of the status of various natural areas and systems. These data are then assessed and summarized in monitoring reports or bulletins that can be used by the City to measure changes in the quality of its natural areas. The conservation authorities have indicated their willingness to share this information with the City.

Although not all sources of impact can be readily addressed, major invasive plant species infestations and management of human-use are two important sources of impacts that can be readily addressed through management. Therefore it is recommended that Conservation Management Plans [36] (Strategy 13) be developed for most or all publicly-owned Significant Natural Areas in the city.

The *Future Directions: Parks and Natural Areas Master Plan* (2009) report contains a similar recommendation (#53) and notes that since many Natural Areas are also woodlands, management plans need to address woodland-specific issues. It is stressed that to be achievable, these plans should be concise documents that focus on priority operational requirements, and build on the site-specific data already collected as part of the Natural Areas Surveys and ongoing monitoring studies and reports being undertaken by CVC in a number of these areas.

[36] Note that these are also referred to as "Conservation Plans" in the 1995 NAS and 2009 Future Directions reports.

7.2 URBAN FOREST TARGETS DISCUSSION

Like the Natural Heritage System targets, the Urban Forest targets presented in **Table 2** are considered achievable within the established 20 year timeframe for this Strategy, barring unforeseen circumstances and assuming the full range of Urban Forest-related Strategies in **Section 8** (and supporting Actions recommended through the UFMP) are implemented.

4. Urban Forest Canopy Cover: The most common measure associated with the Urban Forest is canopy cover. This measure is useful for illustrating changes in the extent and distribution of mature tree cover in a given area, but provides a more complete picture when considered in combination with data on the composition, structure and health of the Urban Forest.

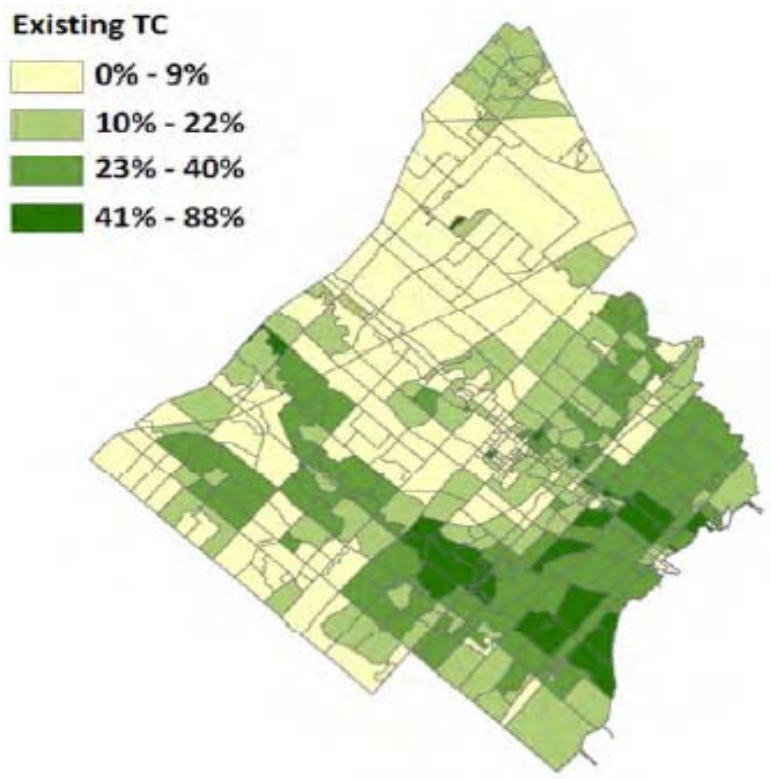


Figure 14. Existing tree canopy cover by small geographic units in Mississauga
(City of Mississauga Urban Forest Study 2011)

Work completed by the Peel Region Urban Forest Working Group using 2011 aerial imagery and GIS-based analyses confirms that Mississauga's canopy cover is about 15%, and his highly variable in different portions of the city (as illustrated in **Figure 14**).

American Forests[37] have suggested that a canopy cover target of 40% is optimal for sustainability, however this target is difficult to achieve in many urban jurisdictions, and requires ingenuity and resources to overcome the challenges that all urban sectors face, such as competing goals for limited space. Consequently, some municipalities in southern Ontario have either decided to set targets that are more realistic in relation to what they have, and what they could have, or not to set canopy cover targets at all.

In reality, increasing canopy cover in an urban area is more challenging than might be expected. For example, analyses done for the *Town of Oakville's Urban Forest Management Plan* (2008) estimated that increasing tree planting efforts by 10% per year would increase canopy cover from 29.1% to 29.6% over a period of about 30 years, assuming relatively low mortality rates. Real considerations and challenges to increasing canopy cover include: natural tree mortality; loss of trees to pests, diseases and storm events; climate change stressors; the need to accommodate ongoing development, and associated servicing; and realities that limit the amount of resources that can be directed to urban forest activities.

As a result of these considerations, and taking into account available canopy cover data, as well as for Mississauga's current and anticipated land use context over the next 20 years, a city-wide canopy cover target of 15% to 20% has been recommended for the next 20 years (to 2033). A higher, more optimal, target should be considered for the following 20 year period.

It is also important to understand that canopy cover estimates have different levels of accuracy depending on the methods and tools used. Therefore, estimates of canopy cover should be understood to truly be estimates, and comparisons between municipalities should not necessarily be viewed as "apple for apple" comparisons.

[37] American Forests is a non-profit conservation organization and advocacy group committed to protecting and restoring forests in the United States.

Why is Mississauga's Canopy Cover Target only 15% to 20%?

A conservative canopy cover target of 15% to 20% for 2033 has been identified to reflect the fact that it will be a significant challenge just to maintain the existing canopy cover over the next 20 years. The City and its partners are already working to sustain and expand canopy cover through various initiatives (described in the UFMP). However, even with these efforts, a target of 15% to 20% is considered realistic for the following reasons:

- **Emerald ash borer**, a pest that kills almost all ash trees, is established in Mississauga and will peak over the next few years resulting in the loss of most of the City's ash (more than 10% of the city's canopy cover).
- Many **lands in the City are already zoned for uses that permit some type of development**. Although the City works with proponents to avoid and minimize the removal of trees, and replace them on-site were possible, some trees are typically removed as part of this process.
- The City is responsible for ensuring that existing and approved development has adequate servicing (e.g., roads, water mains, etc.). The **improvement or expansion of existing services**, or installation of new services, can also result in the removal of trees, although the City tries to ensure these are replaced on-site to the extent possible.
- Trees are removed for **human safety reasons** as they decline as part of their natural life cycle or become hazards due to severe damage inflicted by storm events, pest infestations, or human activities. This results in the removal of 1500 to 2000 trees annually.
- The **majority of the City's trees are relatively small** (e.g., 15 cm diameter or less) and will not begin to start contributing substantially to canopy cover for at least 10 to 20 years.
- Although urban forestry practices have improved immensely over the past decade or so, in **the past, many trees were planted in sub-optimal conditions**. As a result, some of these trees will need to be removed and replaced, and in improved growing conditions, before they can contribute significantly to the City's future Urban Forest canopy.
- Most trees planted over the next 20 years will not begin to significantly contribute to canopy cover until the following 20 year period.
- **Trees that are planted, even in good soils with ample below and above ground space, can perish if not adequately maintained**, especially if they are exposed to extended periods of droughts. This will continue to be a challenge for the City, and all those planting trees in the city, under the new reality of climate change.

5. Urban Forest Quality (of Street and Park Trees): The City currently has an inventory of its street trees that is useful, but not completely up to date, and excludes most park trees. Tree health and safety can only be optimized if inventories of these assets are current, and if appropriate management is undertaken proactively. Therefore, having a current street and park tree inventory that is tied into a well-managed maintenance program is one of the best, and most cost-effective ways, way to ensure the City's trees are kept in a healthy condition for as long as possible.

Currently, diversity estimates by leaf area show that sugar maple comprises 12% of the Urban Forest population, Norway maple 8%, green ash 8%, and Manitoba maple and white ash each about 7%. This relatively low species diversity increases vulnerability of the Urban Forest to pests or diseases, such as emerald ash borer. Improving tree species diversity will improve the Urban Forest's resilience to a wide range of stressors. The targets set out in **Table 2** are drawn from the urban forestry literature[38] and should be achievable in most settings if the full range of non-invasive tree species suited to Mississauga's climate and growing conditions are considered. While species native to eastern North America are generally preferred, in some locations other non-invasive species may be more suitable.

An important aspect of tree species diversity is the proportion of highly invasive tree species, which is currently estimated at more than 15% of the City's street and park trees. Invasive tree species like Norway maple have been planted in Mississauga, and elsewhere, for many years because they are relatively tolerant to many of the stressors associated with street tree life. However, as discussed throughout this Strategy, the street trees do not exist in isolation from the natural areas, and the abundant seeds from these trees spread to places where they out-compete the native vegetation and disrupt ecosystem processes. Many "weedy" tree species are also more prone to structural problems as they mature, resulting in increased risk and maintenance costs.

Despite these issues, invasive trees still provide important ecosystem services (e.g., air pollution removal, shade), and so the recommended approach is one of gradual replacement of City street and park trees with non-invasive species as trees are removed as part of planning or maintenance. This work will primarily be undertaken by City staff, who will also assess change through the City's tree inventory. A reduction in the proportion of invasive street and park trees of 7% over 20 years is considered feasible.

6. Urban Forest Canopy Cover Distribution: Currently the canopy cover distribution in Mississauga is very uneven (see **Figure 15**). For example, sub-watersheds in the western part of the city and along the lakeshore have average canopy covers ranging between 15% and 58%, while those in the eastern part of the city and away from the lakeshore, have canopy covers ranging between 1% and 14%. Some of this unevenness is a result of the history of development in Mississauga (e.g., older residential neighbourhoods, particularly those with large lots, tend to have higher canopy coverage than newer neighbourhoods with smaller lots) and some of it reflects constraints outside the City's control (e.g., extensive tree cover is not permitted within the Pearson airport lands due to safety reasons).

None-the-less, having a more evenly distributed canopy across the city, and particularly across all residential areas, was recognized as an important objective warranting a target. After much discussion, land use types were identified as the best measure for assessing relative cover in different parts of the City. This assessment will ultimately be done by City staff.

In 2014 the Region of Peel will be launching a unique tree planting prioritization study that incorporates a range of environmental, human health and social considerations, including receipt of fewer ecosystem services because of lower levels of canopy in a given area. This study, to be undertaken in partnership with the City of Mississauga, other area municipalities, and the local conservation authorities, will be an excellent opportunity to develop a transparent, practical and progressive framework identifying tree planting priorities within the City.

The *City of Mississauga Urban Forest Study* (2011) identified uneven canopy cover distribution as an issue, and developed a preliminary Priority Planting Index for the City (as shown in **Figure 14**) based primarily on consideration for areas of low canopy cover and higher population densities. Preliminary priorities for tree planting are circled in red. This is an example of the kind of information that will be considered, in conjunction with other data and input from City staff and key stakeholders, to develop and implement Urban Forest expansion (per Strategy #13) in a way that improves the overall distribution of canopy cover and targets areas where it provides the most benefits.

[38] F. S. Santamour. 1983. Woody plant succession in the urban forest: filling cracks and crevices. Journal of Arboriculture 9: 267-270.

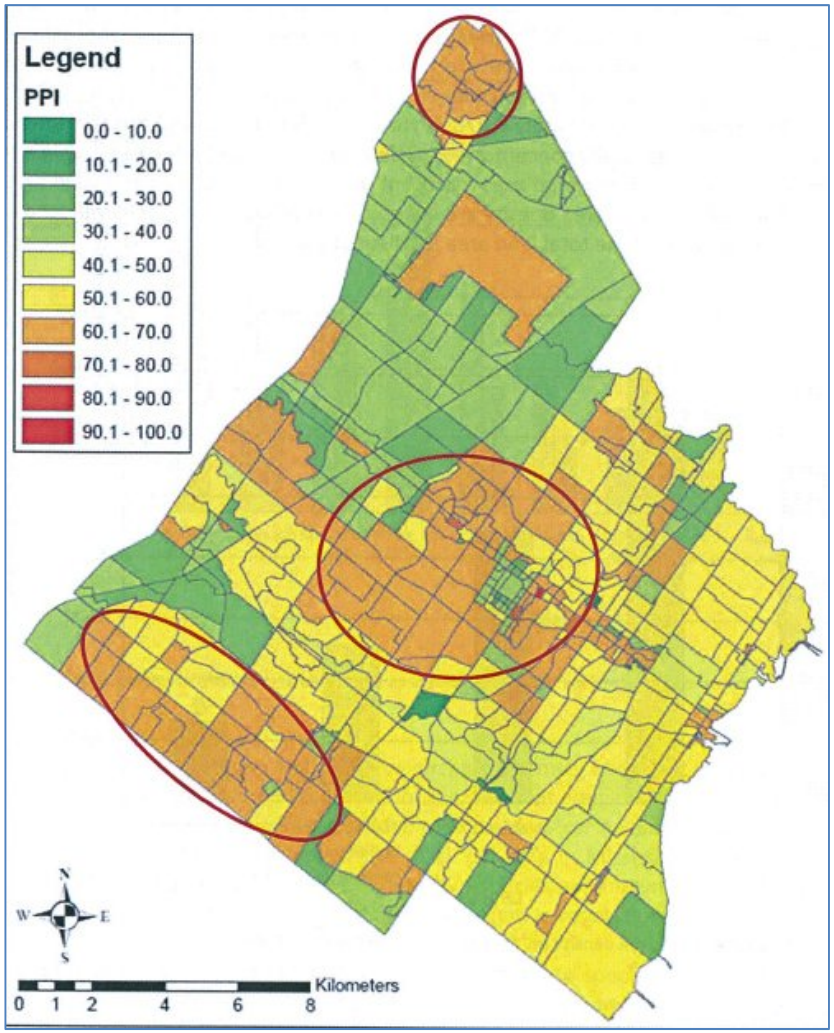


Figure 15. Conceptual Priority Planting Index mapping developed by the Peel Urban Forest Working Group (from City of Mississauga Urban Forest Study, 2011)

7.3 BEYOND TARGETS: LOOKING AT THE BIGGER PICTURE

The Natural Heritage System and Urban Forest targets (as set out in **Table 2**) provide one way to measure the success of this Strategy, but they do not provide a comprehensive picture of how the City is progressing in terms of its overall management of natural heritage and urban forest resources, or the extent to which the community and stakeholders have become more fully engaged in caring for these assets throughout the city.

As described in Strategy #26, the recommended review and monitoring for Mississauga's Natural Heritage System and Urban Forest includes two components:

1. a review and update of a "made for Mississauga" criteria and indicators based monitoring framework, and
2. a review of the status, timing and anticipated budgetary requirements of each Strategy in this NH&UFS (and the supporting UFMP Actions).

The recommended criteria and indicators framework[39] provides for a more comprehensive evaluation of: (1) the state of the Natural Heritage System and Urban Forest, (2) the state of municipal planning and management (including operations), and (3) the level of community engagement partnerships as they relate to the Natural Heritage System and Urban Forest.

This monitoring framework is provided in Appendix A of the UFMP.

[39] Based on a model developed by Kenney, W.A., van Wassenaer, P.J. and A. Satel. 2011. Criteria and Indicators for Strategic Urban Forest Planning and Management. Arboriculture & Urban Forestry, Volume 37, Number 3 April 2011 pp 108-117.

8 BIG PICTURE CHALLENGES AND OPPORTUNITIES

The development and implementation of this NH&UFS in Mississauga is a timely response to a range of challenges facing the City's Natural Heritage System and Urban Forest. While redevelopment and intensification place increasing pressures on existing trees and natural areas, challenges such as climate change-induced drought stress and invasive pests and pathogens will place increasing pressures on natural systems and features. These challenges are compounded by the increasing disconnectedness between people and green spaces.

> In a recent survey of Canadian households, 83% of respondents considered access to green spaces a human right, and many acknowledged access to green spaces improves their work performance and reduces stress, and yet 34% to 46% of respondents reported they had only visited a park or forest once in the previous three months, and 22% reported they had never visited a forest.
>
> *Husqvarna's 2013 Global Green Spaces Report*

Ironically, as these challenges mount, the benefits provided by each urban tree and natural area will become increasingly valuable for the wide range of ecosystem services they provide (see **Section 4**).

Key challenges faced by Mississauga's Natural Heritage System and Urban Forest include:

- instilling a new mind-set of the "total landscape as a life-support system"
- trying to maintain and enhance ecological connectivity in a built-up landscape
- reconciling natural heritage and urban forest objectives with the need to accommodate continued growth
- building resilience to climate change and related stressors in a context of uncertainty
- getting the entire community to become more fully engaged in caring for the Natural Heritage System, Urban Forest and other green spaces and green infrastructure around them
- building on and expanding partnerships with all levels of government to increase levels of support and facilitate implementation of various Strategies, and
- the need for sustained management commitments.

These challenges, and opportunities related to them, are discussed in the following sections. As Mississauga shifts into a period of intensification and infill unless these challenges, and related opportunities, are actively addressed and pursued, the city risks irretrievably degrading and/or losing portions of the valuable Natural Heritage System and Urban Forest which remain.

8.1 INSTILLING A NEW MIND-SET: THE TOTAL LANDSCAPE AS A LIFE-SUPPORT SYSTEM

Humans, by nature, like to compartmentalize. Working across disciplines and taking a holistic, systems-based approach does not come naturally to most people, or to organizations. However, nature is inextricably interconnected and requires cross-disciplinary and cross-departmental thinking.

A principal theme that has emerged from consultations for this Strategy is the need to protect and manage Natural Heritage System and Urban Forest assets in a city-wide landscape context. Natural areas and trees need to be seen as part of the entire city landscape, and be recognized as having relationships with other components of the Green System (see **Figure 1**).

Many aspects of city planning and management affect the Natural Heritage System and the Urban Forest, as do the activities of residents and the numerous other private and public landowners across the city. The design and location of roads (e.g., provision of underpasses or traffic calming at key locations) and neighbourhoods, as well as commercial and industrial areas, all present opportunities to integrate natural spaces and trees into the urban setting if these elements are given due consideration. In some cases, wildlife, (occasionally even rare wildlife), have adapted to make elements of the city's grey infrastructure their home (e.g., Chimney Swifts, who as their name suggests nest in abandoned chimneys, and Barn Swallows, who – not surprisingly – frequently nest in out-buildings).

Protecting and enhancing the City's Natural Heritage System and Urban Forest is key to having a healthy ecosystem and a healthy community. Examples of opportunities include[40]:

- naturalization of storm water management facilities and portions of open spaces not needed for active use
- encouraging (and where possible requiring) at-source control of storm water run-off and providing enhanced on-site infiltration
- integrating treed and/or vegetated landscapes in parking lots, sidewalks, or boulevards with continuous trenches that provide for adequate soil volumes and moisture to promote healthy tree growth
- integrating green roofs and use of bird friendly building designs[41], and
- improving riparian habitat (where it does not conflict with conveyance of storm flows) associated with watercourses and wetlands.

Recent research on ecosystem services in southern Ontario valued:

- **forests in urban areas at $25,843/ha ($10,458/acre) while forests in rural areas were valued at $4,443/ha ($1,798/acre), and**
- **wetlands in urban areas at $161,420/ha ($65,324/acre) while wetlands in rural areas were valued at $15,171/ha ($6,140/acre),**

reflecting the greater value attributed to natural areas in urban centres simply because more people live there.

Troy, A. and K. Bagstad. 2009. *Estimation of Ecosystem Service Values for Southern Ontario*. Prepared for the OMNR

[40] Notably the City already considers many of these measures in planning and design, but does not necessarily require them.

[41] These measures are already being considered as part of the City's Green Development Strategy which has been underway since 2009.

A good example of how the City is trying to shift in this direction is approval, in principle, for City staff to shift the funding of the City's storm water program from property taxes to a dedicated storm water rate that will be related to the area of impermeable surface on properties to encourage land owners to reduce their impermeable surface area and implement measures to better manage storm water runoff.

Embracing this new mind-set will require a higher priority be given to addressing environmental issues in order to deliver a high level of community services and achieve sustainable growth and economic prosperity.

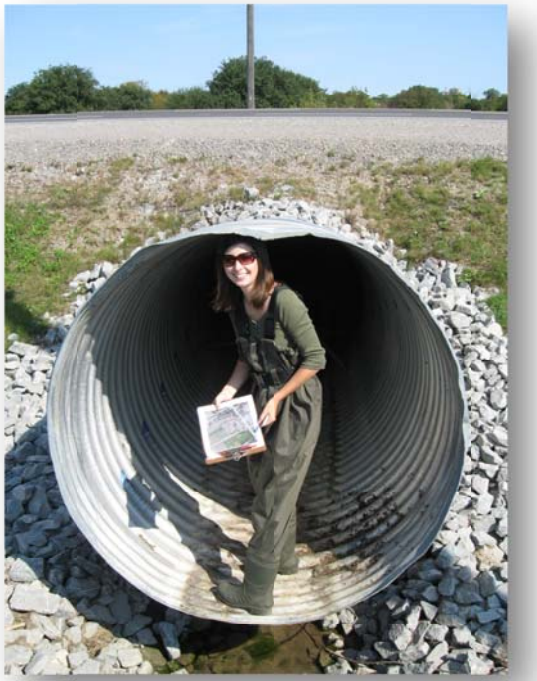
8.2 IMPROVING NATURAL HERITAGE SYSTEM CONNECTIVITY

Providing connections among natural areas within the city, and beyond to natural areas in adjacent municipalities, is one of the biggest challenges for improving natural heritage in built-up, urban landscapes.

Mississauga has been urbanizing for over 50 years, and prior to that was largely cleared for agriculture. As a result, wildlife that requires undisturbed natural habitat disappeared from the city long ago. With a few exceptions (e.g., Jefferson salamander and several frog species), the wildlife that currently resides in the city is adapted to, or tolerant of urban conditions. White-tailed deer and other urban-adapted wildlife (which principally reside in the city's valleys), will utilize narrow, urban green corridors to access feeding areas (often residential gardens) on the adjacent tableland. Other mid-sized mammals such as racoons, skunks, opossum and coyote are also well-adapted to urban landscapes. Although birds are not hindered by the same barriers, they may still need to access habitat patches that are not too distant from each other (i.e., stepping stones linkages) for feeding and dispersal, especially during migration when resting and feeding is critical. Although most fish species can move up and down watercourses, in-stream barriers (e.g., raised culverts, weirs, dams, etc.) or reaches of inhospitable habitat (e.g., open concrete channels) inhibit movement. Urban infrastructure thus poses significant barriers to many species of wildlife that inhabit the city.

In general, the more connections that can be made ecologically functional, the more species can be maintained in the city, thus responding to the principle of "maximizing biodiversity". However, given Mississauga's urban form, it is unrealistic to pursue the establishment of new connections that are truly ecological and meet the requirements of all plants and wildlife. Some of the city's primary linkages (e.g., along the major river corridors) (see **Map 1**) support a relatively high level of ecological function, but most other linkages in the city, while adequate for urban wildlife, are not ideal from an ecological perspective.

Outside the Natural Heritage System, the City's existing Green System provides more widespread connections (see **Map 2**). Although acknowledged in some policies and language in the City's Official Plan (2011), this function needs to be more formally recognized and enhanced, while still recognizing that there are existing uses (active sports fields, cemeteries, manicured picnic areas, botanical gardens, school play areas, etc.) all of which need to be maintained as part of the City's responsibility to service delivery. Enhancement of linkage function through naturalization and/or tree planting (which generally also enhances other ecological functions) should occur where it is appropriate and does not compromise the primary function of the various types of uses in the Green System. Other opportunities include the consideration of eco-passages, and specifically the integration of passages such as culverts beneath roads, to facilitate amphibian and/or small movement where warranted.



Beyond the City boundaries, there are existing and potential natural heritage connections in all directions to consider: to the north there are connections along the Credit River and Etobicoke Creek watersheds into Brampton; to the east the Mimico Creek watershed runs from Brampton, through Mississauga, to the lakeshore in Toronto; to the south the Lake Ontario shoreline provides a riparian linkage between Toronto and Oakville; and to the west the Joshua

Creek and Sixteen Mile Creek watersheds extends into Oakville and Milton respectively. Further north, in Caledon and northern Brampton, is the Greenbelt Plan area (that includes portions of the Niagara Escarpment and the Oak Ridges Moraine).

Recognition of these connections that are external, but close, to Mississauga are key to supporting the health and resilience of both the Natural Heritage System and the Urban Forest in the city, as these systems, and the threats to them, do not recognize political boundaries and must be managed in a coordinated way to be effective.

8.3 BALANCING NATURAL HERITAGE AND URBAN FOREST OBJECTIVES WITH URBANIZATION, INFILL AND INTENSIFICATION

Mississauga's population is forecast to grow substantially over the next 20 to 40 years, as are the populations of adjacent municipalities. New residents bring diversity, ideas and opportunities to the city, but also put more demand on existing green and grey infrastructure. Intensification and redevelopment will make preservation of existing trees and natural areas (including wetlands), and integration of new green spaces into developed landscapes more challenging and more important.

Mississauga has been fairly proactive in the identification of its natural heritage, largely through the creation and implementation of its Natural Areas System in 1996, as well as through the implementation of programs to acquire, restore, enhance and manage those features. Over the past decade it has also been building its urban forestry program. However, as in any urban centre, resources for natural heritage assets must be shared with other priorities.

Although there are currently substantial policy and programming commitments to maintain the City's Natural Heritage System and Urban Forest, a greater level of commitment from the City, and from the community and other stakeholders in Mississauga, will be required that includes:

- a more integrated and coordinated approach to growth management that considers the city's green infrastructure to be as valuable as its grey infrastructure, and looks for opportunities to maximize green infrastructure in all projects
- a willingness to engage the full range of stakeholders more actively, including activities such as encouraging residential, commercial and industrial land owners to naturalize part or all of their properties (where appropriate), and
- sustained resource allocations to support these initiatives, and more proactive management of the City's "green" assets.

The City is at a critical juncture in its growth where, unless the planning, management and engagement for Natural Heritage System and the Urban Forest assets is fully recognized as a top priority, the quality of life in the city will be adversely affected as a result of the gradual loss of the valuable ecosystem services provided by these assets to the community.

8.4 BUILDING RESILIENCE TO CLIMATE CHANGE AND OTHER STRESSORS

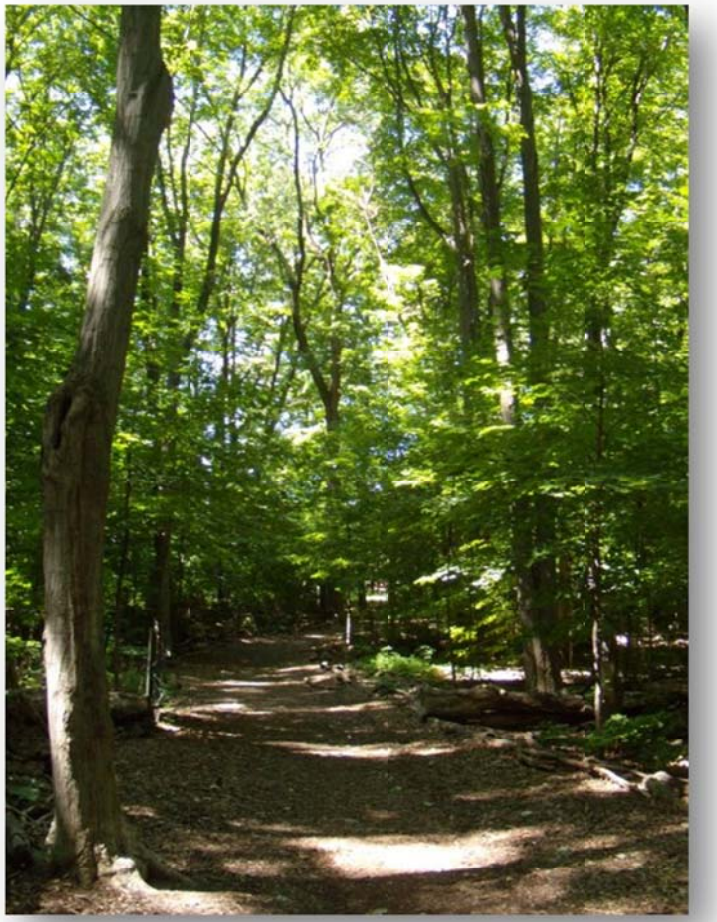
Climate change is documented as having measurable impacts in Peel Region (*Peel Climate Change Strategy* 2011), elsewhere in Ontario, and around the world. Although there is uncertainty around how exactly climate change will impact the environment, there is a high level of scientific certainty that in southern Ontario there will be warmer winters, hotter summers, and more frequent intense rain (or snow) events.

There is also uncertainty about the cumulative impact these changes will have on populations of plants and wildlife, and ecosystems, and how these changes will in turn affect people. Anticipated impacts include: changes in distribution or extinction of some species, more opportunities for species (particularly those adapted to slightly warmer climates) – including pests and pathogens that have to date remained "south of the border", and stress associated with increasing periods of drought combined with periods of sudden, intense storms[42]. In urbanized communities such as Mississauga, these effects are likely to be compounded by the extent of paved and unvegetated surfaces.

However, this challenge presents an opportunity to embrace proactive natural heritage and urban forest management approaches, which can make the city more resilient to climate change[43]. Strategies to manage the effects of climate change on the Natural Heritage System and Urban Forest are closely aligned with many of the strategies identified in this document (**Section 9**). Prime examples include:

- planting a greater diversity of plant species native to eastern North America, including those considered better adapted to warmer and drier conditions (e.g., Carolinian zone species)
- protecting and enhancing natural area connectivity to facilitate native species movement and adaptation
- minimizing further expansion of non-climate stressors such as invasive plant species, or pests and diseases, and
- introducing more shade (e.g,. from large-canopied trees), particularly into public spaces and areas dominated by paved surfaces, where the urban heat island effect is felt most intensely during the summer months.

Expanding the Urban Forest in urban "hot spots" will not only provide cooling and shade for people, and increase the longevity of the paved surfaces beneath it, but will also create an environment that is more conducive to growing trees, creating a positive feedback loop.



[42] Current information and direction is available in *Climate Ready: Ontario's Adaptation Strategy and Action Plan 2011-2014* and on the Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) website at http://www.climateontario.ca/

[43] The *Peel Climate Change Strategy* (2011) includes an action that specifically identifies "implementing best practices related to urban forestry" as a proactive adaptation action.

8.5 SHARING THE RESPONSIBILITY

The City of Mississauga, as described above, has been fairly proactive in identifying and working towards effective management of its natural assets. However, the extent of the City's ability to plan for and manage the natural assets within its boundaries is limited by a number of factors, not the least of which is available resources and the extent of its jurisdictional powers.

Externally, federal and provincial support for municipal natural heritage and urban forest research and management is very limited (particularly when compared to the United States, or some European countries). This puts a disproportionate burden on municipalities to invest in their green infrastructure, even though the benefits of these investments can extend well beyond local boundaries. As has already been recognized in Goal 5 of the *Peel Region Urban Forest Strategy* (2011), there is an urgent need for formal support, both in terms of policy and resources, from upper tiers of government for sustainable management of green infrastructure. .

Internally, much of the Natural Heritage System and Urban Forest in Mississauga is found on residential, commercial, industrial and institutional lands where the City has limited control outside of the development approval process. The *City of Mississauga Urban Forest Study* (2011) confirmed that the greatest opportunities for expanding the city's canopy cover are found within the residential areas. Therefore, in order to be effective and to meet the city-wide targets established for this Strategy (see **Section 7**), management and stewardship of the natural environment must be a shared responsibility.

Although a number of community groups have, and continue to, participate in and contribute substantially towards various stewardship initiatives, broader involvement and commitment will be required. To support this shift, the City can allocate additional resources to:

- promote the ideas in this Strategy using a variety of tools and resources
- provide wider support for community groups to direct their efforts and help ensure they are successful and directed at priority initiatives, and
- build more partnerships to leverage resources and funds external to the City.

Further direction in this regard is provided in the engagement strategies in **Section 9.3**.

8.6 ACCEPTING THE NEED FOR SUSTAINED MANAGEMENT

In an urban setting, natural assets require ongoing management to (a) fulfill a number of the natural functions that are undermined, and (b) minimize and mitigate the various impacts and stressors natural assets are subject.

Management of City-owned natural areas, including wetlands and woodlands, ideally includes invasive species management, management of appropriate access and use, hazard tree management, and ongoing re-evaluation to ensure that activities completed and measures put in place have been effective, and that no new issues have arisen. In addition, resources are required to undertake or oversee enhancement and/or restoration works, even if much of the labour is provided at no cost by volunteers.

For trees outside of natural areas, there are a wide range of urban forest-related activities that require attention if the asset is to be managed optimally. Basic activities on City lands include routine tree maintenance (e.g., pruning and inspection), tree establishment (e.g., planting and post-planting care), risk assessment, and invasive pest species monitoring and management.

Resources are also required to ensure natural asset policies and guidelines are implemented through the planning process (e.g., plan review and site inspection prior to, during and following construction) and that the City's natural asset related by-laws are administered and enforced.

Therefore, it is critical that senior City staff, Council and the public understand that an ongoing and substantial commitment of staffing and resources is required to sustain, and particularly to enhance and expand, the Natural Heritage System and Urban Forest in the city.

9 STRATEGIES FOR MEETING NATURAL HERITAGE AND URBAN FOREST OBJECTIVES AND TARGETS

One of the most effective ways to address the challenges of sustaining natural features and functions in an urban setting is through strategic initiatives based on accurate information, appropriate best practices, and a collaborative approach that engages the community, key stakeholders and the municipality, all with the support of higher levels of government (i.e., the Region, the Province and the Federal government).

Sustaining Mississauga's Natural Heritage System and Urban Forest will require:

1. PLANNING - effective and creative planning that places a priority on the protection of significant natural heritage and trees in the city, and that recognizes the need for pursuing enhancement, restoration and expansion;
2. PROTECTION and MANAGEMENT - ongoing management of Natural Areas and the Urban Forest, and enforcement of applicable by-laws and legislation, to ensure these entities are maintained to be healthy, diverse and (where publicly accessible) safe;
3. ENGAGEMENT and PARTNERSHIPS - the active support and engagement of the City, public and private sector stakeholders, and the community-at-large, as well as the support of higher levels of government; and
4. TRACKING - tracking of key metrics and variables to see where progress is being made, and where adaptive management may be required.

A total of 26 Strategies addressing these key topics are provided in **Sections 9.1 through 9.4**. Each strategy provides information on the following subcomponents as it relates to that Strategy:

- Strategy number and Title
- Implementation Guidance
- Current Practices
- Best Practices
- Rationale

Where more implementation guidance is provided in the Urban Forest Management Plan (UFMP) to support these strategies, the reader is directed to the relevant Action(s) in the UFMP, which is a separate, stand-alone document.

9.1 PLANNING FOR THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

STRATEGY #1: Improve inter-departmental coordination and information sharing on natural heritage and urban forest issues

Implementation Guidance:

- Hold workshops for departmental Directors and Managers (to discuss how they can help support the objectives of this Strategy)
- Directors and Managers representing all City departments should:
  - keep the NH&UFS as an item on their joint meeting agendas after completion of the Strategy
  - facilitate the implementation of Strategies related to their department, and
  - monitor the status of the implementation of Strategies related to their department

- Hold workshops and/or 'lunch and learns' and/or nature walks for City staff at all levels to inform and engage them on various aspects of the NH&UFS
- Increase collaboration between the Environment Section and Parks and Forestry Division regarding outreach, education and environmental programs that relate to both groups
- Formalize involvement of Forestry staff in the early stages of all development projects where existing trees and/or opportunities for tree planting and/or naturalization exist (see UFMP Action #3 for implementation guidance)
- Provide internal training of key City staff on topics as they are identified, which to date include:
    - Compliance with Ontario's *Endangered Species Act* (2007) on both public and private projects
    - The application of the *Migratory Birds Convention Act* where it relates to timing restrictions for tree removals
    - Best practices for avoiding and minimizing the spread of invasive species when working within or adjacent to natural areas
    - Species selection and soil volume / quality requirements for tree establishment (e.g., training on the Tree Preservation and Planting Manual recommended under Strategy #15)
- Establish a NH&UFS Working Group composed of appropriate City staff (or use the existing Environmental Network Team) to meet several times per year to evaluate how NH&UFS implementation is moving forward, identify shifts in approaches (if required) and compile information related to the four-year updates (see Strategy #26).

Current Practices: Directors and managers representing the City departments of Community Services, Planning and Building, and Transportation and Works currently meet monthly to keep each other informed about strategic directions and initiatives being undertaken, and to facilitate inter-departmental coordination. Additional information sharing among sections within departments, and among departments, occurs on an informal basis.

Best Practices: Each municipality has a unique organizational structure, and employs different mechanisms to try and ensure inter-departmental coordination on various issues - there are no "one size fits all" solutions. However, in any municipality, natural heritage and urban forest assets occur throughout the jurisdiction, and are potentially impacted by the activities of many departments. Therefore if these assets are to be protected / enhanced / restored / expanded, they need to be considered with a multi-departmental and coordinated approach.

Rationale: In Mississauga, where the land use context is an almost entirely built out municipality where future development will be primarily infill and intensification in nodes and corridors, support for natural heritage and urban forest principles and objectives, along with coordination and creative multi-disciplinary problem solving, will be required to ensure that these critical assets are sustained, enhanced and, where possible, expanded. A coordinated inter-departmental approach will also support a shift towards a "total landscape" approach (as described in **Section 8.1**) among City staff.

STRATEGY #2: Revise the City's Green System policy framework to clarify Natural Heritage System components and include the Urban Forest

Implementation Guidance:

- Rename the "Natural Areas System" to the "Natural Heritage System"[44]
- Create a consolidated category for all natural heritage features afforded the highest level of protection called "Significant Natural Areas" and retain the existing category of "Natural Green Spaces" for features or areas where a more flexible approach is warranted in
- Revise the City's Official Plan Green System framework to reflect the policy changes above (as illustrated in **Figure 16**)[45] and:
    - Add a category for the Urban Forest, with applicable sub-categories, to illustrate its inclusion in this framework
    - Show "Residential Woodlands" as being within both the Natural Heritage System and Urban Forest categories, and continue to map them as part of the Natural Heritage System
    - Distinguish between Green System components that are mapped in the Official Plan Schedules and those that are part of the system but not readily mapped

[44] Note that the shift in nomenclature from "Natural Areas System" to "Natural Heritage System" was approved by the Steering Committee and Core Working Team for this project, and has therefore been adopted for use in this Strategy and will be formalized once the Strategy is adopted by Council.

[45] Note this revised framework *may* be incorporated into the Official Plan along with the conceptual Venn diagram provided in **Figure 1** for context.

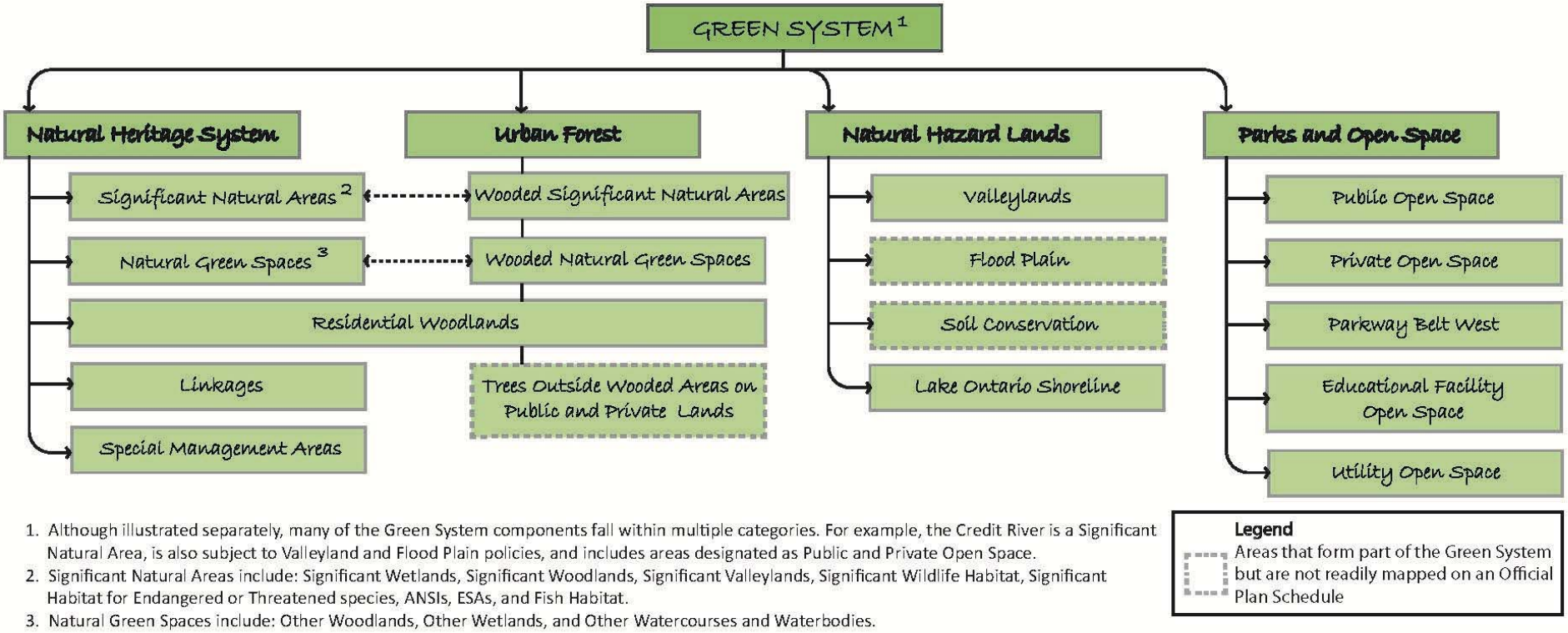


Figure 16. The proposed Green System policy Framework (refer to the current framework provided in **Figure 13**)

- Identify opportunities for policy linkages between aquatic natural heritage and storm water management objectives that are complimentary
- Implement these policy updates through an Official Plan Amendment (OPA) process that includes public consultation
- Ensure that "Residential Woodlands", "Linkages" and "Special Management Areas" are clearly and consistently included as part of the Natural Heritage System in corporate reporting as well as public reports

Current Practices: The current Green System framework, as illustrated in **Figure 13**, provides a useful model for taking a more holistic, city-wide approach to natural heritage and urban forest planning, but in its current form does not use the term "Natural Heritage System" or show that the Urban Forest is a cornerstone of the Green System that is interrelated with the Natural Heritage System. In addition, the current Natural Areas System categories of "Residential Woodlands", "Linkages" and "Special Management Areas" are not consistently included in corporate reporting for monitoring success in achieving City Strategic Plan objectives.

Best Practices: With respect to natural heritage, current best practices consistent with Provincial guidance include taking a systems approach to natural heritage protection, which includes providing appropriate levels of protection for significant features incorporating landscape-scale and local-scale connectivity among them. The use of the term "Natural Heritage System", which connotes this systems approach, is becoming more widely used in municipal Official Plans in Ontario, and is the term used in the Provincial Policy Statement (2005) and supporting guidelines.

Increasingly, progressive urban and urbanizing jurisdictions in Ontario and elsewhere (e.g., Town of Oakville, City of Brampton, Town of Ajax, City of Guelph, City of Medicine Hat (Alberta), City of Portland (Oregon)) are also recognizing the importance of the Urban Forest in their high-level planning documents. Mississauga was one of the first jurisdictions to undertake a systems-based approach to natural heritage protection and management (1995).

Rationale: This Strategy emphasizes a systems approach, clearly distinguishes categories that have different policy approaches, simplifies the former categories within the Natural Areas System, and illustrates how the Urban Forest is a cornerstone of the Green System and also shares many components with the Natural Heritage System. This proposed change builds on the existing "Green System" framework to take an inclusive, holistic approach to natural heritage and urban forest planning.

"Residential Woodlands" is a planning category that is unique to Mississauga and captures areas of the city that are residential but also have relatively high proportions of canopy cover on large lots. Moving this category under the broader category of "Urban Forest" recognizes that these areas are key contributors to the Urban Forest, but continuing to map them as part of the Natural Heritage System recognizes their ecological and hydrologic functions (e.g., habitat for canopy and migratory birds, as well as other wildlife, ecological linkage and contributions to groundwater recharge and flood management due to the presence of extensive permeable surfaces beneath them and the evapotranspiration by the mature trees).

STRATEGY #3: Revise Official Plan policies related to the Natural Heritage System to be more consistent with Provincial and conform to Regional policies

Implementation Guidance:

- Revise Official Plan policies to better reflect the intent of the Provincial Policy Statement by using terminology and structure from the Provincial Policy Statement for the recommended natural heritage system and features and areas to be included in the proposed "Significant Natural Areas" category (e.g., Significant Wetlands, Significant Woodlands, Significant Valleylands, etc.)
- Revise the Official Plan policies to clarify the relationship to the Regional Greenlands System so it is clear what features fall into the "Core Areas" or "Natural Areas and Corridors" (in which development is largely constrained) and "Potential Natural Areas and Corridors" (where land uses are less constrained) of the Greenlands System per Regional Official Plan Amendment (ROPA) 21b
- Clarify what constitutes a significant woodland and significant valleyland (within a Significant Natural Area) by using Table 1 of ROPA 21b as a basis for the policy criteria (see **Appendix E**)
- Revise the Official Plan description of the Green System to include areas identified by the conservation authorities as part of their natural heritage systems
- Implement policy updates through an Official Plan Amendment (OPA) process that includes public consultation
- Ensure development plans are screened (by the new Environmental-Natural Heritage Planner) for consistency with these policies

Current Practices: Areas designated as "Core Areas" in the Region's Greenlands system have been designated as Greenbelt (not to be confused with the Provincial Greenbelt) in the City of Mississauga's Official Plan, giving them the highest level of protection, which is consistent with the Region's policies. However, this is not readily apparent because the Mississauga Official Plan uses terms that do not clearly align with either current Provincial or Regional policy direction related to natural heritage. Specifically, the broader Natural Areas category includes the sub-categories of Significant Natural Sites, Natural Sites and Natural Green Spaces with many of the Significant Natural Sites corresponding to Regional Core Areas and/or City Greenbelt designated lands. In addition, the policies speak (separately) to the natural heritage features and areas protected under the Provincial Policy Statement (and appropriate levels of

protection for each) as well as Core Areas of the Regional Greenlands System (and policies protecting those features from development and site alteration). Consequently, the relationship between the mapped Natural Areas System (and its sub-categories), and the Provincial and Regional policy categories is unclear. The conservation authorities' natural heritage systems include additional undeveloped lands that would assist in the achievement of ecological targets to protect and enhance biological diversity. The City also recognizes the value of these lands and currently includes much of them within the Green System. However, their value in the context of meeting conservation authority targets is not explicitly recognized.

Best Practices: All Official Plans in Ontario are required to be consistent with the Provincial Policy Statement, conform with Provincial Plans where they apply, and conform to upper tier Official Plans such as the Peel Official Plan. The Provincial Policy Statement (2005) provides complete protection for some significant features (e.g., significant wetlands) and allows for development within others where it can be demonstrated that the proposed development will not have a negative impact to the feature (e.g., significant woodlands).

Many municipalities designate their significant natural heritage features and areas in a specific designation that does not permit development (e.g., Town of Oakville, City of Guelph, City of Markham). Notably, municipalities are permitted to go beyond the minimum standards set by the Provincial Policy Statement. For example, in some jurisdictions where the remaining significant woodlands continue to be under persistent development pressures, "no development" policy approaches have been adopted for these features (e.g., Region of Peel). Peel ROPA 21b sets out the criteria for what constitutes a significant woodland (i.e., all woodlands 2 ha and above plus woodlands between 0.5 and 2 ha that meet specified criteria for ecological significance such as the presence of trees 100 years and older); that matrix should be the basis for defining significant woodlands in Mississauga.

Rationale: This Strategy provides recommendations to clarify the intent of the City's natural heritage policies, clarify linkages to the Provincial Policy Statement, and ensure consistency with the Regional Official Plan, thereby providing a defensible policy framework.

STRATEGY #4: Clarify and strengthen Official Plan policies related to the Natural Heritage System

Implementation Guidance (refer to Figure 16, Appendix E):

- Significant Natural Areas: Clarify and strengthen the level of protection and permitted uses in these areas as follows:
  - No development or site alteration within significant wetlands or woodlands, or the habitat of threatened and endangered species
  - No development or site alteration within other natural heritage features and areas except for minor development and minor site alteration (as permitted in the Peel ROPA 21b), and except for essential infrastructure subject to an Environmental Impact Study (EIS) or Environmental Assessment (EA) that demonstrates no negative impacts on the feature or its ecological function
  - Require an EIS for development proposals within, or on lands adjacent to, a Significant Natural Area
  - Clarify where Significant Natural Areas are to be designated "Greenlands" versus "Open Space", as well as the land use and protection intent for Significant Natural Areas not designated "Greenlands" or "Open Space" and zoned for development
- Linkages: Clarify and strengthen the policies as follows:
  - Where site alteration or development is approved within Linkages, every effort will be made to enhance the linkage function on lands remaining undeveloped
  - Development on lands within or adjacent to a linkage may require an EIS which assesses the ability to maintain, restore or where possible improve the Linkage function.
- Special Management Areas: Clarify the policies as follows:
  - Where development or site alteration is permitted within Special Management Areas, restoration and enhancements will be encouraged, as part of the development application that will expand and/or enhance the ecological features and functions of the adjacent Significant Natural Area
  - Require an EIS for development or site alteration within Special Management Areas, but allow for waiving of this requirement at the discretion of the city if there are no natural features present
  - Special Management Areas on public lands will be a priority for stewardship and/or restoration initiatives

- Where applicable and feasible, parts or all these areas will be brought into public ownership through the development application process

- Residential Woodlands: Clarify and strengthen the policies as follows:
  - Building coverage and lot creation should be restricted to maintain the Residential Woodlands to the greatest extent possible, and replace canopy removed.
  - Require site plan approval for all applications within all Residential Woodlands that addresses grading and landscaping, and requires an arborist report and/or tree planting / preservation plan with each application to demonstrate no negative impacts to the Urban Forest.
  - The need for an EIS for any applications within a Residential Woodland will be at the discretion of the City but should only be required where the Residential Woodland overlaps with or is adjacent to some other natural heritage or natural hazard feature, or where the woodland exhibits characteristics of a natural area.
- Buffers: Revise the Official Plan to require that buffers for Significant Natural Areas be determined through a site-specific EIS, with consideration for applicable conservation authority policies and/or guidelines. The policies should also encourage the dedication of privately held buffer areas (along with the Significant Natural Area) to public ownership, while still recognizing any pre-existing development approvals. They should also encourage the restoration and enhancement of buffers, and identify any role they may have in contributing to Natural Heritage System targets identified by the conservation authorities, as well as the potential use of other design elements to provide buffering effects.
- Implement policy updates through an Official Plan Amendment (OPA) process that includes public consultations
- Update Environmental Impact Study (EIS) Guidelines
- Ensure development plans are screened (by the new Environmental-Natural Heritage Planner) for consistency with the revised natural heritage policies and EIS guidelines

Current Practices: The Mississauga Official Plan currently provides a Natural Heritage System framework that includes Natural Areas, Linkages, Special Management Areas and Residential Woodlands, but lacks clarity with respect to policy direction regarding each of these components. Currently, the City requires an EIS for all proposed development or site alteration within or adjacent to any of these features except for Residential Woodlands, where an EIS may or may not be required, but an arborist report is always required. The conservation authorities have requirements for setbacks to regulated features (such as wetlands), and some guidelines for setbacks to unregulated features. The buffers for unregulated features, and sometimes regulated features as well, are determined based on analysis of site-specific factors through the EIS.

Best Practices: For those jurisdictions with identified Natural Heritage Systems, different municipalities take different approaches to identifying and classifying the features and areas in their systems. All include categories that encompass Provincial Policy natural heritage categories, often with one category for the "no development" features and another for the features where "development may be permitted subject to an EIS that demonstrates no negative impacts". In some cases, as described in Strategy #3, jurisdictions with large urban or urbanizing areas have elected to go beyond the Provincial Policy Statement. Although some jurisdictions, and the Province, are beginning to put forward prescribed minimum buffers to selected features, it continues to be the practice in most municipalities to determine buffers (with consideration for minimums) on a site-specific basis. It is a complex issue, with pros and cons to both approaches and no simple or clear best practice at this time.

The Regional Official Plan also provides criteria and thresholds for "Core" woodlands as well as "non-Core" woodlands to direct its area municipalities to develop appropriate policy.

Residential Woodlands is a category unique to Mississauga designed to capture residential areas with extensive canopy cover.

Rationale: This strategy clarifies the policies that apply to each component of Mississauga's Natural Heritage System, and provides policies that are both consistent with Provincial and Regional direction, and appropriate in the context of Mississauga. In an urban landscape where almost all of the future development will be infill and/or intensification, it is not appropriate to recommend minimum prescribed buffers to natural heritage features (beyond what are already prescribed by the conservation authority) as there will be too many site-specific and unique situations to address. In this context it is also important for the remaining natural areas to be protected, and for opportunities

for enhancement and restoration to be integrated to the planning process to sustain the Natural Heritage System for the long term.

STRATEGY #5: Refine Official Plan policies to better support connectivity within the Natural Heritage System

Implementation Guidance (see related Strategy #11):

- Refine Official Plan policies to clearly:
  - Recognize the linkage function provided by all Natural Heritage System components, and connections to systems outside the city (e.g., along the lakeshore, broader watershed areas, the Provincial Greenbelt to the north)
  - Recognizes the role of the broader Green System in providing linkage between Natural Heritage System components
  - Support the integration of eco-passages for wildlife (e.g., culverts under roads to accommodate amphibian movement) where there are documented "hot spots" for movement
- Develop policy for parks and open space (public and private) that:
  - Explicitly recognizes the role of the Green System in supporting connectivity within the City
  - Requires consideration of preserving linkage functions on City-owned properties, without compromising the primary uses of those lands
  - Encourages stewardship initiatives on open space lands not owned by the City that would enhance natural values and the linkage functions
- Implement policy updates through an Official Plan Amendment (OPA) process that includes public consultation

Current Practices: The current Natural Areas System structure includes some mapped Linkages and is connected along the major watercourses, but does not fully recognize: (1) the implicit linkage function of the major watercourse/valley systems, (2) the collective linkage function provided by all areas protected in the system, or (3) the role of the Green System in contributing to connectivity across the city and to adjacent municipalities. At present, development and site alteration is not permitted in Linkages unless there is a demonstration of no negative impact to the feature or function. Notably, some of the current linkages include a transit reserve along the 403 and hydro corridors.

Best Practices: Ideally, Natural Heritage Systems are developed in a context where dedicated, substantial linkages based on the biophysical context and known wildlife movement patterns can be identified and protected prior to extensive development. Linkages are also identified on different scales ranging from regional (e.g., Niagara Escarpment) to local (e.g., river and stream valley systems) to site-specific (e.g., amphibian movement corridor between two wetlands). They may include "stepping stone" linkages that provide stop-over habitats for species to facilitate movement through unnatural land uses.

In urban landscapes where opportunities to identify and protect such linkages are limited, alternative and innovative approaches should be considered to recognize and support linkage functions. These include: protection of existing landscape-scale linkages (often along river and stream valleys), identification of linear land uses where the function is somewhat compatible with linkage ecological functions as linkages (e.g., hydro corridors, railway verges, trail networks), identification of wildlife movement "hotspots" over existing roads as locations for ecopassages[46], and (a unique approach being suggested for Mississauga) recognition of the role of all green space in providing some degree of linkage, and pursuing/encouraging naturalization of portions of these areas where it does not conflict with existing land uses.

Rationale: Maintaining, and where possible, enhancing usable linkages between protected natural areas is widely recognized in both current science and policy as important for sustaining terrestrial and aquatic natural heritage in landscapes fragmented by other land uses. In Mississauga this can only be achieved by recognizing the linkage functions of existing ecological connections at various scales, facilitating wildlife movement in "hotspots" over existing roads, and pursuing naturalization of lands providing ecological connections where feasible.

[46] An ecopassage for large mammals was recently completed over Highway 69 in central Ontario, and smaller-scale ecopassages for amphibians, reptiles and small mammals have been included in highway/road designs in the Town of Richmond Hill, City of Guelph, and elsewhere. Monitoring of the effectiveness of these structures in facilitating wildlife movement is ongoing in various locations.

STRATEGY #6: Strengthen Official Plan policies related to the Urban Forest

Implementation Guidance:

- Better integrate the Urban Forest into the Green System framework (per Strategy#2)
- Strengthen the Urban Forest policies in the Official Plan by:
    - Adding goals specific to the Urban Forest (e.g., improving canopy cover, species and structural diversity)
    - Changing "no negative impacts to trees" to "no overall negative impacts to the Urban Forest" to be consistent with the rest of the policies and allow for flexibility where appropriate
    - Adding requirements for identification of opportunities for tree replacement (in addition to protection), as well requirements for planting off-site or cash-in-lieu where replacement cannot be accommodated on site
    - Adding a directive to develop and implement consistent standards for tree protection and replacement to be applied to private and public projects
    - Expanding clause 6.4.4(i) to support additional strategic partnerships beyond invasive species management
    - Adding a clause to avoid planting invasive tree species
    - Adding a definition of the Urban Forest and "no (net) negative impacts to the Urban Forest"
- Implement policy updates through an Official Plan Amendment (OPA) process that includes public consultation
- Ensure development plans are screened (by the new Environmental-Natural Heritage Planner) for consistency with these policies

Current Practices: The current Urban Forest policies, which were a new addition to the updated Official Plan (2011), strike a good balance between supporting overall protection, enhancement and expansion of the Urban Forest, while still allowing for development considered appropriate by the City. However, there are a few areas where these policies could be clarified and strengthened. The use of the term "no impacts" with respect to the Urban Forest is a unique way to use this Provincial Policy Statement term, and needs to be defined.

Best Practices: Over the past few years, an increasing number of municipalities in southern Ontario, particularly those with active urban forestry programs, have introduced urban forest visioning into their strategic plans and urban forest policies into their Official Plans. Municipalities in southern Ontario with specific policy sections in their Official Plans dedicated to urban forestry include the Town of Oakville, City of Brampton, City of Guelph, and Town of Ajax. Some other nearby municipalities with active urban forest programs, such as the City of Toronto and the Town of Milton, have policies related to the urban forest in their Official Plans that are embedded in other policy sections.

Rationale: Having a comprehensive and strong set of high-level urban forest policies in an Official Plan shows a municipality's commitment to this asset and sets the direction for city-wide policy implementation and related practices.

STRATEGY #7: Update Residential Woodlands mapping and ensure site plan control areas include all Residential Woodlands

Implementation Guidance:

- Update Residential Woodlands mapping to better reflect current conditions, and ensure that all residential areas in the City with concentrations of relatively high levels of canopy cover are captured
    - This exercise will make use of current tree canopy analyses completed on a city-wide basis by the Peel Urban Forest Working Group and should include the development of a transparent methodology and/or clear criteria for inclusion (or exclusion) of an area from the "Residential Woodlands" category
- Expand Site Plan Control areas to capture all Residential Woodlands
- Note: Additional staffing resources, or re-allocation of existing staffing, in the Planning and Building Department will be required to implement this strategy

Current Practices: The Residential Woodlands mapping in the current City's Official Plan has been carried forward from the former Official Plan, and is based on data and analyses from the late 1980s. Residential Woodlands were mapped using the best available mapping tools at that time (i.e., a visual assessment of air photos), along with other planning considerations (e.g., lot sizes). When applications come in under Site Plan and when proponents are required to assess trees (and vegetation) on site, they must also consider opportunities for tree preservation and replacement. However, the Residential Woodlands, as mapped, are not entirely captured as Site Plan Control Areas, and some of the areas that would qualify as Residential Woodlands today may also be excluded.

Best Practices: The Residential Woodlands overlay in the City's Official Plan was, and continues to, be a unique and progressive approach to identifying areas on large residential lots where concentrations of relatively high levels of canopy cover in the City exist, along with native understorey vegetation in some areas. This overlay provides an opportunity to ensure that these areas are subject to greater scrutiny with respect to tree preservation and replacement when changes to existing development are proposed.

Rationale: Implementation of these mapping and zoning changes will ensure that (a) all areas in the City with relatively high levels of canopy cover are subject to greater scrutiny when development is proposed within them, and (b) opportunities for preservation, replacement and/or compensation are explored as appropriate.

STRATEGY #8: Strengthen existing by-laws to improve their ability to support Natural Heritage System and Urban Forest objectives

Implementation Guidance:

- Update the Public Tree Protection by-law (see UFMP Action #15 for implementation guidance)
- Update the Erosion Control, Nuisance Weeds and Encroachment by-laws (see UFMP Action #16 for implementation guidance)
- After a four to eight year period of monitoring and assessment, review the Private Tree Protection by-law and update as needed (254-12) (see UFMP Action #17 for implementation guidance)
- Strengthen the existing by-laws and continue to build on their success rather than pursuing a new Ravine Protection By-law (as in Toronto) (see **Appendix F** for more background)

Current Practices: The City currently has six by-laws in place that it uses to help regulate activities on public and private lands related to the Urban Forest and natural areas:

(1) The Street Tree by-law, which regulates the injury or removal of City-owned trees, is currently being updated to conform with the current *Municipal Act* and be consistent with other City by-laws.

(2) The Erosion Control by-law (512-91) (which is equivalent to what many municipalities call their "site alteration" by-law) – which regulates the removal and placement of fill on parcels of 1 ha and larger - is also under review.

(3) The Nuisance Weed by-law (267-03) currently regulates landscaping on private properties and requires grass not to exceed 12 inches in height, and for landowners to remove all nuisance weeds.

(4) The Property Standards by-law (654-98) which, among other standards, requires trees to be maintained so that they do not pose a danger, or removed if the hazard cannot be removed through maintenance. This is consistent with the Private Tree Protection By-law (254-12) which allows for removal of hazard trees without a permit.

(5) The Encroachment by-law (057-04) applies to City-lands and is used to regulate the encroachment of private landowners into adjacent City-owned lands, including parks and natural areas. This by-law has been used to successfully "reclaim" well over 100 ha (100's of acres) of public natural areas over the past few years.

(6) The City's Private Tree Protection by-law (254-12) has been in place since 2001, and revised in 2012, following extensive internal and external

consultations, to be somewhat more restrictive. It now regulates the removal of three or more trees with diameters greater than 15 cm per calendar year (as opposed to five).

Best Practices: Since the passing of the *Municipal Act* on 2001, dozens of municipalities across southern Ontario have passed tree by-laws to regulate activities related to public street and park trees, as well trees on private lands. Generally, woodland by-laws are enacted by the upper tier municipality (like the Region of Peel), while by-laws focused on individual trees are under the purview of local area municipalities (like Mississauga). There are also many municipalities that have erosion control and/or sediment control by-laws to regulate the movement of soil/fill. There are not many other municipalities with encroachment by-laws, and fewer that actively enforce them as effectively as Mississauga.

Best practices related to private tree by-laws are difficult to assess since each municipality's by-law is tailored to local circumstances and resources, and there is currently no mechanism for tracking the relative effectiveness of the different by-laws. However, it is generally agreed among tree by-law officers that these by-laws are as much an educational tool as a regulatory tool, and that any by-law is only as effective as the resources dedicated to its implementation and enforcement.

Rationale: By-laws are one of several tools that can be used to help support natural heritage and urban forest objectives by regulating activities that may negatively impact trees and/or natural areas and/or the soils that support them. In Mississauga there are already a suite of by-laws that can be used in this regard, but many of them require updates and revisions to ensure that their potential use is optimized. More specific guidance is provided in the UFMP.

Notably, a comprehensive review of the potential value of implementing a new by-law targeted at Mississauga's ravine (i.e., stream/river valley corridor) areas completed as part of this project (see **Appendix F**). This review concluded that the City has already zoned most of its ravine areas as Greenbelt or Open Space, and already has a number of by-laws that, if revised and used in conjunction with conservation authority regulations in ravine lands, will provide as much or more protection than a new ravine by-law would.

STRATEGY #9: Implement and build on existing policies and guidelines related to green infrastructure

Implementation Guidance:

- Build on the recommendations in the City's *Green Development Strategy* (2009) and the guidelines in the City's *Green Development Standards* (2010) by continuing to pursue and implement the following recommendations:
  - enforce existing planning tools
  - undertake outreach and education related to a variety of "green" development approaches, and
  - use a range of incentives to actively encourage "green" development practices
- Consider, as part of the five-year review for the *Green Development Strategy* (i.e., in 2015), expanding on the existing incentives and guidelines with some additional policies, guidelines and by-laws that would directly support the City's Natural Heritage System and Urban Forest, such as:
  - a Green Roof policy (and possibly a related by-law)
  - more comprehensive guidance for bird-friendly building design
  - requiring minimum canopy cover in parking lots
  - developing and introducing city-wide shade policies, and
  - ensuring guidelines support the use of new technologies to integrate trees more effectively into the built environment when more traditional approaches are not feasible

Current Practices: In 2010, Council accepted a *Green Development Strategy Phase 3 Report* for the City, approved establishment of a Green Development Task Force, and adopted Stage One Green Development Standards. The Stage One *Green Development Standards* (2010) publication that provides some "made in Mississauga" guidance for integrating some "green" approaches into site plan and re-zoning applications. This document is supplemented by the CVC/TRCA Low Impact Development Stormwater Management Planning and Design Guide. These standards suggest that applicants consider "where appropriate": maximizing natural infiltration and retention of storm water, integration of new trees and native vegetation (including within "hardscapes"), and elements of bird-friendly building design.

Best Practices: As described in the *Green Development Strategy* (2009), Toronto has been a leader with respect to the development of policies and guidelines related to green roofs, bird-friendly building design, "green" parking lot design, and shade. Toronto has also developed a by-law that regulates green roof requirements. Toronto's shade guideline and policy development is a good example of City staff in parks and forestry collaborating with the health industry to achieve complimentary objectives. A number of larger cities throughout Canada and North America have also developed bird-friendly design guidelines (e.g., Markham, Vancouver, B.C., Chicago, Ill., New York City, N.Y., and San Francisco, CA). In addition, more urban municipalities in Ontario, and elsewhere, are exploring the integration of green roofs into their cities, as well as incentives for this and other green development initiatives.

The *Green Development Strategy* (2009) for Mississauga is a progressive document that identified the use of existing planning tools along with City and third-party targets as a key recommendation for moving the City towards greener development practices.

Rationale: In urban areas such as Mississauga, the Natural Heritage System and Urban Forest are not discrete features, but interact with, and are heavily influenced by, the people and urban structures that surround them. One way of better integrating natural elements into urban matrices, and of managing urban storm water, is to (a) mimic some of the functions of natural and treed areas within the built landscape (e.g., green roofs, naturalized storm water management swales, artificial shade structures), and (b) design structures and spaces in cities with greater consideration for wildlife (e.g. bird-friendly buildings) as well as the humans that inhabit it (e.g., provision of natural shade along sidewalks and trails, in parks and other public open spaces). Green development approaches can also result in density bonusing, which allows the protection or creation of natural areas in the remaining lands.

STRATEGY #10: Pursue expansion of the Provincial Greenbelt in Mississauga

Implementation Guidance:

- Determine, with the Region and the Province, the scope and extent of the required consultations, and undertake these consultations with the public, agencies and Aboriginal groups
- Identify the resource requirements associated with pursuing implementation of this designation (e.g., costs of consultation, possible survey requirements, and promotion)
- Confirm which City, Region and conservation authority lands are suitable for inclusion in consultation with staff of the appropriate agencies
- Complete, and provide to the Region of Peel, a detailed justification report, demonstrating that the six criteria (as outlined in the *Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area 2013)* can be met
- Identify legal parcel descriptions for all publicly owned parcels to be included in the Urban River Valley designation.
- Seek a resolution from both the City Council and Regional Council to formally request the Greenbelt Plan expansion

Current Practices: On April 28, 2010 Mississauga City Council supported, in principle, the addition of public lands in the Credit River Valley to the Province's Greenbelt Plan pending the results of a feasibility analysis that examined the location of suitable lands and the implications of the designation for recreational uses, facilities and infrastructure.

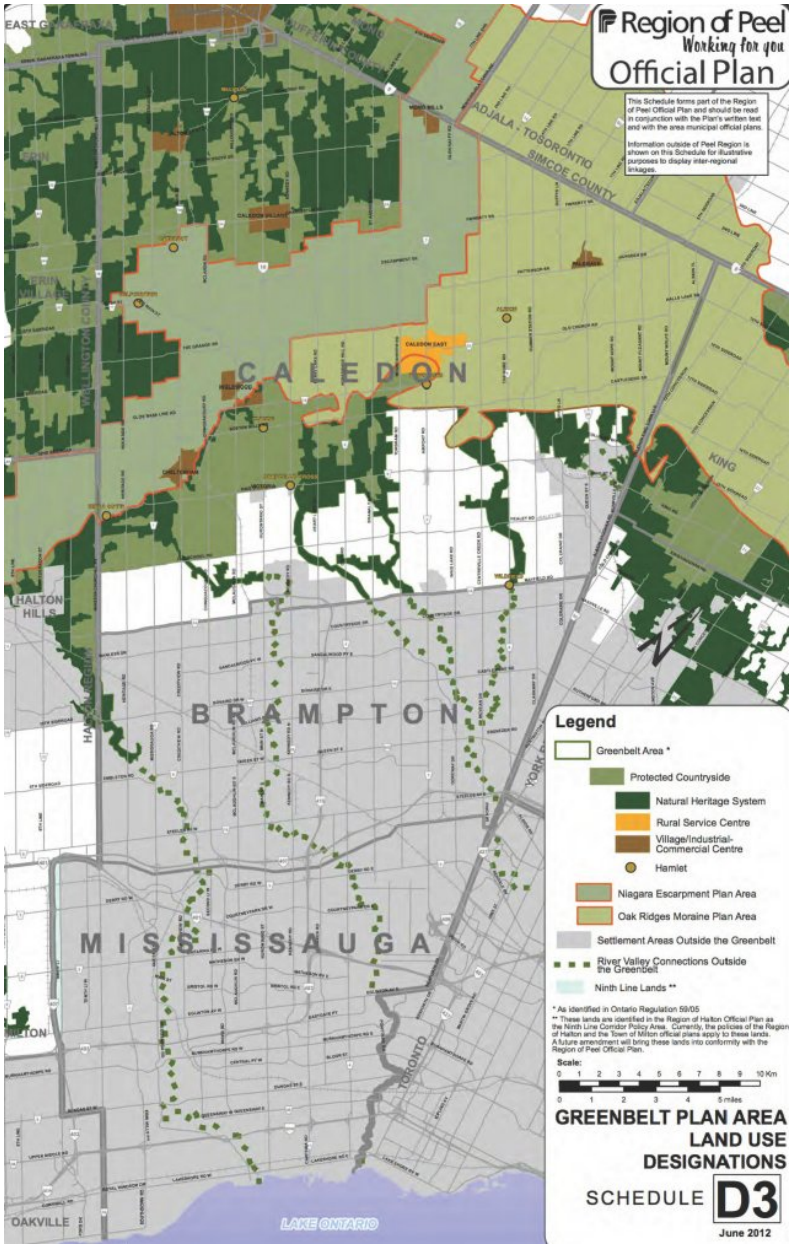


Figure 17. Regional Greenbelt Plan Area with river valley connections shown in green dots (from the Region of Peel Official Plan, 2013 consolidation)

On January 9, 2013, the Province passed Amendment #1 to the Plan which allows for the inclusion of publicly-owned valleylands in municipalities south of the Greenbelt Plan Area to be designated as Urban River Valleys (URV) under the Greenbelt Plan, at the discretion of the municipality and provided they have support from the applicable upper tier jurisdiction (in this case the Region of Peel). These lands would be part of the Greenbelt but continue to be governed by applicable municipal official plan policies, which are consistent with the the Greenbelt Plan.

A *Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga* was completed as part of this Strategy in 2013. Key findings included:

- It is feasible to expand the boundaries of the Greenbelt Plan into the City of Mississauga using the new URV designation of the Greenbelt Plan
- There are a number of City and conservation authority owned lands in Mississauga's valleylands that could be considered for inclusion as URV lands, although they are not contiguous
- The applicable City policies will continue to apply to these lands
- Expanded or new infrastructure approved under the Environmental Assessment Act or similar approval is permitted provided it supports the needs of the adjacent urban areas and supports the goals and objectives of the Greenbelt Plan
- Including publicly owned lands of the Credit River and Etobicoke Creek Valleys in the Greenbelt Plan would have some benefits to the City including:
    - increasing the profile of the lands subject to the Urban River Valley designation by including them in a Provincial Plan
    - raising awareness of the need to protect the Urban River Valleys as part of a natural heritage system, and
    - raising awareness and providing educational opportunities on the importance of the regional linkages and the role of the Urban River Valleys as a natural heritage system and their role in linking the large core areas in the upper reaches of the watershed to Lake Ontario.

Best Practices: Several largely urban municipalities in the GTA considered Greenbelt expansion prior to Amendment #1 to the Greenbelt Plan being passed (i.e., Town of Oakville, City of Toronto) but found that it was not conducive to being applied in an urban setting. Since the passing of Amendment #1, no other municipalities have formally pursued it, which would make the City of Mississauga the first.

Rationale: Designating selected public lands in the City's valleylands as Provincial Greenbelt Plan URV lands could elevate the profile of these lands, raise awareness of the importance of these areas, and support educational and stewardship opportunities. It would also be an opportunity for Mississauga to show leadership through this initiative.

9.2 PROTECTING AND MANAGING NATURAL HERITAGE AND THE URBAN FOREST

STRATEGY #11: Enhance and expand the Natural Heritage System

Implementation Guidance:

- Recognize the proposed expansion areas [47](as identified on **Map 1**) as candidates for inclusion in the City's Natural Heritage System, including:
    - Significant Natural Areas (158 ha)
    - Natural Green Spaces (129 ha), and
    - Special Management Areas (476 ha)
- For the proposed expansion areas, as with other Natural Areas, boundaries are subject to review and refinement at the time of planning applications
- Maintain and improve ecological connectivity (Strategy #12)
- Identify potential additional Residential Woodland areas (Strategy #7)
- Continue to review future potential expansion areas (which are expected to be relatively minor refinements and updates) per current practice in the annual reviews of the Natural Heritage System through the Natural Area Survey Updates
- Undertake targeted invasive plant management in Natural Areas (see UFMP Action #10 for implementation guidance)
- Develop a targeted Urban Forest expansion plan (see UFMP Action #11 for implementation guidance)

[47] The area of Residential Woodlands has remained unchanged, but will be subject to review through Strategy #7. Linkage area was slightly reduced as two linkages were re-designated as Natural Green Spaces. The total recommended potential expansion areas amount to 757 ha (1870 acres).

- Implement a targeted Urban Forest expansion plan (see UFMP Action #12 for implementation guidance)
- Track and recognize naturalization / stewardship initiatives on public and private lands (see UFMP Action #13 for implementation guidance)
- Work with CVC to integrate and implement the *Credit River Water Management Strategy*, and explore opportunities to support implementation of the *Credit River Fisheries Management Plan, Wetland Restoration Strategy, and Lake Ontario Integrated Shoreline Strategy*.

Current Practices: Prior to this Strategy, expansion of the City's Natural Heritage System has been primarily pursued through the detailed evaluation of Natural Area boundaries as part of the annual updates undertaken through the review of aerial photographs, combined with field verification where access has been provided. Changes to the municipal boundary, as in the recent acquisition of the 9th Line Corridor lands, has also resulted in the identification of potential additions to the City's Natural Areas System through a separate environmental study, however these circumstances are unusual. As part of this Strategy, additional opportunities for expansion were identified with City planning staff (an overview of the methodology used to identify recommended expansion areas for the Natural Heritage System is provided in **Appendix D**).

Best Practices: Although the approaches used vary among municipalities, in southern Ontario natural heritage systems are typically identified through a comprehensive survey of natural heritage features and subsequent screening against established criteria. In urban environments, especially those as built out as Mississauga, it is difficult to make substantial additions to a natural heritage system, unless there are expansions of the municipal boundary. A number of municipalities and conservation authorities in highly urbanized areas have begun to identify potential restoration areas through their own natural heritage studies as ways of enhancing existing systems and potentially expanding them in the future. Mississauga's approach to Natural Heritage System expansion, as outlined **Appendix D** and in Strategy #12, includes elements that are both progressive and unique.

Rationale: As Mississauga completes its build-out, it is important to ensure that all areas meeting criteria for being components of the Natural Heritage System are identified, and that opportunities for connecting or enhancing it are not overlooked so that the system is as robust and as resilient as possible.

STRATEGY #12: Maintain and improve Natural Heritage System connectivity

Implementation Guidance (see Strategy #5 for policy direction):

- Explicitly recognize that all areas within the Green System contribute to connectivity to varying degrees both within the City, and between the City and adjacent municipalities (**Map 2**)
- Recognize "Direct Linkages" within the Green System **Map 2**) as priority sites for potential naturalization and/or reforestation efforts
- Identify areas where linkage mechanisms such as eco-passages or traffic-calming (Strategy #5), or mitigation measures such as warning signs, would enhance connectivity of the Natural Heritage System, by:
    - analyzing animal mortality data collected by the Animal Service Department, as well as any data from the CVC/TRCA's road mortality study, to determine if there are wildlife road mortality "hot spots" in the city, and
    - focusing on species groups such as amphibians and reptiles which are most susceptible to road kill, as well as deer which can present a hazard to both humans and the animal itself
- Track and recognize naturalization / stewardship initiatives on public and private lands (UFMP Action #13 for implementation guidance)

Current Practices: At present, none of the components in the Natural Areas System beyond the areas explicitly identified as linkages are fully recognized for their implicit ecological linkage function. Linkages that currently identified in the Natural Areas System (**Figure 3**) include some linear utility features, such as the transit reserve along Highway 403 and some hydro corridors, as well as some parks and drainage channels. Not all linear utility features are recognized, nor is the role of the numerous parks and open spaces in the Green System, all of which contribute to varying extents to supporting natural connectivity across the city. Mitigation to manage deer crossings where the Credit River meets Highway 401 have been implemented and monitored by the Ministry of Transportation. However other potential wildlife crossing locations in the city where mitigation may be appropriate have not been formally identified or measures implemented.

Best Practices: In a built out, urban landscape like Mississauga's, the primary continuous linear natural features remaining are typically the watercourses and their associated valleys. In most urbanized jurisdictions in southern Ontario the natural heritage value of these features, including their linkage function, is captured within some type of natural heritage system.

Some urbanizing municipalities have also tried to identify additional upland linkages, at least on a conceptual level (e.g., City of Markham, Town of Oakville), while the TRCA has for many years promoted the idea of the "living city" to emphasize a more holistic approach to ecosystem management in urban areas. However, no municipalities have tried to formally recognize the supportive linkage functions of the green and open spaces outside the natural heritage system framework, as recommended in this Strategy for Mississauga.

Rationale: Monitoring of Mississauga's natural areas since 1996 has confirmed a decline in the quality of many of these areas as urbanization has proceeded (e.g., lower native species diversity of both plants and wildlife). This decline has been most notable in the smaller, isolated features in the City. Similar observations have been made in Toronto, and elsewhere, supporting the well-established conservation theory that in fragmented landscapes biodiversity and ecosystem health cannot be sustained in "islands of green" without on-going management. Consequently, it is now widely recognized that maintaining and, where possible, building connectivity between protected features is one of the keys to ensuring the long-term sustainability of natural heritage features and functions.

STRATEGY #13: Enhance and expand the Urban Forest

Implementation Guidance:

- Develop a targeted Urban Forest expansion plan (see UFMP Action #11 for implementation guidance)
- Implement a targeted Urban Forest expansion plan (see UFMP Action #12 for implementation guidance)
- Work with the Peel Region Urban Forest Working Group, and other partners, to identify criteria for prioritization based on scientific, environmental, social and community considerations
- Key considerations should include:
    - findings and recommendations from the *City of Mississauga Urban Forest Study* (2011)
    - priority areas for reforestation identified through conservation authority subwatershed plans, as well as CVC's new Draft Natural Heritage System, Landscape Scale Analysis, and the current Lake Ontario Integrated Shoreline Strategy and Credit River Parks Strategy
    - neighbourhoods and/or land uses with canopy cover well below the City's current average of 15%
    - areas anticipated to be most heavily affected by Emerald ash borer-caused tree mortality, and
    - air quality

Current Practices: The City plants tens of thousands of small-stock native trees and shrubs annually (with the total being close to 30,000 in 2012) through with various partners and volunteers. Tree planting locations are generally in response to community requests or requests from the conservation authorities, and do not necessarily align with strategic objectives such as the desire to increase canopy cover in certain neighborhoods where air quality is known to be taxed. As a result, some areas in the City that may be priorities for tree establishment (e.g., for health reasons) may be overlooked.

The need to be more strategic about tree planting (and follow-up maintenance) region-wide is also recognized by the Peel Urban Forest Working Group and at the local municipal scale in the urban forestry studies they have produced.

Best Practices: A number of municipalities with active urban forestry programs have, as part of their programs, begun to identify and pursue targeted tree establishment based on a number of factors (e.g., available planting spaces, planning commitments, considerations for the urban heat island effect, opportunities adjacent or close to protected natural areas, etc.). Examples include the City of Toronto and Town of Ajax. TRCA has also been a leader for some of the municipalities within its jurisdiction in helping identify preliminary "potential plantable spaces" with desktop analyses (as in the case of the *City of Mississauga's Urban Forest Study* 2011) to create conceptual Priority Planting Index mapping (as illustrated in **Figure 15**).

Rationale: Strategic prioritization and implementation of opportunities for expansion of the Urban Forest will accelerate the provision of urban forest benefits where they are most needed, contribute to a more equitable distribution of canopy across the different parts of the city over time, and contribute to the maintenance and expansion of the city's overall canopy cover, as well as to meeting Natural Heritage System targets where the reforestation is within or adjacent to components of the Natural Heritage System.

STRATEGY #14: Improve tree establishment practices on public and private lands

Implementation Guidance:

- Develop consistent and improved City-wide tree preservation and planting specifications and guidelines (see UFMP Action #4 for implementation guidance)
- Increase effectiveness of tree preservation as part of private projects (see UFMP Action #18 for implementation guidance)
- Increase effectiveness of tree preservation as part of municipal operations and capital projects (see UFMP Action #19 for implementation guidance)

Current Practices: There are currently specifications and standards for tree protection and planting or public and private projects in several different documents for use in different types of projects (e.g., *Community Services Subdivision Requirements Manual* (2002), Development and Design and Forestry section standards (2008)). Several of these are currently under review, but the current versions are not comprehensive, could better integrate current best practices, and are not consistent among different departments.

City staff and contractors are expected to adhere to existing standards, however the same standards are not upheld for all projects, and on-site supervision during and following construction is not necessarily done by a Certified Arborist or Landscape Architect knowledgeable about assessing planting stock and appropriate protection and/or planting techniques.

Best Practices: A number of municipalities in southern Ontario and elsewhere in North America have developed comprehensive tree preservation and planting specifications, standards, and guidelines to help ensure consistent application of best urban forestry practices (e.g., City of Barrie; City of Markham; City of London; City of Toronto; City of Palo Alto, California). These documents include a wide range of best practices for tree establishment, ranging from most effective tree protection techniques to minimum soil volume requirements and tree replacement ratios.

Implementation of updated specifications, supported by effective inspection and compliance enforcement by a qualified Arborist (or professional with comparable expertise), will result in improved tree protection and establishment practices. In the Town of Oakville, an Arborist is required to sign-off on approved site plans to confirm tree planting and protection have been implemented according to the established standards.

Rationale: Developing and implementing tree preservation and tree planting specifications, standards and guidelines city-wide, that reflect current best practices, will help ensure the protection of existing trees as well as the establishment of new trees, show the City is leading by example, and help ensure consistent approaches are followed. Ensuring that planted stock is good quality and consists of a high diversity of primarily native, non-invasive species will also help build resilience to urban stressors and climate change.

STRATEGY #15: Make tree health and risk management practices on City lands more proactive and effective

Implementation Guidance:

- Develop consistent and improved City-wide tree preservation and planting specifications and guidelines (see UFMP Action #4 for implementation guidance)
- Update and maintain the inventory of City street and park trees (see UFMP Action #5 for implementation guidance)
- Optimize street and park tree maintenance cycles (see UFMP Action #6 for implementation guidance)
- Implement a young street and park tree maintenance program (see UFMP Action #7 for implementation guidance)
- Develop and implement a street and park tree risk management protocol that takes a conservative approach to managing potential risks posed by older trees in view of the numerous benefits and services they provide (see UFMP Action #8 for implementation guidance)
- Implement a pest management plan for the Urban Forest that will build on the lessons learned from dealing with Emerald Ash Borer (see UFMP Action #9 for implementation guidance)
- Undertake targeted invasive plant management in the Natural Heritage System (see UFMP Action #10 for implementation guidance)
- Implement and enforce improved tree establishment practices on public and private lands (see UFMP Action #14 for implementation guidance)

Current Practices: Tree health and risk management practices are necessarily focused on City lands as this is where the City has a commitment to provide a certain level of service. The City also needs to undertake basic due diligence with respect to tree risk issues on its lands.

Current street tree elevation program pruning frequency is approximately once every 8 years per tree, while park tree maintenance is reactive or request-based. While some young trees are tended to as part of the maintenance program, such practices are not comprehensive or formalized or frequent enough outside of the standard two year warranty period.

While tree risk issues are sometimes identified and/or managed during the course of regularly scheduled street tree maintenance, most tree risk assessment and management is reactive and/or request-based. Recently, implementation of the Emerald Ash Borer (EAB) Management Plan has placed a strain on Forestry and Parks Division staff resources; this is likely to continue to for the next few years.

Some limited invasive species management occurs in the City's natural areas when time and resources permit, and site-specific efforts to eradicate Giant Hogweed have been quite successful.

Best Practices: Best practices suggest that a seven or eight-year street tree pruning cycle is optimal if it is supported by other proactive urban forest management and health practices (as are being recommended for Mississauga). In most municipalities, park tree maintenance tends to be largely reactive in nature, although the 2000 ISA Ontario *Best Management Practices for Ontario Municipalities* recommends trees in active parks be visually inspected annually if possible, and considers once every five years is acceptable (although even this standard is hard to meet for most municipalities).

A formal young tree pruning program is one of the most cost-effective practices to help to ensure the future development of healthy, large-statured and structurally stable trees. This work is ideally undertaken by qualified Arborists, but can be done by trained volunteers (e.g., Calgary, New York City).

Implementation of a tree risk policy or protocol that coordinates inspection, mitigation and proactive planning in order to improve safety and reduce risk,

uncertainty and liability, is a critical component of effective tree risk management.

Both a pest vulnerability matrix (to assess the municipality's relative risk with respect to various urban forest pests), as well as a framework for pest-specific management plans, are also very useful tools in preparing for and addressing some of the unknowns related to the Urban Forest.

Invasive plants present a major threat to the ecological health and sustainability of natural areas in southern Ontario. Although their control is a challenge, targeted and sustained efforts in high priority natural areas have yielded some successes in cities like Toronto.

Rationale: Shifting towards tree health and risk management practices that are more proactive requires an initial investment, but quickly results in cost savings (as a result of taking a preventative approach), as well as a healthier Urban Forest. Increased maintenance frequency, particularly of young trees, will result in improved tree health, reduction in tree-related risk, and improved identification and monitoring of urban forest pests/pathogens. Improved tree risk management protocols will reduce incidence of tree-related risk and associated costs, and reduce the City's potential liability with respect to municipal trees, while better pest preparedness will facilitate an effective response to any future urban forest pest invasions. Better maintenance will also reduce the costs of tree replacement in the long term, while targeted invasive plant management will enhance the sustainability of the Natural Heritage System.

STRATEGY #16: Work with local conservation authorities to identify opportunities to support aquatic ecosystem objectives

Implementation Guidance:

- In consultation with conservation authority staff, as well as City staff from Transportation and Works, look for opportunities to integrate site-specific recommendations from relevant fish habitat management plans (e.g., *Credit River Fisheries Management Plan* 2002) and watershed management plans into site-specific Conservation Management Plans for Significant Natural Areas (see UFMP Action #20)
    - Options include development and implementation of a Mississauga-specific fisheries management plan (based on existing data), and consideration of CVC's stormwater management thermal guidelines
- Take a catchment approach by looking at watercourses outside the Significant Natural Areas and exploring opportunities for habitat enhancement and/or restoration
- Ensure management recommendations are consistent with the City's woody debris management strategies in the Cooksville Creek watershed
- Key considerations should include mitigation or removal of fish barriers, and maximizing the extent of natural vegetation along riparian corridors and adjacent to wetlands
- Track and recognize naturalization / stewardship in riparian areas associated with wetlands and watercourses (see UFMP Action #13 for implementation guidance)

Current Practices: The emphasis of management activities undertaken by the City within its Natural Areas is largely on terrestrial features, despite the importance and critical ecological function of the many watercourses that run through Mississauga. This is primarily because activities within the watercourses and associated valleys are already regulated by the local conservation authorities, and because water movement in the City is also managed from an

operational and safety perspective by City staff in Transportation and Works.

The City currently undertakes projects in cooperation with the conservation authorities on management activities that improve aquatic habitat (e.g., riparian planning projects), as well as with local organizations (e.g., the Credit river Anglers Association), as opportunities arise. Notably, the conservation authorities usually take the lead in initiatives related to watercourses as the City does not have fisheries biologists or aquatic habitat specialists on staff, or have resources or capability to undertake management of aquatic habitat.

Best Practices: In southern Ontario, the principal agencies for regulating watercourses and wetlands are the conservation authorities, and most municipalities have working relationships with the conservation authorities to manage local aquatic systems from an ecological perspective. However, it is also the responsibility of the municipality and the local conservation authority to protect residents and property from risk of flood. Therefore, while municipalities (including Mississauga) can cooperate in joint management initiatives in support of aquatic ecosystems, ecological considerations have to be balanced with storm water management considerations.

Rationale: This Strategy recognizes that watercourses and aquatic habitats are critical components of the City's Natural Heritage System, and that improvement to riparian habitats should be explored to support both the linkage function and the intrinsic habitat functions of these areas. Because what we do on land affects water, their management is best considered together, even if implementation and the lead for management initiatives is divided between the City and the conservation authorities. However, such activities need to ensure they do not conflict with any flood management measures.

STRATEGY #17: Continue strategic acquisition of high priority natural areas

Implementation Guidance:

- The City should continue to acquire components of the Natural Heritage System as opportunities and funds permit
- Considerations for priority acquisitions should include:
- Natural areas associated with the lakeshore and the Credit River (per the *Master Plan for Parks and Natural Areas* (2009) and the Credit River Parks Strategy (in progress)
- Purchasing components of Natural Heritage System most vulnerable to development, such as Special Management Areas
- Consideration of priority areas identified in the CVC *Greenlands Securement Strategy* (to be informed by CVC's *Natural Heritage System* (in progress)
- Significant Natural Areas that are of relatively high ecological value in the City

Current Practices: The City has, over the past decade or so, been very successful in gradually acquiring valued natural areas through dedication, purchase and other means (e.g., Hewick Meadows). Between 2008 and 2013 the City successfully acquired over 90 ha (220 ac).The priorities for acquisition to date have been along the valleylands, particularly of the Credit River, and the lakeshore. This strategic direction is confirmed in the City's 2009 Strategic Plan. In addition, other high quality natural areas outside of these priority areas have also been brought into public ownership as opportunities have arisen.

CVC supports the City of Mississauga's program to acquire important urban greenlands through the Region of Peel's Greenlands Securement Program, and also supports the City of Mississauga's planning policies that encourage and require dedication of natural heritage lands through the permitting and development process.

Best Practices: Many municipalities and conservation authorities recognize that securement of valued natural areas is an effective way to ensure their long term protection. Municipalities like the City of Toronto, City of London, and Town of Oakville all have policies in their Official Plans that are supportive of acquisition, and other approaches, to secure natural features in public ownership. In the Town of Milton, management plans for woodlands to be assumed by the Town are typically required as part of the development process.

Rationale: Securing valued natural areas in the City helps protect them from future development pressures, and also helps ensure that these areas become accessible to the public for outreach, engagement, and passive recreational uses. City ownership also means that the City can control the type(s) and extent of management to be undertaken.

STRATEGY #18: Ensure effective implementation and enforcement of Natural Heritage System and Urban Forest policies and by-laws on public and private projects

Implementation Guidance:

- Implement and enforce policies, guidelines and by-laws related to the Natural Heritage System
- Implement and enforce improved tree establishment practices on public and private lands (see UFMP Action #14 for implementation guidance)
- Increase effectiveness of tree preservation as part of private projects (see UFMP Action #18 for implementation guidance)
- Increase effectiveness of tree preservation as part of municipal operations and capital projects (see UFMP Action #19 for implementation guidance)

Improving the enforcement of natural heritage and Urban Forest policies and by-laws will require:

- City staff and contractors/practitioners working with the City to be familiar with the current and applicable policies and by-laws
- Formalization of the involvement of a qualified Arborist, Ecologist, and/or comparably qualified professional at the City, to be involved at the early planning stages of all development and infrastructure projects whether they be led by the City, a private proponent, or an external agency (e.g., such as the Ministry of Transportation) to ensure all opportunities for protection and/or replacement of trees/vegetation, and/or habitat are considered
- Requirements for use of a qualified Arborist or Ecologist, or comparably qualified professional, to be on-site periodically to supervise compliance with approved plans related to the protection or establishment of trees and/or other vegetation prior to, during and following construction
- Increasing the value of securities held (for private projects) to include coverage for tree protection as well as replacements, and starting to require comparable securities for public projects, which are only released upon final inspection by a City Arborist or Ecologist
- Additional resource requirements (or reorganization of existing resources) to ensure qualified staff are available to undertake additional review and enforcement will be required as part of implementation

Current Practices: Currently, Arborist reports are typically required as part of all private developments and site plans, and these reports are typically reviewed by a Technologist and/or Landscape Architect. On City led projects, City Arborists or Ecologists are generally consulted, but arborist reports are not always required. Arborists or Ecologists from the City's Parks and Forestry Division are typically consulted on an "as-needed" basis as determined by the individual file manager. However, opportunities for tree preservation or establishment, or naturalization, may be overlooked because City Arborists or Ecologists are not consistently involved in the early stages of the planning process, nor is a qualified Arborist or Ecologist usually involved in the site supervision prior to, during and following construction.

Best Practices: On both private and municipally-led projects, effective planning before development begins is critical to successful on-site outcomes, but does not guarantee effective implementation. However, the ability to impose conditions and require securities can help ensure compliance with approved plans. The Town of Oakville ensures enforcement by giving Town staff the authority to issue stop work orders and conduct site inspections as required, and by having a three-staged audit process that must be documented before the Town signs off. The City of Toronto is increasingly realizing the benefits of having qualified Arborists on-site during large-scale capital projects or even smaller scale maintenance operations to ensure tree-related policies and by-laws are respected.

Rationale: Working to identify opportunities for protection, enhancement, restoration and/or expansion of the Urban Forest and/or natural heritage through both public and private development projects demonstrates the City's commitment to its Urban Forest and natural heritage targets. It also presents opportunities for increasing awareness and engagement.

9.3 ENGAGING THE COMMUNITY AND BUILDING PARTNERSHIPS IN CARING FOR NATURAL HERITAGE AND THE URBAN FOREST

STRATEGY #19: Leverage social media to expand promotion and outreach related to the Natural Heritage System and Urban Forest

Implementation Guidance:

- Have Parks and Forestry work with Communications staff to use Facebook and Twitter to promote natural heritage and Urban Forest workshops, stewardship events, and other public activities, including launches of new publications and website pages, as well as the availability of updated tree protection / planting guidelines
- Post and tweet highlights from the four-year NH&UFS Update Reports (Strategy #26)
- Create short video clips on topics and issues related to the Natural Heritage System and Urban Forest (see UFMP Action #21 for implementation guidance)
- Make the City's tree inventory publicly accessible to support outreach, education and stewardship (see UFMP Action #22 for implementation guidance)

Current Practices: The City has recently updated its Forestry section on its website, and in April 2013 launched a new website for its One Million Trees 20-year program. The Forestry section on the website is well-organized and comprehensive with distinct sub-sections for: City trees and boulevards, private trees and encroachment, pests and disease management, maintenance of natural areas, stewardship (getting involved) and relevant by-laws.

The One Million Trees website is a stand-alone site (with the address "onemilliontrees.ca") and has been designed in a format that is very modern and eye-catching, with content that has been written with a broad audience in mind. It also provides updates on the number of trees planted, as well as the organizations and individuals who have planted trees. It also includes technical guidance related to how to plant trees and about species selection, as well as a link to a "tree benefits estimator". One of the strengths of this website is it provides a cohesive umbrella for a number of supporting organizations that contribute resources and information.

The City also posts an interactive map of all the natural areas and links to the current site-specific map and fact sheet for each one. This is a valuable tool that facilitates natural heritage planning, and keeps the process transparent from an information-sharing perspective. Although the City does have a street tree inventory, this inventory is out of date and has not been made available to the public through the website.

Best Practices: Websites represent a cost-effective tool for sharing a wide range of information related to a municipality's natural heritage and urban forest assets, as well as informative links to other websites. Examples of jurisdictions with very comprehensive urban forestry websites include the City of Toronto the City of Ottawa and the City Edmonton. There are now also several jurisdictions who have posted their tree inventories on-line, including the Town of Oakville, City of London and City of Ottawa. Both the City of Calgary, and the Toronto-based non-profit organization LEAF use short video clips to share information (e.g., how to plant a tree) and engage viewers in urban forestry.
Mississauga is one of the few municipalities in Ontario to post current summaries of all of its natural areas through an interactive city-wide map, and to undertake an ambitions 1 million tree program over the next 20 years., Peel Region also has an interactive map showing data on its natural areas gathered through the CVC's Natural Areas Inventory, and the City of London also launched a "Million Tree Challenge" several years ago with a local non-profit group called Reforest London.

Rationale: Given that the City's forestry-related web-based resources are already quite comprehensive, the next step is to build on these resources by expanding digital outreach by: (1) tapping into the social media through Facebook, Twitter and short YouTube videos, and (2) making the City's tree inventory readily accessible to the public. Having the tree inventory on-line could potentially be used in conjunction with the 3-1-1 forestry "hotline" to facilitate the placement of requests for assessment, removal or replacement of City trees.

STRATEGY #20: Use daily planning, operational and enforcement activities as opportunities for outreach

Implementation Guidance:

- Implement and enforce improved tree establishment practices on public and private lands through education of proponents and contractors (see UFMP Action #14 for implementation guidance)
- Increase effectiveness of tree preservation as part of private projects through education of proponents and contractors (see UFMP Action #18 for implementation guidance)
- Increase effectiveness of tree preservation as part of municipal operations and capital projects through education of partners and contractors (see UFMP Action #19 for implementation guidance)
- Educate City staff on the current policies, guidelines and by-laws related to natural heritage and the Urban Forest (per Strategy #1) to ensure the messaging to proponents and the public is consistent
- Specific initiatives identified to date include:
    - Develop colourful and clear pamphlets (using an established format) that summarize applicable legislation, scope of the various by-laws, and what some of the penalties for violation are, and make these available at the Planning & Development desk, as well as on the City's website
    - Wherever tree preservation hoarding is erected, post standard signs that indicate it is a City-mandated Tree Protection Zone and what the penalties are for obstruction

Current Practices: City staff in the Parks and Forestry Division that support by-law enforcement and stewardship consider education a key part of their job, and use face-to-face meetings as opportunities for outreach. The Division has also developed a series of pamphlets and information post cards (printed in colour, with a consistent look to them, and written in non-technical language) on key topics including: gypsy moth, EAB and the Private Tree Protection By-Law (254-12). These publications are available through the Forestry Section, and are disseminated to residents as appropriate. However, the City does not currently have one centralized document that summarizes its tree-related specifications and guidelines, or its natural heritage and urban forest-related policies, or a formalized mechanism for sharing this information.

Best Practices: More municipalities are recognizing the importance of branding and marketing their messages to compete on a level playing field with the many other sources of information and imagery people are exposed to on a daily basis. Examples include the City of Guelph's Healthy Landscapes program which has its own logo and look that appears in newspaper advertisements as well as on resources developed for this program. The City of Mississauga's One Million Trees Program is another example of a well-branded program with a unique look that carries over from the program website to the posters and pamphlets developed to date.

Rationale: This Strategy is a very cost-effective approach to outreach that simply requires City staff to be well-versed and consistent in their messaging related to the policies, by-laws and guidelines related to natural heritage and urban forest planning. Using day-to-day interactions with various development proponents, contractors, landowners, and others as opportunities for education and outreach is one of the most effective ways to share this information because the person or people involved have an immediate interest in understanding it. It also sends a message that the City is committed to its Natural Heritage System and Urban Forest targets.

STRATEGY #21: Continue to pursue and expand current outreach and stewardship programs with various stakeholders

Implementation Guidance:

- Improve and maintain awareness about current Natural Heritage System and Urban Forest policies, by-laws and technical guidelines (see UFMP Action #23 for implementation guidance)
- Continue to support and expand targeted stewardship of local business and utility lands (see UFMP Action #24 for implementation guidance)
- Continue to support and expand targeted engagement of youth and stewardship of school grounds (see UFMP Action #25 for implementation guidance)
- Continue to support and expand targeted engagement of residents and community groups, and stewardship of residential lands (see UFMP Action #26 for implementation guidance)
- Develop a database providing the ownership and management contacts of large corporate properties (i.e., exclude residences) to facilitate outreach initiatives aimed at greening the management practices on large "campus-type" land holdings
- Develop stewardship material and a program specifically directed to corporations with large private land holdings, that outlines the benefits of naturalizing and low-energy maintenance practices, and the role those lands can play in supporting the Natural Heritage System and the broader Green System.
- Continue to work with various partners to undertake stewardship on public lands (see UFMP Action #27 for implementation guidance)
- Design and operate a City Arboretum / Memorial Forest for the community that provides a place for spiritual connections to nature (see UFMP Action #28 for implementation guidance)
- Specific action items identified to date include:
    - hold information sessions for local arborists and the development community to share current policies, guidelines, bylaws and technical specifications
    - hold workshops in neighbourhood community centres and places of worship
    - encourage broader use of established programs in schools, such as TRCA's "Watershed on Wheels" program that comes to the school for scheduled half day time periods, as well as CVC's and CH's educational programs
    - work with large open space land owners/managers and expand the relationship with Partners in Project Green and Credit Valley Conservation's Greening Corporate Grounds Program by working to engage new businesses around the airport and beyond
    - support stewardship programs targeted to schools
- Build on the Significant Tree Program by making the list of trees publicly available and formalizing criteria for which trees should be recognized

SIGNIFICANT TREES

- Promote the ongoing Sustainable Neighbourhood Retrofit Action Plan (SNAP) pilot project in the Applewood area more widely
- Use the "Let Your Green Show" campaign to help promote the NH&UFS

Current Practices: The City has held open houses on key topics (e.g., emerald ash borer), typically at a City venue (such as City Hall or the Living Arts Centre). The City has also been involved in some outreach to youth through its various stewardship initiatives. However, targeted workshops to particular interest groups, as well as meeting people in their own community centres, has not been normal practice.

Best Practices: This Strategy includes a range of outreach tools targeted to certain groups because of their ability to influence the development of Mississauga's landscape. Examples of relevant best practices include:

- emphasis on the value of the Natural heritage System as a whole and its functions as opposed to looking at individual natural areas
- workshops on specific topics or technical issues (e.g., native plant selection, tree planting tips, etc.) like those offered by the Town of Oakville and City of Brampton as well as the non-profit organization LEAF in the Greater Toronto Area and beyond
- presentations and workshops provided where people work or congregate for social or religious reasons, rather than having them come to a City Hall or comparable location (e.g., City of Guelph Healthy Landscapes program)
- TRCA's "Watershed on Wheels" that has been designed to meet Grades 1 through 8 Ontario science and technology curricula expectations

Rationale: Particular groups identified as priorities for targeted outreach related to the Natural Heritage System and Urban Forest include local arborists, local developers, private open space uses, and youth. These groups were identified as priorities because it was felt they might have a disproportionate opportunity to support NH&UFS objectives. Providing these groups with presentations / workshops tailored to meet their interests and needs, and provided in a venue familiar to them, will facilitate the information sharing process.

STRATEGY #22: Develop and undertake a campaign to promote the City's Natural Heritage System

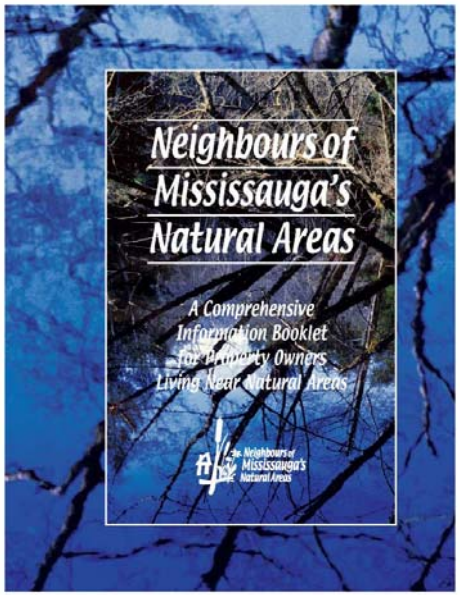
Implementation Guidance:

- Create short video clips on topics and issues related to the Natural Heritage System (see UFMP Action #21 for implementation guidance)
- Implement a classification system in the City that clearly distinguishes publicly accessible natural areas (e.g., Rattray Marsh, Erindale Woodlot, Creditview Wetland, Cawthra Woods) from active parks
- Distinguish public Significant Natural Areas from public active use parks through a promotional campaign that includes:
    - a logo and brand for Mississauga's Natural Heritage System to be used for all signs and interpretive materials, as well as information maps and brochures
    - the development of a conceptual map of all the City's accessible Significant Natural Areas that groups them into several categories based on their locations (e.g., lakefront, Credit River, etc.)
    - materials (on-line, hardcopy pamphlets, signs) that highlight some of the unique ecological attributes of these areas, as well as their sensitivities, and provide clear guidance on appropriate types of uses
- Revamp the "Neighbours of Mississauga's Natural Areas" booklet, in both a PDF/on-line format and a hardcopy format, to:
    - place more emphasis on the value and functions of the Natural heritage System as a whole and less on the individual areas
    - incorporate the new map of the City's Natural Areas
    - highlight acceptable, and unacceptable, activities in these public areas
    - include information on ecosystem services, as well as the relationship between the Natural Heritage System and the Urban Forest
    - highlight applicable policies and by-laws (e.g., encroachment by-law, tree protection by-laws)
    - make it shorter, more visually appealing
- Work with local user groups (e.g., cross-country ski club, fishing club, cycling club) to explore opportunities for joint promotion and stewardship through Significant Natural Areas management

Current Practices: The City of Mississauga has comprehensive mapping of its Natural Areas as well as an interactive map that allows for current site-specific mapping and a fact sheet on each individual area to be downloaded. The website also provides a list of Natural Areas and open spaces where restoration and/or naturalization work is underway. However, the City's public Natural Areas are not really promoted in a comprehensive way beyond the information posted on a few parks on the City's website, nor are they clearly distinguished from the City's active use parks. The City and CVC have developed colourful information brochures on selected parks and Natural areas, such as the Lakefront Promenade Park and Marina brochure.

Best Practices: The City of Kitchener is one of the few cities to clearly distinguish its publicly accessible natural areas from its active recreational parks. Natural areas are managed very differently from active parklands, and also have their own promotional program. Kitchener's Natural Areas Program is designed to engage the community in environmental stewardship projects, educate people about Kitchener's natural areas, and create opportunities for people to experience nature in the city. As discussed throughout the NH&UFS, emphasizing the value and functions of the Natural heritage System as a whole, rather than simply highlighting selected areas, is also an important conceptual shift to promote.

Rationale: Clearly distinguishing publicly accessible natural areas from active recreational parks facilitates internal management and also provides a good framework for marketing Natural Areas in the city, and engaging the community in their stewardship. Making people aware of the value and functions of the Natural Heritage System "in their backyards" will encourage support for investments into the protection and management of this system.



STRATEGY #23: Build on partnerships with the Region, agencies, institutions and nearby municipalities to share information, pursue joint initiatives, and coordinate responses to shared environmental threats

Implementation Guidance:

- Partner with local agencies and institutions to pursue shared research and monitoring objectives (see UFMP Action #29 for implementation guidance)
- Build on existing partnerships with the Region of Peel and nearby municipalities to facilitate information sharing and coordinated responses to issues such as climate change and pest infestations as well as noxious plant disease management (see UFMP Action #30 for implementation guidance)
- Work with the local Conservation Authorities to share monitoring information in support of Significant Natural Area management, as well as outreach and promotion

Current Practices: The City of Mississauga has been an active partner in the Peel Region Urban Forest Working Group since 2009 and continues to benefit from regular meetings where information and ideas are shared, along with some joint initiatives and resources. The City has also collaborated with adjacent municipalities and the Canadian Food Inspection Agency on cross-boundary invasive pest issues (e.g., Asian long-horned beetle control, and more recently, emerald ash borer research), but these collaborations are typically *ad hoc*.

Although there is interest in building research partnerships, none have been established to date beyond a partnership with University of Toronto in Mississauga's intern program which includes a short-term research component.

Best Practices: Although some municipalities try, it can be challenging to coordinate partnerships with academic and/or research institutions to conduct applied research that addresses selected local natural heritage and urban forest issues. In part, this is because many of the natural heritage and urban forest questions needing to be answered are complex and therefore require many replications to be studied over many years, which align well with a student`s need to finish a two or three year program. It is also a best practice to seek co-benefits from the sharing of resources to undertake collaborative research among jurisdictions.

Rationale: Conducting and analyzing research projects is outside the mandate and scope of the City`s Parks and Forestry Division. However, there is a need for site-specific assessments of the environmental factors that influence the longevity of street and park trees in Mississauga, and better understanding of why trees do better in some areas than others. Any research that would begin to provide more information in this regard would be very helpful to City staff.

STRATEGY #24: Pursue funding from a range of sources, and support non-profit organizations and institutions doing the same

Implementation Guidance:

- Broaden the pursuit of funding opportunities to encompass all those identified in **Appendix G** in collaboration with partners where appropriate, and continue to update this table as appropriate
- Provide support to schools, non-profit groups and businesses in their pursuit of funding opportunities that align with the City's natural heritage and urban forest objectives
- Explore opportunities to partner with different departments in the City to pursue different funding avenues

Current Practices: The Parks and Forestry Division has been successfully pursuing funding and resource sharing opportunities through Evergreen, TD Green Streets, and various partnerships. The partnership with Evergreen is a good example of the cross-pollination between different stewardship initiatives. The partnership with Evergreen began in 2004 and now includes annual activities in more than 10 City parks. Evergreen also participates in local Earth Day events and the Mississauga Fall Fair, has partnered with the University of Toronto in Mississauga to plant 22 sites on campus, and launched the Greening Corporate Grounds campaign with CVC.

Best Practices: Although few municipalities can afford it, it is ideal to have a staff person dedicated, at least on a part-time basis to pursuing and coordinating funding opportunities. The City of Kitchener has a Natural Areas Coordinator who, among other things, pursues funding. In the City of Guelph, their Healthy Landscapes Technician is largely responsible for pursuing funding. In the City of London, staff support members of the local ReLeaf organization, who are very effective at marketing themselves and obtaining supporting funding.

Rationale: For municipalities, resources are always a limiting factor in pursuing initiatives related to natural heritage and the Urban Forest. However, there are a number of funding sources available to the City of Mississauga (see **Appendix G**) (and other public or non-profit organizations) that can facilitate the pursuit of engagement or stewardship activities.

Figure 18. Example of a rebate offered through LEAF for native tree purchases at selected nurseries

STRATEGY #25: Identify cost-effective incentives to support the implementation of Natural Heritage System and Urban Forest objectives

Implementation Guidance:

- Increase promotion of the request-based street tree planting program
- Ensure Mississauga's 'Urban Design Awards program includes recognition for enhancement and expansion of the Natural Heritage System and the Urban Forest
- Explore the feasibility of working with LEAF to offer rebates on native tree and shrub purchases at local nurseries
- Continue to explore the feasibility of a credit or incentive program linked to maintenance of a certain proportion of permeable surfaces on one's property
- Consider and explore other incentives as ideas and opportunities arise

Current Practices: The City currently provides street trees in front of residences at no cost upon request, and is also in the process of developing an Environmental Grants Program as well as an Environmental Design Award (per the LGMP) with both due for launch in 2014.

Best Practices: There are a variety of incentives used in different jurisdictions to engage the community in implementation of natural heritage and urban forest objectives. One of the most common, as in Mississauga already, is the provision of a free tree for the front yards on request. The City of Mississauga is currently exploring the feasibility of a unique incentive via a credit or incentive program tied to maintaining permeability (i.e., unpaved) over a certain proportion of private properties) to recognize infiltration function and contribution to storm water management. There are also various incentives (e.g., free trees, free labour), associated with many of the stewardship programs identified in Appendix D of the UFMP.

Rationale: Incentives are another useful tool for engaging those who may not otherwise be interested in supporting natural heritage and urban forest objectives. Creative incentives also provide an opportunity for education, and can make a connection between the incentive and the value or benefits provided by the service.

9.4 TRACKING THE STATE OF THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

STRATEGY #26: Track and report on the status of the Natural Heritage System and Urban Forest

Implementation Guidance:

- Adopt the monitoring framework developed for Mississauga's Natural Heritage System and Urban Forest (see UFMP Action #1 and Appendix A for implementation guidance), which aligns with the targets identified in **Section 6**
- Monitor the status of the Natural Heritage System and the Urban Forest with support from the Region, local agencies and other partners (see UFMP Action #2 for implementation guidance)
- For the annual Natural Area Survey updates:
    - review Conservation Management Plans to identify any recent management actions that require inspection and/or monitoring
    - re-structure the annual Natural Area Survey updates so they focus only on communicating major changes that may require urgent management responses, with a more comprehensive city-wide trend analysis/report once every four years
    - annual updates should be brief (approximately 1 to 15 pages) and in non-technical language to communicate the state of the Natural Heritage System and any new management concerns to Council, Senior Managers and external stakeholders
    - management needs identified in annual updates should be transferred to Conservation Management Plans (see UFMP Action #20) to enable prescriptions to be implemented on a timely basis
- For Natural Heritage System monitoring, draw on information and summaries from CVC and TRCA's ongoing aquatic and terrestrial monitoring programs
- For the Urban Forest monitoring:
    - assess Mississauga's canopy cover (using leaf on aerial satellite imagery) once every four years
    - assess street and park tree species diversity and condition using the current street and park tree inventory once every eight years

- Consolidate findings from annual Natural Area Survey updates and canopy cover analyses into to a State of the NH&UFS report once every four years (i.e., in early 2022, 2026, 2030 and 2034) that is concise, includes images and graphs, and clearly communicates the status, importance and outstanding activities within the Natural Heritage System and Urban Forest.
- Circulate highlights, or the report in its entirely, to all City departments, the Environmental Advisory Committee, Council, stakeholders and the community

Current Practices: Natural areas in each quarter of the City are surveyed and reported on annually, so a complete review of natural areas across the city is completed every four years. Annual reports are comprehensive, written in relatively technical language, and used to update the statistics for the entire City. The Natural Areas Survey database is also updated as part of this process and is used to generate fact sheets for each area. Although much valuable information is collected, it is not effectively disseminated to decision-makers, and is not consistently communicated to operations staff in terms of management needs.

To date, the GIS-based canopy cover assessments for the City have been undertaken with the Region of Peel Urban Forest Working Group. It has not been determined if this arrangement will continue or if the City will assume responsibility for this work. The City`s street tree inventory is to be updated and maintained more regularly as part of this Strategy, and once updated will serve as the basis for monitoring.

Currently Mississauga conducts a high level performance review of the Living Green Master Plan actions once a year, but there is no monitoring that jointly assesses the Natural Heritage System and the Urban Forest.

Best Practices: To the best of our knowledge, no other Ontario municipality has a natural heritage database that reflects over 15 years of monitoring, or is as comprehensive as the City's. Thus Mississauga is in a unique and desirable position in terms of understanding its natural heritage features. Ideally, annual update information would be incorporated into an adaptive management process where new critical management issues are incorporated into Significant Natural Area Conservation Management Plans annually, with a comprehensive four-year summary.

There are a number of tools available to assess and monitor urban forest canopy cover, but the method used by the Peel Urban Forest Working Group (in collaboration with experts from the USDA Forest Service) is the most accurate and comprehensive method currently available, and is recommended going forward.

Trends, positive and negative, should be efficiently communicated to City staff, decision-makers within the City, and external stakeholders to maintain and improve awareness of the Natural Heritage System and Urban Forest, and ensure the reasons for ongoing investment and management are understood.

Rationale: The Strategy vision, guiding principles and strategic objectives are intended to set the strategic direction for the 20-year period, and regular performance reviews integrated within this framework will allow for both the state of the Natural Heritage System and Urban Forest in Mississauga to be assessed, along with the status of the implementation of the NH&UFS Strategies (and supporting UFMP actions).

More effective use and reporting of the Natural Heritage System and Urban Forest monitoring findings will: provide clear measures of the state of the system, raise awareness and interest, contribute to greater involvement of all City departments in natural heritage and urban forest protection and management, and result in increased return on the investment made in monitoring and reporting.

10 OVERVIEW OF IMPLEMENTATION

An implementation guide for the NH&UFS has been developed in support of this Strategy but is provided as a separate stand-alone document, facilitating its update as required over the 20 year period. The guide identifies, for each of the 26 recommended Strategies:

- the timing for implementation[48]
- which City department(s) and/or section(s) will lead its implementation
- key implementation components (taken directly from this Strategy document)
- estimated new resource requirements (including staffing), and
- potential external partnerships and/or funding.

The LGMP provides guidance for priority setting with respect to "green" strategies as follows:

- Build on Environmental Success (i.e., on existing standards, plans, policies, partnerships)
- Raise Public Awareness
- Collect Baseline Data[49]
- Understand Mississauga's Energy Future
- Build Partnerships and Collaboration

These priorities were considered in the NH&UFS Implementation Guide development.

The new resource requirements identified for the NH&UFS amount to $2,141,713 in total over the entire 20 year period, with the bulk of these costs linked to a new Environmental-Natural Heritage Planner position.

The breakdown by four year Strategy period is provided below:

- 2014 – 2017: $339,281
- 2018 – 2021: $443,108
- 2022 – 2025: $463,108
- 2026 – 2029: $448,108
- 2030 – 2033: $448,108

PLANNING STRATEGIES: The bulk of the new costs associated with the NH&UFS (about 80%) are for the creation of a new Environmental–Natural Heritage Planner position. This individual will require expertise in natural heritage and urban forest planning, as well as some background in ecology and arboriculture, and will be needed for the implementation of most of the planning related Strategies. They will also support implementation of some of the protection / management and engagement Strategies. The location of this position (i.e. which City department they will work in) is to be determined.

PROTECTION AND MANAGEMENT STRATEGIES: None of these Strategies have any related new budget or staffing requirements in the NH&UFS, however this is because the new costs related to many of these strategies are identified through the UFMP, which estimates $2,866,970 of new budget being required over the 20 year period of the Plan, primarily for management-related activities.

These costs are largely related to updates to or shifts in operational activities that require an initial investment in order to secure medium to long term gains for the health and sustainability of the Urban Forest and Natural Heritage System (e.g., updates to the street and park tree inventory, investment in a pest management plan, etc.) and the hiring of two seasonal staff and two students to support broader stewardship initiatives on both public and private lands.

ENGAGEMENT STRATEGIES: About 20% of the new costs associated with the NH&UFS are related to expanding outreach and education to a range of stakeholders and the community at large. Most of Mississauga's Natural Heritage System and Urban Forest are located on private property, therefore having local landowners and residents "buy in" to this Strategy and its objectives, and help implement them, will be critical. Notably, some additional new costs associated with expanded stewardship efforts are identified in the UFMP Implementation Guide.

[48] Timing windows are aligned with the five four-year cycles for project review and monitoring over the Strategy's 20 year time frame (i.e., 2014 – 2017, 2018 – 2021, 2022 – 2025, 2026 – 2029, 2030 – 2033).

[49] Although the LGMP notes that baseline data have already been collected for natural areas and the urban forest, and indeed the data needed to assess the indicators identified in the LGMP have been, there are additional indicators that have been identified through the NH&UFS that require additional metrics to be measured.

Recommended items with associated costs include pamphlets (on-line and hardcopy) that summarize by-laws applicable to the Urban Forest, signs and hoarding identifying Tree Protection Zones (on public and private projects), and a campaign to promote the value of the City's Natural Heritage System. All these items are focused on either (a) educating people about existing policies and legislation in place to protect and/or regulate activities within the Natural Heritage System and Urban Forest, or (b) fostering a better understanding of the value of the Natural Heritage System and Urban Forest as essential green infrastructure and key contributors to quality of life in Mississauga.

TRACKING STRATEGY:
A key part of this strategy will be monitoring its progress (through the framework provided in the UFMP Appendix A, per Strategy #26). Updating Conservation Management Plans annually and comprehensive reviews every four years will facilitate the implementation of an adaptive management approach. The four-year review cycle also aligns with the City's budgetary cycles to facilitate planning tied to available budgets and current priorities, and will allow for targeted budget requests that correspond to advancing specific strategies within these four year windows.

Most of the work associated with monitoring the City's Natural Heritage System and Urban Forest is expected to be undertaken by City staff with some support from the local conservation authorities (largely CVC) and the Region.

At present, local conservation authorities have fully funded aquatic and terrestrial monitoring programs that can be drawn on to support City objectives, however, this may not always be the case and it is possible that in the future additional monitoring funds will be required to ensure continued data acquisition and analysis. Currently, the only cost identified with monitoring Strategy #26 is related to the publication of an overview document once every four years that summarizes the state of the Natural Heritage System and Urban Forest, as well as highlights related to these areas over the four year period.

Tracking the status of the various criteria and indicators identified for both the Natural Heritage System and the Urban Forest (as provided in Appendix A of the UFMP), and assessing progress towards the established targets (**Section 7** and Appendix A of the UFMP), will be critical to the effective implementation of this Strategy. Having a four-year review period will also allow for adaptive management, where appropriate.

As is evident from the discussion above, although the NH&UFS and UFMP are each stand-alone documents with their own Implementation Guides, effective implementation of this Strategy will require not only coordination with implementation of the UFMP, but that both are funded.

This allocation of funds is a cost-effective and necessary investment in Mississauga's sustainability. This investment recognizes that the City's continued growth and economic development are reliant on and enhanced by a healthy Natural Heritage System and Urban Forest within the city, and beyond, and will help ensure the physical and mental well-being of the community, while also helping Mississauga mitigate and adapt to climate change.

11 GLOSSARY OF TECHNICAL TERMS

Adaptive Management: A systematic process for continuously improving management policies and practices by learning from the outcomes of previously employed policies and practices. In active adaptive management, management is treated as a deliberate experiment for the purpose of learning.

Biodiversity (short for Biological Diversity): The variety of life and its processes; it includes the variety of living organisms, the genetic differences among them, the communities and ecosystems in which they occur, and the ecological and evolutionary processes that keep them functioning, yet ever changing and adapting (*Saving Nature's Legacy – Protecting and Restoring Biodiversity*, Noss and Cooperrider 1994).

Buffer: Areas between protected natural areas and the surrounding landscape or seascape which help protect the network from potentially damaging external influences and which are essentially transitional areas.

Canopy Cover: A measurement of the areal extent of vegetation foliage, typically measured in percentage of total land area. It can include both trees and shrubs, or just trees. For example, the City of Mississauga's tree canopy cover is estimated at 15% of the total land area of the city.

Carbon sequestration: Carbon sequestration is a biochemical process by which atmospheric carbon is absorbed by living organisms, including trees, soil microorganisms, and crops, and involving the storage of carbon in soils, with the potential to reduce atmospheric carbon dioxide levels.

Ecosystem services: A term used to describe the processes of nature needed to support the health and survival of humans. While ecological goods and services are required and used by all living organisms, they are primarily considered in terms of their value (quantified or not) to humans. Ecological services include processes such as air and water purification, flood and drought mitigation, waste detoxification and decomposition, pollination of crops and other vegetation, carbon storage and sequestration, and maintenance of biodiversity. The products generated by these services include fundamental items like clean air, fresh water, food, fiber, timber, and medicines, as well as less tangible items like mental health and spiritual well-being.

Family: For plants, the family includes plants with many botanical features in common and is the highest classification normally used. Modern botanical classification assigns a type plant to each family, which has the distinguishing characteristics of this group of plants, and names the family after this plant.

Genus: For plants, the genus is the taxonomic group containing one or more species. For example, all maples are part of the genus called *"Acer"* and their Latin or scientific names reflect this (e.g. Sugar maple is called *Acer saccharum*, while Black maple is called *Acer nigrum*).

Geographic Information System (GIS): An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

Greenhouse gases: Gases that contribute to the greenhouse effect, i.e., hinder heat radiation from escaping through the atmosphere.

Green Infrastructure: A concept originating in the mid-1990s that highlights the contributions made by natural areas to providing important municipal services that would cost money to replace. These include storm water management, filtration of air pollution and provision of shade. The Green Infrastructure Ontario Coalition has defined this term as "natural vegetation, vegetative systems, soil in volumes, and qualities adequate to sustain vegetation and absorb water, and supportive green technologies that replicate ecosystem functions".

Heat Island Effect: The urban heat island effect describes the documented phenomenon of urban areas being significantly warmer than the surrounding rural areas largely due to the extent of built structures and paved areas. The temperature difference usually is larger at night than during the day, is most apparent when winds are weak, and is noticeable during the summer and the winter.

Invasive Species: A plant, animal or pathogen that has been introduced to an environment where it is not native may become a nuisance through rapid spread and increase in numbers, generally to the detriment of native species.

Mitigation: Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards

Monitoring: Regular measurement and/or evaluation of an area, ecosystem, habitat, community, species, etc. to identify changes in abundance and/or quality, usually in response to a management action or a predicted impact (e.g. development). .

Native Species: A species that occurs naturally in a given geographic region that is present only through natural processes.

Natural Capital: An economic metaphor for the limited stocks of physical and biological resources found on earth, and of the limited capacity of ecosystems to provide ecosystem services.

Naturalization: The process by which an non-native species becomes a (new) part of a local flora or fauna, reproduces and spreads without human assistance, or a management prescription that involves cessation or reduction of deliberate intervention, thus allowing the development of a more natural plant and animal community.

Qualified Arborist: A person who maintains his or her certification through the International Society of Arboriculture and/or the American Society of Consulting Arborists as a competent practitioner of the art and science of arboriculture.

Resilience: In ecology, resilience is the capacity of an ecosystem to respond to a perturbation or disturbance by resisting damage and recovering quickly. Such perturbations and disturbances including random variable events such as fires, flooding, windstorms, insect population explosions, and human activities such as deforestation and the introduction of exotic plant or animal species.

Right-of-Way: A portion of land granted through an easement or other legal mechanism for transportation purposes, such as for a rail line, highway or roadway. A right-of-way is reserved for the purposes of maintenance or expansion of existing services. Rights-of-way may also be granted to utility companies to permit the laying of utilities such as electric power transmission lines (hydro wires) or natural gas pipelines.

Street Trees: Municipally owned trees, typically found within the road right-of-way along roadsides and in boulevards, tree planters (pits) and front yards.

Sustainability: It refers to the adequate access, use and management of the natural resources, to ensure that the people of present and future generations are able to meet their basic needs on an uninterrupted basis. Pattern of behaviour that guarantees for each of the future generations, the option to enjoy, at the very least, the same level of welfare enjoyed by the preceding generation. Emphasis is placed on the intergenerational equity of development.

Urban Forest: All trees, as well as the soils that sustain them, located on public and private property within a given jurisdiction. This includes trees in natural areas as well as trees in more manicured settings such as parks, yards and boulevards. Some definitions also include shrubs, but because the urban forest canopy cover assessment completed for the City in 2011 excluded shrubs, they have also been excluded from this definition.

Watershed: An area of land that feeds water to a river, draining through the landscape into tributaries and main river channels. Also called “catchments”, “drainage basins” or “river basins”.

APPENDIX A
PHASE 1 STAKEHOLDER AND PUBLIC CONSULTATIONS SUMMARIES

Mississauga Natural Heritage & Urban Forest Strategy
Phase 1 Stakeholder Session #1 – Aboriginal Groups
November 20th, 2012 at 1:00 - 3:00 p.m.
Mississauga City, 201 City Centre Drive, 9th Floor, Rick Hansen Room

OVERVIEW

Individual discussions were held on November 20th with aboriginal groups to discuss Mississauga's Natural Heritage & Urban Forest Strategy. Invitations were provided to seven aboriginal organizations represented in the City of Mississauga. A representative from Six Nations of the Grand River and a representative from the Peel Aboriginal Network participated in these discussions. These meetings began with welcoming remarks from Olav Sibille (Project Manager, City of Mississauga), followed by a presentation on the project given by Mirek Sharp (Project Lead for the North-South Environmental consulting team). Following the presentation, Susan Hall from LURA Consulting facilitated the discussion and solicited input from the participants. During the sessions, participants were asked to provide their input to the strategy vision, guiding principles, as well as opportunities for engagement and implementation.

SUMMARY

The key themes and discussion points from the aboriginal group discussions are summarized below.

Input to Vision and Guiding Principles

Participants noted they would take the comment forms back to their organizations to seek input. There was little direct comment on the vision and guiding principles at these sessions. Both participants liked the terms protect, enhance, manage and expand. One participant encouraged use of strong policy language, such as the word 'compel'.

Key Discussion Points

- **Clarity of terminology:** The importance of using clearly defined terms (e.g., natural hazard lands, etc.) in a consistent manner was emphasized.
- **Recognition of aboriginal cultural and ancestry:** Participants identified the need to recognize aboriginal culture and ancestry as part of natural heritage strategy. Hunting and fishing were noted as opportunities to continue aboriginal cultural heritage practices particularly along the Credit River. Signage to recognize footpaths or other historically significant features was also suggested.
- **Support for City initiatives:** In general, participants were pleased with the work being undertaken by the City. They are supportive of City's 'green plans and initiatives', including the Living Green Master Plan, Emerald Ash Borer Management Plan, Credit River Park Strategy as well as this Strategy.
- **Archaeological connections:** Aboriginal groups noted that they were particularly interested in areas with aboriginal archaeological sites.
- **Consultation approach:** One participant raised a concern that it may be a challenge for aboriginal groups to respond within the Strategy's time frame, which they considered tight. It was suggested that the consultation approach be made available to participants to share with their networks.
- **Best practices for enhancing tree canopy:** Tree planting programs were considered important. One participant suggested looking at the City of Toronto's model for a tree bylaw and the City of London`s One Million Tree Challenge.
- **Supporting aboriginal initiatives:** One participant noted they had a reforestation program underway that aligns with the objectives of this process and overall greening in Ontario. The Peel Environmental Network representative discussed programming they are offering to teach students in schools and through workshops about Aboriginal history and philosophy that centres on the interrelationship of humans and the natural environment to foster stewardship.
- **Outreach and education**: Participants noted the importance of outreach and education, and connecting people with nature. Suggestions for outreach included: visiting community events and places with pop-up tents, hosting guided hikes, educating residents about the aesthetic perceptions associated with natural features, promoting the benefits of

naturalized landscapes, using numbers and tracking (monitoring) to communicate key messages, and using creative tools to educate about the value of connected natural river systems such as floating ducks moving downstream (e.g., City of Vancouver).

- **Spirituality and the web of life**: One participant noted the importance of spirituality and recognizing the spiritual value of our natural heritage systems, as well as of promoting the `web of life' philosophy and teachings that all elements of nature and people are connected and impact each other.

Mississauga Natural Heritage & Urban Forest Strategy
PHASE 1 Stakeholder Sessions #2, #3, #4 and #5
November 20th, 2012 at 3:30 - 5:00 p.m.
November 22nd, 2012 at 10:00 a.m. - noon, 1:00 - 3.00 p.m. & 3:30 - 5:00 p.m.
Mississauga City, 201 City Centre Drive, 9th Floor, Rick Hansen Room
Mississauga Civic Centre, Committee Room C
Mississauga Living Arts Centre, Bank of Montreal Room

OVERVIEW

Four stakeholder sessions were held over November 20th and 22nd to discuss Mississauga's Natural Heritage & Urban Forest Strategy. The number of participants at each meeting ranged from four to 21. These sessions were held for a wide range of external stakeholders representing: government and agencies (including adjacent municipalities and local conservation authorities), committees to City Council, educational institutions, environmental groups, community groups and residents associations, recreational facilities, business and development organizations, local utilities and transit, and arboriculture firms. Notably, no representatives from business development organizations were able to attend the Phase 1 sessions. Each session began with welcoming remarks from Olav Sibille (Project Manager, City of Mississauga), followed by a presentation on the project given by Mirek Sharp (North-South Environmental, Project Lead for the consulting team). Following the presentation, Margot Ursic from Beacon Environmental (November 22nd) or Susan Hall from Lura Consulting (November 20th) facilitated the discussion and solicited input from the participants. During the sessions, participants were asked to provide their input to the strategy vision, guiding principles, as well as opportunities for engagement and implementation.

The key themes and discussion points from the Phase 1 stakeholder meetings #2 through #5 are summarized below.

SUMMARY

Input to Vision and Guiding Principles

Generally participants supported a vision that included the words *protect, enhance, manage and expand*. Additional suggestions for vision and guiding principle elements included:

- Ecological, holistic, systems thinking; connectivity;
- Balancing protection of natural areas with economic development;
- 'Compel' and 'encourage' as applicable;
- Universal design and accessibility;
- Public education;
- Increasing value and pride in the natural environment; stewardship;
- Linking culture and nature; linking nature with human health;
- Habitat and biodiversity;
- Relationships between land uses;
- Financial aspect of sustainability;
- Sustainable landscapes – naturalized, low maintenance;
- Innovative thinking; and
- Consideration of urban agriculture and/or community gardens.

Key Discussion Points

- **Accessibility**: Participants representing the Accessibility Committee noted that accessibility issues, such as site design and appropriate set-backs, must be considered as part of the strategy.
- **Balance City`s environmental protection and prosperity goals:** One participant commented on the importance of balancing natural area protection goals with economic development goals. They noted that great green spaces can attract business; however, too many environmental constraints and delays related to the permitting process can discourage businesses from locating in a particular municipality.
- **Importance of numbers and tracking (monitoring):** Several participants inquired about the different statistics provided regarding levels of

natural area coverage and tree canopy cover, and emphasized how it will be important to present these baseline data clearly and consistently. Some participants also inquired about the extent to which gains and losses in natural areas and tree cover is tracked, and indicated it would be helpful to the City and the community to have a good understanding about how these are changing over time.

- **Looking to best practices:** Many stakeholders supported the importance of looking to other municipalities or organizations for guidance. Examples provided include: the City of Toronto and the Town of Aurora regarding tree bylaws, and the Town of Oakville regarding urban forest management and community engagement. One participant noted that members of council in Mississauga are particularly interested in comparisons with other municipalities and encouraged the project team do integrate these as a way to gain support from Council.
- **Recognition of cultural heritage:** Several participants identified the importance of recognizing the City's natural and cultural history, and their interrelatedness. Areas of cultural significance were also identified as a potential opportunity for natural heritage protection and/or enhancement as areas with cultural value may also have natural heritage value.
- **Recognition of mental health benefits:** There was a discussion about the mental health benefits of natural heritage. It was suggested that the Strategy should look into new research in this area and make clear links between sustaining natural heritage and sustaining human health.
- **Importance of clear messaging and community engagement:** Many participants felt that it will be essential to communicate the Strategy clearly, and engage people in its implementation, for it to be successful. It was noted that people are willing to contribute and will do so when they feel inspired and have the guidance they need.
- **Importance of outreach and education, particularly to youth**: Many stakeholders felt that effectively engaging a wide range of stakeholders and the public would be critical to the success of this strategy, and the health of the natural environment in Mississauga. It was acknowledged that both individual and institutional land owners have important roles in environmental stewardship and expansion, as they own most of the land in the City. It was felt quite strongly that youth need to be more broadly engaged in the development of the strategy and the implementation of future environmental natural heritage actions, and engaged in hands-on outdoors activities.
- **Suggestions for engaging the community:** Ideas presented for community engagement include: focused education and awareness activities for developers and new homeowners to help prevent tree removals when building new homes; improved awareness of the value of natural assets, including concrete numbers to raise the profile of these assets; public education on tree watering and tree maintenance; and better maps and signs that advertise the local natural heritage.
- **Fostering collaboration between organizations**: There are many organizations, including conservation authorities, municipalities, and other agencies that share the responsibilities surrounding natural heritage. The strategy should recognize those connections and identify ways to build on them.
- **Importance of regulation and enforcement**: Participants noted the importance of strong regulation as a companion to comprehensive outreach and education.
- **Ideas for strengthening regulation**: Suggestions made for strengthening protection of natural heritage and the urban forest include: tightening Mississauga's Private Tree Protection By-law (254-12), expanding the Province's Greenbelt designation into the City (or something comparable), using the cultural landscape designation and the site plan application process to protect trees and natural areas, designating core natural heritage features as well as supporting features, and having more resources for by law enforcement.
- **Concern about inadequate enforcement**: Several participants expressed concern that the City does not have enough staff to fully enforce the various by-laws and regulations it currently has in place.
- **Value of ecological corridors and connections:** Ecological corridors and connectivity were identified as important components of the strategy, and key to sustaining the Natural Heritage System. Gaps in terrestrial connectivity in Mississauga were recognized. Suggestions for improving connectivity included looking at roadsides / transportation corridors and hydro corridors. The importance of building and maintaining connections between people and the nature around them was also discussed.
- **Need for creative thinking to identify opportunities for enhancement:** There was discussion in several stakeholder sessions about the need to think creatively about opportunities for natural heritage enhancement

because of the fact that Mississauga is now almost entirely built out and will be primarily growing through intensification and redevelopment. Suggestions included looking at a wide range of opportunities including the supportive functions of manicured parks and open spaces, landscaped areas in various land use types (e.g., residential, commercial and industrial areas).

- **Need to integrate "green" into built-up areas using the latest tools and technologies:** Recognizing the fact that Mississauga is largely urbanized and entirely built out, several participants pointed to the need to integrate trees and naturalized spaces into built-up areas (e.g., green roofs on buildings, treed islands in parking lots, storm water management areas). This should be done both to connect people to green spaces in tangible ways (e.g., edible landscaping), and bring the many benefits of green spaces to areas where these elements are currently lacking.
- **Using trees and natural areas to help manage storm water**: A couple of participants noted that opportunities to quantify the contributions of trees and natural areas to improved storm water management functions in the City should be explored. Another participant noted that the anticipated impacts of climate change should also be considered in this regard (i.e., greater frequency of more sudden and intense storms).
- **Need to consider climate change:** Several participants noted the importance of considering climate change in the Strategy, including how it will impact selection of trees for planting and management of natural areas.
- **Changing approaches in invasive species management**: It was noted by one participant that some invasive and removal protocols have evolved, meaning that the technical training of those involved in this work needs to keep pace with such developments.
- **Considerations related to hydro corridors**: When considering opportunities for naturalizing associated with hydro corridors, a participant representing a hydro company noted several issues that require consideration, including: clearances for height and set-backs, existing standards, long-term maintenance requirements, and issues with animals damaging equipment.
- **Consideration of tax incentives:** One participant suggested that tax incentives, such as conservation easements, should be considered as a way to promote natural heritage protection, particularly on private lands. It was noted that Lorne Park Estates is a community where tax breaks were used to provide incentives for natural heritage protection.

Mississauga Natural Heritage & Urban Forest Strategy
PHASE 1 Public Open Houses #1 and #2
December 6th, 2012 at 2:30 to 4:30 p.m. and 6:30 to 8:30 p.m.
Mississauga Living Arts Centre, Bank of Montreal Room

OVERVIEW

Two public open houses were held to discuss Mississauga's Natural Heritage and Urban Forest Strategy (NH&UFS) during the afternoon and evening of December 6th, 2012. In total, there were 21 participants. These sessions were open to any interested parties and were advertised in the Mississauga News, on the City website, in local community centres, and on mobile signs. Each session began with welcoming remarks from Laura Piette (Director, Planning, Development & Building Services, City of Mississauga), followed by a presentation about the project given by Mirek Sharp (Project Lead for the North-South Environmental consulting team). Following the presentation, Susan Hall from Lura Consulting facilitated the discussion and requested feedback and input from the participants. Participants were asked to provide their input to a strategy vision, guiding principles, and strategic opportunities for engagement and implementation.

The key themes and discussion points from the Phase 1 public open houses are summarized below.

SUMMARY

Input to vision and guiding principles

Generally participants supported a vision that included the words *protect, enhance, manage* and *expand*. Additional words and ideas for the vision and guiding principles include:

- Enhance connectivity;
- Green infrastructure such as green roofs;
- Improve access (more trails; better trail maintenance, especially in winter);
- Preservation of biodiversity and wildlife;
- Measurement and monitoring;
- Restoration and naturalization;
- Stewardship;

- Connections to human health;
- Pride in the natural environment;
- Increase tree canopy cover;
- Wetland protection;
- Honour heritage sites;
- Protect and re-introduce native species; remove invasive species; and
- Healthy landscapes.

Key Discussion Points

- **Communicating the Strategy:** Several participants emphasized the importance of the wording and messages associated with the strategy in order to achieve engagement. Suggestions for communicating the strategy effectively included: clear messaging, having specific and readily understood goals, highlighting the known connections between a healthy natural environment and human health, and better recognition of the city's public natural areas as special and unique places that can be readily accessed. One participant suggested that a clear distinction should be made between green infrastructure (i.e. green roofs) and natural heritage, while another felt making a clear distinction between active parks and natural areas/parks would be very beneficial to educating the community, as well as City staff, about their different functions.
- **Valuing local natural heritage:** One participant noted that the Ontario Network for Ecosystem Services is an organization looking at valuing ecological services that may provide some useful information for the Strategy.
- **Fostering community connections to nature:** Related to the issue above, a number of participants expressed the importance of residents feeling a part of and taking ownership in the city's natural heritage for this strategy to succeed. Targeted education of youth, and other members of the community, with respect to natural heritage and the urban forest was considered to be a critical aspect of this strategy.
- **Suggestions for increasing stewardship of local natural heritage:** Mechanisms suggested include: participation in the maintenance of their natural environment (e.g., stewardship on their own property and in their community), and engaging the youth in hands-on experiences that teach them about the natural world around them and their role in it. One participant noted success by Halton Region working in partnership with the mountain biking community in order to better protect sensitive natural areas from the effects of mountain biking.
- **The need for clearly defined goals and measurable targets:** A few participants commented that the Strategy needs to have tangible goals and strong resource planning in order to help ensure that the Strategy's recommendations will be implemented. They also suggested that specific targets for tree canopy are needed to guide strategic efforts, and emphasized the importance of identifying appropriate locations for planting.
- **Ways to increase tree canopy cover:** There was some discussion around how best to increase canopy cover, and key role of private landowners was recognized again in this context. Suggestions included: basing tree replacement on leaf area rather than on a stem for stem basis, providing incentives for planting trees, creating a heritage tree program, protecting older trees, improved maintenance of street tees, and planting along transportation corridors.
- **Being inclusive:** Some participants suggested that the language of the strategy needs to be inclusive in so far as it should not emphasize certain natural features (e.g., the Credit River valley) at the expense of others (e.g., Etobicoke Creek). It was also suggested that urban agriculture, gardens as well as urban agriculture be considered within the strategy.
- **Protecting what we have:** Some participants commented that stronger bylaws for preserving the urban forest are needed along with greater capacity for enforcement in order to better protect the city's remaining natural heritage and treed assets. Expanding the Greenbelt along the Credit River was also identified as a mechanism to enhance protection of existing significant natural heritage. One participant suggested that addressing phosphorus loads from homeowner runoff in the Credit River be included as Strategy recommendations.
- **Ecological connectivity in Mississauga:** Although the presentation emphasized the north-south ecological connectivity in the City along the river valley corridors, one participant noted that Sixteen Mile Creek also provides some east-west connectivity on the City's west end, and between the City and the adjacent Town of Oakville. Another participant noted some degradation and encroachment in the Etobicoke Creek corridor that could present opportunities for naturalization.

- **Inquiry about Ninth Line lands**: One participant was interested in the future plans for the Ninth Line lands and would like to provide input before any plans are made.
- **Considering climate change:** It was generally recognized that climate change impacts need to be considered as part of the Strategy. Suggestions included consideration of species from the Carolinian Canada ecozone, as well as the need for the establishment and maintenance of vegetation in flood prone river valley corridors.
- **Tying natural heritage investments to population growth:** One participant suggested that the City should tie levels of investments in natural heritage protection and maintenance to population growth (i.e., allocation of tax dollars towards natural heritage and urban forestry initiatives should be increased proportionately with population growth).

APPENDIX B
PHASE 2 STAKEHOLDER AND PUBLIC CONSULTATIONS SUMMARIES

Mississauga Natural Heritage & Urban Forest Strategy
PHASE 2 Stakeholder Session #7 – Aboriginal Groups
June 18th, 2013 at 12:30 p.m. to 2:00 p.m.
Telephone conference call

OVERVIEW

In an effort to use stakeholders' time efficiently, aboriginal groups were invited to participate in individual discussions with the City of Mississauga staff, City of Brampton staff and the consulting team to provide input to both Mississauga's Natural Heritage & Urban Forest Strategy (NH&UFS) and Brampton's Natural Heritage and Environmental Management Strategy (NHEMS). The purpose of these discussions was to gain input from stakeholders on key aspects of the draft Mississauga NH&UFS and provide early insights to the development of Brampton's NHEMS. Invitations were provided to seven aboriginal organizations represented in Mississauga and Brampton. A representative from the Mississaugas of the New Credit First Nation participated in the conference call.

The discussion began with a brief welcome from Olav Sibille (Project Manager, City of Mississauga) and Susan Jorgenson (Manager of Environmental Planning, City of Brampton), followed by an overview about the two projects given by Mirek Sharp (Project Lead, North-South Environmental). Following the presentation Susan Hall from Lura Consulting facilitated the discussion.

The key themes and discussion points are summarized below.

- **Recognize aboriginal cultural and ancestry:** There are many opportunities to recognize aboriginal history in both Mississauga and Brampton. For example, there is rich ancestry along the Credit River that can help tell the story of the First Nations peoples. There is an opportunity to create a specific site that can show series of images, photography, mapping, and include interactive educational features or creative experiences. In addition, there is interest in developing and promoting a series markers along Mississauga's and Brampton's waterways to recognize historical sites (i.e., similar to the Yellow Fish Road program) and be promoted during Heritage Month. This could include developing an in-school program where students would research where their school is located, which First Nation is there, then paint a moccasin (marker) of the indigenous people to recognize their history.
- **Recognize First Nations in the landscape:** When travelling through southern Ontario, First Nations are not reflected in the landscape. There are good examples of integrating function within nature and reflecting natural values in buildings (e.g., Montreal airport with cultural and natural elements in the stone and archways).
- **Incorporate Carolinian and other native plants:** There is a list of heritage plant species available that could be used for plantings and an opportunity to educate people about medicinal plants and promote their protection.
- **Create a memorable experience**: Commemoration of aboriginal sites is a good start, but there is a need to create a memorable experience that will help people understand the value of nature and protect urban forests. There are opportunities to integrate educational walking tours around water and sacred sites to increase cultural knowledge.
- **Continue to educate:** Education plays an important role in stewardship. There is a need to educate people about native and non-native plantings and invasive species. People need tools to help them learn how to protect natural heritage.
- **Integrate natural heritage protection in the Official Plan:** Green lands need to be included in the Official Plan and clearly defined so that they can be recognized and protected.

Mississauga Natural Heritage & Urban Forest Strategy
PHASE 2 Stakeholder Meetings #8 - #11
June 13th (10:00 a.m. – 12:00 p.m. and 1:00 p.m. – 3:00 p.m.), and
June 18th (9:00 a.m. - 11:00 a.m. and 3:30 p.m. – 5:00 p.m.)
Mississauga Living Arts Centre, Cannon Room
Mississauga City 201 City Centre Drive, 9th Floor, Rick Hansen Room
Civic Centre, 300 City Centre Drive, 2nd Floor, Committee Room B

OVERVIEW

Four stakeholder sessions were held on June 13th and June 18th to discuss Mississauga's Natural Heritage & Urban Forest Strategy (NH&UFS). The purpose of these Phase 2 discussions was to gain feedback from stakeholders on key aspects of the draft NH&UFS. The number of participants at each session ranged from five to twenty. These sessions were held for a wide range of external stakeholders representing: government and agencies (including adjacent municipalities and local conservation authorities), committees of City Council, educational institutions, environmental groups, community groups and residents associations, business and development organizations, local utilities and arborist firms.

Each session began with welcoming remarks from Olav Sibille (Project Manager, City of Mississauga), followed by a presentation on the project given by Mirek Sharp (North-South Environmental, Project Lead for the consulting team) and/or Margot Ursic (Beacon Environmental). Following the presentation Susan Hall from LURA Consulting (June 13th and 18th) or Margot Ursic (June 18th) facilitated the discussion and solicited feedback from the participants.

The key themes and discussion points from the Phase 2 stakeholder sessions #8 through #11 as well as the additional comments received following the meetings are summarized below.

SUMMARY

Feedback on Vision, Guiding Principles and Objectives

Participants supported the overall vision, guiding principles and objectives of the NH&UFS. In one session, there was a discussion about how to make the vision shorter and simpler in order to have a greater impact and be more memorable. Key suggestions included:

- Replace the terms 'protect, enhance, restore, expand and connect' with 'protect'
- Be consistent if using the term 'connect', then ensure that connection is integrated into the strategies. Similarly, climate change and integrative management identified in the guiding principles should carry through to the strategies.
- Remove 'biodiversity' and use 'total landscape as a life support system' as the basis for the vision.
- Some suggested 'the City, private and public stakeholders, and members of the community' be replaced with 'everybody' or 'Mississaugans'. However, others felt that naming each group would help to hold all groups accountable for environmental protection.

At one session, some of the participants felt that the NH&UFS objectives were very technical. Given their place near the beginning of the document, it was suggested that they be more aspirational.

In addition, there was a suggestion to consider adding in a diagram and explanation of how all the elements fit together (e.g., relationship between vision, guiding principles, objectives, strategies and targets) to help clarify the strategy's organization.

Feedback on Targets

Participants provided little feedback on the targets. The feedback received was supportive of indicators and targets as tools to be used to measure performance of the NH&UFS. Those who expressed opinions about the targets suggested:

- Targets are not ambitious enough for a 20 year planning horizon. More aggressive targets will drive creative and innovative ways of adding more natural heritage areas, and or linkage areas, including natural heritage creation as well as partnerships with various landowners.
- **Natural Heritage System Size Target:** Increase from 12% -14% to a minimum of 20% over the next 20 years.
- **NHS Linkage Target**: Expand the minimum of 30m of vegetation on either side to 50m to 60m for the Credit River.
- **Urban Forest Canopy Cover Target:**
    - 15% is extremely low for a city the size and stature of Mississauga. A higher target will show residents a higher level of commitment to the City of Mississauga's air quality, action on

climate change, biodiversity, habitat and overall community health and wellbeing.
    - Should match what recommended by Environment Canada (i.e., 30% forest cover in a given watershed) to be achieved by 2033.
- **Urban Forest:**
    - One participant asked whether the project team had considered the implications of using species diversity to measure urban forest quality. The project team explained that the recommendation to include species diversity is a result of assessments suggesting there are approximately 10 species of trees dominating streets and parks. Increasing diversity of street and park trees will be critical to increasing resiliency to climate change and other threats.

Feedback on the Planning Strategies:

In general participants were supportive of the planning strategies presented. Participants made the following suggestions about the planning strategies:

- **Urgency of natural heritage protection:** The urgency of natural heritage protection/conservation and the implementation of the NH&UFS recommendations was raised several times during the sessions. One participant suggested including a strategy to encourage Council to quickly amend the Official Plan based on the recommendations of the NH&UFS. Another participant indicated that there is a need to more actively incorporate ecological principles into City policy and planning.
- **Implications of mapping natural areas**: The consulting team confirmed that the data used to create Map 1: Natural Heritage System (with proposed expansions) was the City's existing Natural Heritage system plus proposed expansion areas identified based on screening several sources (including conservation authority landscape scale analysis) and were to be refined and verified through site-specific studies undertaken as part of the planning process.
    - Participants felt that designating properties as 'natural areas' or simply marking them as the colour green on a map might have implications for economic development. Councillors, City staff as well as developers and businesses could misinterpret green areas on a map to mean that development is restricted and/or there are special environmental protection conditions. This can affect property values and deter businesses from locating on particular piece of land.
    - Participants recommended that the mapping be completed at a scale that can show some degree of differentiation between properties, and that the intentions behind the mapping are very clearly stated and communicated to the development committee, planners, conservation authorities, etc.
    - Subsequent comments submitted by some representatives and members of the business community indicated there some site specific concerns with portions of Maps 1 and 2..
    - It was noted by one participant that there are opportunities to identify additional linkages that are not currently included on the maps, specifically along the shoreline. The discussion highlighted that expansion may not be possible along the waterfront where the land is owned by Ontario Power Generation. Participants also noted inconsistencies in how private lands were categorized that need to be addressed. For example some industrial sites (e.g., Holcim site) were identified as expansion areas while other properties (e.g., GE site) were not.
- **Potential implications of recommended strategies**: A concern was raised about the potential implications of the some of the recommended strategies. For example, as part of the Lake Ontario Integrated Shoreline Strategy (LOISS), CVC has been working with corporations to naturalize their properties. Identifying these lands as expansion areas in the NH&UFS could act as a constraint and affect the ability to do work with them in the future. Another concern was that expansion and enhancement strategies may result in expanded wildlife movement and eventually lead to increased road ecology conflicts.
- **Existing plans and strategies:** Several participants made reference to plans and strategies that should be considered in relation to the NH&UFS, including: Inspiration Lakeview, Mississauga Waterfront Parks Strategy, Inspiration Port Credit, the Downtown 21 Plan, the Region of Peel Road Characterization Study, and the Peel Active Transportation Study.
- **Strategy #1 - Improve coordination and information:** Two participants stressed the importance of not only interdepartmental coordination and information sharing, but a need for greater emphasis on the connections

between neighbouring municipalities (and other jurisdictions) who are doing similar work and facing similar problems. A representative from the Region of Peel noted that coordination is occurring, for example the Region has an agreement with the City regarding street trees, where the Region owns the assets and the City does the maintenance. It was also noted that when the Official Plan amendment comes forward for approval under *Planning Act*, the City will consult with the Region to help ensure that all the changes will be passed.

- **Strategy #4 - Clarify and strengthen Official Plan policies related to the NHS:** There was discussion, particularly amongst representatives from the business community, about the requirements for site plan approval relating to Residential Woodlands.
    - Participants questioned the effectiveness of site plan approval as a way to protect natural heritage on private property because the process does not necessarily prevent tree removal and can be onerous on developers/property owners.
    - The project team noted that not all Residential Woodlands are captured by the current site plan control bylaw. The site plan control requirements would be applicable to Residential Woodlands, not across the city as a whole.
    - Some concern was also expressed that the requirements for an Environmental Impact Study (EIS) for any development within, or adjacent to, an Urban Forest / Residential Woodland would be onerous and not result in any additional trees being saved.
    - Developers noted a need to clearly define Residential Woodlands (provide a quantitative explanation of which residentially treed areas are - or are not - included) to be able to fully assess the impacts of this recommendation.
    - Developers also noted that the requirement of an arborist report may be too narrow and that an arborist or a qualified ecologist and tree inventory report should be considered acceptable.
    - One participant commented that the current private tree bylaw is readily understood by developers and has significantly improved their practices.
- **Strategy #9 - Develop policies and guidelines that support the NHS:** Participants indicated that:
    - The City should launch an aggressive industrial commercial roof greening and retrofit program focused on the introduction of green roof technologies for any new industrial commercial development, and a retrofit program for existing industrial commercial buildings.
    - Green roofs are gaining popularity among higher density residential developments; however, they are still cost prohibitive for commercial and industrial developments.
- **Development Charges**: One participant suggested that there are opportunities to use Development Charges Section 37 (density bonusing), other similar mechanisms, or less formal arrangements with developers, to improve natural heritage in the City. For example, developers could contribute to increasing the tree canopy in exchange for increased density. However, it was noted that developers often face barriers when trying to make this type of arrangement with the City, as a result of development policies and pushback from residents.
- **Zoning for development:** There was a discussion about the issue with natural heritage areas being zoned by the City for development and the need for protection of these areas. One participant suggested that most of these properties will trigger approvals and require rezoning.
- **Opportunities with green infrastructure and hydro corridors:** There were a number of discussions about opportunities associated with green infrastructure. The project team noted that green infrastructure is recognized as part of the City's Green System and as having a linkage role. One participant suggested that the Provincial Parkway Belt Plan also considers the highways as having a secondary green function. With regards to hydro corridors, participants from the Ministry of Infrastructure Ontario explained that the Provincial Secondary Land-use Program provides licences for using Hydro One land for various uses, such as parking, trails, linear pathways, community gardens, sports field, etc. The requirements are based on certain clearances and voltage and a permit/payment process based on the value of adjacent land.
- **Opportunities on closed landfill sites**: Old landfill sites were noted as having natural heritage value and being potential sites for naturalization.

Feedback on the Protection and Management Strategies:

In general participants were supportive of the protection and management strategies presented. Participants made the following suggestions about the protection and management strategies:

- **Identify wetlands as part of the strategy**: One participant emphasized the need to explicitly recognize the value of wetlands throughout the NH&UFS and integrate wetlands more prominently into the protection and management strategy section specifically. The project team noted that Natural Areas and strategies for developing Conservation Plans include wetlands and wetlands are recognized as a valued resource.
- **Strategy #12 - Encourage conservation on private property**: Two participants suggested there is a need to establish City led partnerships with private landowners and other levels of government to establish a stronger natural heritage network and linkage areas across already urbanized landscapes, and encourage conservation of natural heritage on private lands where the majority of mature and native tree stock is located. Participants noted that conservation on private property is always a challenge and the messaging needs to focus on increased value to the homeowner and the neighbourhood. One participant suggested that a Heritage Tree Program could help to realize these goals.
- **Strategy #18 – Continue to strategically acquire high priority natural areas:** One participant noted this strategy should have greater priority and that this strategy could be linked to rezoning areas identified for infill development. Another participant noted that the City should be considering purchasing a property at **Credit River and Main Street to expand the Natural Heritage System.**
- **Strategy #19 - Ensure policies and by-laws are enforced**:
    - One participant noted there needs to be strong enforcement of by-laws and that community members need to be aware that they are enforced. A number of participants suggested this is the most important protection and management strategy.
    - Several participants noted the importance of tree protection and having a strong tree bylaw, considering the rapid loss of tree canopy during development and as a result of Emerald Ash Borer. One participant suggested that the NH&UFS recommend the City revisit and strengthen the tree bylaw immediately in order to better protect large trees. Another suggestion was to make the City's commitment to improving and enforcing the tree bylaw explicit in the NH&UFS strategies.
    - Through a number of discussions there was interest in updating the private tree bylaw to better meet urban forest protection objectives.

Feedback on Engagement Strategies:

In general participants were supportive of the engagement strategies presented. Participants made the following suggestions about the engagement strategies:

- **Strategy #22 - Build on current outreach programs**. Participants recommended that the City:
    - Connect with the Heritage Advisory Committee.
    - Continue to educate developers about the importance of the urban forest.
    - Institute an aggressive understory re-planting program in urban areas, especially focused in communities with high percentage of Ash trees.
    - Foster innovative tree planting partnerships with community organizations, school boards, businesses and private land owners to increase forest cover on both public and private lands, with specific yearly targets to be achieved.
- **Strategy #23 - Develop a campaign to promote the value of public natural areas** – One participant felt this should be a higher priority. The campaign to promote public natural areas should incorporate aspects of daily living, such as active recreation, bird watching, and photography. Other suggestions included: promoting the value of natural heritage to the homeowner, using homeowner testimonials, showing the difference between how much it cost to do something vs. how much it costs not to do it, using social media, tracking progress in a way that is meaningful to citizens and stakeholders, and getting private land owners involved in reporting on progress. One participant suggested that the NH&UFS should emphasize Mississauga as a waterfront city. It was also noted that in addition to engagement strategies, the NH&UFS should promote education especially among youth.
- **Strategy #25 - Develop and expand partnerships to support information gathering, analysis and responses:** Participants expressed support for the idea of improving linkages between academia and applied research and noted that CVC and the Nature Conservancy of Canada are also looking at this. Others emphasized the need for multi-level (i.e.,

municipal, regional, provincial, federal) coordination as a prominent element throughout the NH&UFS.

- **Strategy #26 - Pursue funding sources to support natural heritage and urban forest objectives:** One participant requested mentioning specific local non-profit groups (e.g., LEAF, EcoSource).
- **Strategy #27 - Identify implementation incentives:** There were discussions about the value of using incentives to encourage naturalization of private properties. Participants noted that that the cities of Kitchener and Waterloo are using incentives to reduce stormwater runoff. Participants suggested that a credit or incentive be considered that linked to maintenance of a certain proportion of permeable surfaces on a property.
- **Simplify the process:** One participant suggested that there is a need to simplify the process of community engagement in Mississauga when it comes to greening initiatives, as the onus is on communities to organize themselves and the process is difficult to navigate.
- **Linkages on school properties**: One participant asked whether there were any plans or identified areas for naturalization on school grounds. The project team explained schools volunteer to naturalize portions of the school yards. Participants noted this would need to be done on a school-by-school basis. One participant raised a concern about showing school properties as expansion sites, as and they are zoned residential and school boards may have intentions to sell the properties once the schools become obsolete.

Feedback on Tracking Strategies:

Participants provided little feedback about the tracking strategies, but the feedback received was supportive. Those who expressed opinions about the tracking strategies suggested there is a need to:

- Provide a visual to help convey urgency and/or the process in a meaningful way (e.g., thermometer concept).
- Engage private landowner by reporting on the overall health of trees and urban forest.

Overall Feedback:

In addition to feedback on the specific strategies, participants provided the following overall suggestions:

- **Organize and number strategy components**: It was suggested that most people would only read the first couple of sections of the strategy (i.e. the vision and guiding principles) so these components need to be the strongest elements of the strategy. Another concern was that the numbering of strategies should be easy to follow and there needs to be clarity why some strategies have supporting urban forest actions and others do not. (Note: the actions presented were cross-referenced to the Urban Forest Management Plan). Another recommendation was to indicate there is no preferential order of the strategies or place the overarching or most important strategies first.
- **Make explicit reference to key concepts:** There were several concepts that participants felt were missing from the NH&UFS overview and/or the strategies. Although these concepts would likely be referenced in the full document, their absence as part of the overview of the strategies made them appear as a lower priority or forgotten. For example, even though wetlands are encompassed in natural heritage, it was suggested they be explicitly mentioned within the strategies and other key parts of the NH&UFS. Other references missing from the strategies included: climate change, trails and Low Impact Development (LID).
- **Ensure the NH&UFS is user-friendly:** Several suggestions were about ensuring that the final document is easy-to-read and user-friendly. Recommendations included: colour coding the strategies, giving each strategy an alpha prefix, including a diagram of how all the elements fit together, using consistent language and numbering each section's strategies separately. It was also suggested that the NH&UFS should be attractive and colourful in order to encourage general public, as well as stakeholders such as teachers and principals, to read it.
- **Use and refine the Conceptual diagram (demonstrating the interrelatedness of the Natural Heritage System, urban forest and City's Green System)**: Generally, participants were pleased with the diagram and felt it effectively illustrated the connections between the various natural heritage elements. One idea was to use the diagram as an engagement tool. Another suggestion was to include more basic language in the diagram (i.e.: street trees, meadows, wetlands, backyards, and golf courses) and include supporting green infrastructure.

- **Incorporate locally-specific definitions:** One participant suggested that the NH&UFS should define all key terms and that the definitions should be specific to Mississauga. Rather than being based on Provincial Policy Statement (PPS) definitions or external sources, the definitions should be open to comment from the public, so that there is clarity and agreement the meaning of key terms.
- **Emphasize the value of the NHS and Urban Forest**: One participant noted that the strategy needs to emphasize the monetary value of urban forest and natural areas to support decision making by City staff.
- **How the strategy should be used**: There were a number of discussions about how the NH&UFS should be used and by whom. It was suggested that it should have enough detail to inform development during the design and engineering stages. Another suggestion was that environmental consultants working on Environmental Assessments at both the municipal and regional level should refer to the NH&UFS for direction. It would be useful to include a section in the NH&UFS that gives direction on how to use it.

APPENDIX C
SUMMARY OF DOCUMENTS REVIEWED IN SUPPORT OF THIS STRATEGY

CITY OF MISSISSAUGA

- 2009 Future Directions - Master Plan for Parks & Natural Areas (2010)
- Accessibility Design Handbook (2007)
- Accessibility Plan (2008)
- Arts and Culture Master Plan (2009)
- BY-LAWS:
  - Encroachment By-Law (2004, amended 2011)
  - Erosion Control By-law (1991, under review)
  - Nuisance Weed and Tall Grass Control By-law (2003)
  - Parks By-law (2005, amended 2006)
  - Private Tree Protection By-law (2012)
  - Property Standards By-Law (1998, amended 2008)
  - Zoning By-law (2007)
- City Business Plan 2011-2014 (2011)
- Credit River Adaptive Environmental Management (AEM) Strategy
- Credit River Parks Strategy (in progress)
- Cycling Master Plan (2010) and Implementation Strategy (2010)
- Downtown 21 Master Plan (2010)
- EAB Management Plan (2012)
- Green Development Standards (2012)
- Green Development Strategy (2010)
- Green Development Strategy Phase 3 Report (2009)
- Living Green Master Plan (2012)
- Mississauga Plan (2003), in effect
- Mississauga Urban Forest Study (2011) (in cooperation with the Region of Peel, City of Brampton, Town of Caledon, Credit Valley Conservation and Toronto and Region Conservation Authority)
- Natural Areas Survey 1996 (base document that outlines current Natural Heritage System Strategy)
- Natural Areas Survey (2004) that outlines changes in methodology
- Natural Areas Survey (2010, 2011, 2012)
- Official Plan (2011)
- Recreation and Parks Business Plan 2011-2014 (2011)
- Site Plan Application process
- Strategic Plan (2009)
- Transportation Master Plan
- Transportation and Works Woody Debris Management Strategy
- Waterfront Parks Strategy (2008)
- Willing Partners? Residential Support for Municipal Urban Forestry Policies (Conway and Bang 2012)
- Woody Debris Management Strategy – Operations Guide, Cooksville Creek Watershed (2010)

PROVINCE OF ONTARIO

- Conservation Authorities Act (2006)
- Connecting Nature and People. A Guide to Designing and Planning Natural Heritage Systems (NHS) in Growing the Greenbelt Criteria (2008)
- Growth Plan for the Greater Golden Horseshoe (2006, Office Consolidation Jan. 2012)
- Endangered Species Act (2007)
- Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (OMNR 2009)
- Niagara Escarpment Plan (2005)
- Oak Ridges Moraine Conservation Plan (2002)
- Ontario's Biodiversity Strategy (2011)
- Ontario Greenbelt Plan (2005)
- Ontario Natural Spaces Program
- Provincial Policy Statement (2005)
- Places to Grow Act (2006)
- Parkway Belt West Plan

REGION OF PEEL

- Evolving Natural Heritage Systems Planning (2008)
- Natural Heritage Policy Review (for ROP) - Discussion Paper (2008), including Part C - Beyond PROPR Peel-Peel-Caledon Significant Woodlands and Significant Wildlife Habitat (2009)
- Peel Climate Change Strategy (2011)
- Natural Heritage & Agriculture Policies - ROPA 21B (2010)
- Peel Core Greenlands Mapping Update (2011)

CREDIT VALLEY CONSERVATION (CVC)

- City of Mississauga Landscape Scale Analysis (in partnership with TRCA, Conservation Halton and the City of Mississauga)
- Credit River Fish Management Plan - CRFMP (2002) (with MNR)
- Credit River Water Management Strategy (1992) and its update (2007)
- CVC Ecological Goods & Services Resources
  - Landowner Views on Wetland Enhancement and Restoration in and Adjacent to the Credit River Watershed Report (2013)
  - Ecological Goods and Services – An Introduction Factsheet (2011)
  - The Credit River Watershed: Property Value Appreciation – Impacts of Natural Features Report (2009) and Factsheet (2010)
  - Natural Credit: Estimating the Value of Natural Capital in the Credit River Watershed Report and Factsheet (2009)
  - Analysis of Present and Future Carbon Storage in the Forests of the Credit River Watershed Report and Factsheet (2010)
  - Valuing Wetlands in Southern Ontario's Credit River Watershed Reports and Factsheet (2010)
  - The Importance of Ecosystem Services to Human Well-Being in the Credit River Watershed Report and Factsheet (2011)
- CVC Greenlands Securement Strategy (2004)
- CVC Integrated Watershed Restoration Strategy (IWRS)
- CVC Strategic Plan Update (2008)
- CVC Terrestrial Ecosystem Enhancement Model: Towards a NHS for the Credit River Watershed (2011)
- Lake Ontario Integrated Shoreline Strategy - LOISS (in progress)
- Mississauga's Natural Areas: What Everyone Should Know About Our Protected Areas (2006)
- Natural Heritage Policy Review (Usher 2012)

TORONTO AND REGION CONSERVATION AUTHORITY (TRCA)

- City of Mississauga Urban Forest Study - Technical Report (2011)
- Etobicoke and Mimico Creeks Strategy TRCA Terrestrial Natural Heritage System Strategy (2007)
- Peel Region Urban Forest Strategy (2011) (in cooperation with the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, and Credit Valley Conservation)
- TRCA Terrestrial Volunteer Monitoring Program report (2008)

CONSERVATION HALTON (CH)

- 2009-2013 Strategic Plan Towards a Healthy Watershed
- Conservation Halton's Policy and Guidelines for the Administration of Ontario Regulation 162/06 & Land Use Planning Document
- Halton Natural Areas Inventory (H.N.A.I.)
- Hamilton-Halton Watershed Stewardship Program – Overview

GOVERNMENT OF CANADA

- Area-Sensitive Birds in Urban Areas (2006)
- *Fisheries Act (1990)*
- How Much Habitat is Enough (3rd edition, 2013)
- Navigable Waters Protection Act
- Species at Risk Act (SARA) under Government of Canada

OTHER RELEVANT DOCUMENTS CONSIDERED

- City of Brampton Natural Heritage System Planning and Environmental Management (2009)
- City of Brampton Official Plan (2009)
- City of Guelph Official Plan – OPA 42 (2010, under appeal)
- City of London Living with Natural Areas (brochure)
- GTTA: Living City Project - Etobicoke Creek Watershed (in cooperation with TRCA and CVC)
- Halton Natural Heritage System Definition and Implementation (2009)
- Halton - Greenlands Securement Strategy (2009)
- Halton Regional Official Plan (2009)
- Husquavarna Global Green Spaces Report (2013)
- Sustainable Halton – Options for a NHS in Halton (2007)
- Toronto Bird Safe Guidelines
- Toronto Ravine Protection By-law (2009)
- Toronto Shade Guidelines (2010)
- Town of Oakville Official Plan (2012)

APPENDIX D
OVERVIEW OF METHODOLOGY USED TO IDENTIFY RECOMMENDED EXPANSION AREAS FOR THE NATURAL HERITAGE SYSTEM

A more complete explanation of the approach used to identify expansion areas to the NHS has been provided to the City in a Background Report. The Background Report is an internal document for the benefit of City staff that provides a more technical description of how the mapping was assembled and a record of decisions that were made throughout the two year course of the study.

It is very important to note that the expansion areas recommended in Map 1 are in part predicated on the recommended policy revisions. These policy recommendations will need to be subject to an Official Plan Amendment process before they are incorporated into the Official Plan. Thus the recommended expansion areas must be considered preliminary and draft until the policies are approved, and mapping modified, if and where necessary, in accordance with the final approved policies.

There were two basic steps in identifying areas recommended as additions to the NHS; 1) the identification of potential expansion areas, and 2) the evaluation of potential expansion areas.

Identification of Potential Expansion Areas

In recent years, opportunities for potential expansion of the NHS have been recognized. There are four main sources for these potential expansions:

1. New natural areas or expansions to existing natural areas identified during annual updates of the Natural Areas System undertaken by the City;
2. A city-wide Landscape Scale Analysis (LSA) undertaken by Credit Valley Conservation (CVC), which incorporated information provided by the Toronto and Region Conservation Authority (TRCA);
3. Core Natural Areas identified by the Region as part of their Official Plan update (ROPA 21B); and
4. An area recently added to the west side of the City (Ninth Line Corridor lands).

The potential expansions identified through these sources are not mutually exclusive and there is substantial overlap among them.

It was the consulting team's understanding that work undertaken by the TRCA as part of their Terrestrial Natural Heritage System Strategy (TNHSS) (Etobicoke and Mimico Watersheds Technical Update Report 2010) was incorporated into the LSA. Because of this, the LSA was used as the primary source of potential expansions. There was some confusion regarding this when the initial evaluation had been completed and as a result, following fieldwork and the analysis of the potential expansion areas, the TRCA undertook a comparison of the revised NHS and their TNHSS and communicated the results of that to the study team.

It is very important to understand that the Natural Heritage System (NHS) component of the NH&UFS does not seek to develop a new natural heritage system from scratch, but builds on the existing Natural Areas System by evaluating the potential for its expansion. It is also important to understand that the City's NHS is a response to the policy requirements of the Provincial Policy Statement and Regional Official Plan. As such, the focus is on identifying remnant natural features and linkages and ensuring they receive the appropriate level of protection. Although the NHS includes the identification of areas for restoration and enhancement (principally the Significant Management Areas – SMAs), this is not its primary purpose. The approach used in the development of the NHS is based the selection and evaluation of potential areas identified in the field using criteria and guidelines that meet policy requirements. It does not seek to identify an "ideal system" based on targets, and then look for the best sites to fulfil that ideal. Both approaches are legitimate ways of developing an NHS, but the policy-based approach is more consistent with the City's mandate and planning obligations.

The LSA mapping layer that was used for the evaluation of potential expansions to the City's existing Natural Areas System was CVC's "Core and Highly Supporting Patches" layer. This layer featured the best examples of potential expansion sites within the CVC's LSA layers. As such, it signified the most promising potential for expansion sites for the NAS. In this report, the "Core and Highly Supporting Patches" layer is referred to as the LSA layer. Additional GIS layers with the Region's Core areas, the Ninth Line corridor study sites and other sites recommended from annual updates of the Natural areas System (NAS) were added to the analysis to identify the full range of potential expansion sites.

First, the City's existing Natural Areas System layer was mapped over a digital aerial photograph. The potential expansion sites were overlaid on this mapping to identify the sites that are outside of the Natural Areas System (some LSA sites were partially or wholly within the existing NAS).

This exercise produced over 1000 polygons of various sizes outside of the Natural Areas System. To narrow the results of this exercise, all polygons under 0.5 ha were excluded from further analysis. The rationale for this step was that most of these small areas were "slivers" created where two digital boundaries did not exactly line up. As they "criss-crossed" over each other, they created many small polygons that did not represent real expansions, but were simply artefacts from using different mapping data sources. It should be noted that the boundaries of existing NHS areas in the City are reviewed and refined every four years as part of the NAS updates, thus there is a high degree of confidence in the existing boundaries resulting from detailed aerial photograph analysis and subsequent fieldwork.

In addition, it was decided that discrete areas under 0.5 ha were not large enough to be considered new natural areas (i.e., a discrete area of less than 0.5 ha was considered too small to be a natural area within the Natural Heritage System). This size criterion (0.5 ha) was agreed upon during a meeting with City staff on May 8, 2012, and was later confirmed with the Core Working Team. Lastly, those areas under 0.5 ha that were not artefacts or small discrete polygons consisted of minor boundary changes to the existing Natural Areas System boundary. Since the Natural Areas System boundaries are ground-truthed through the City's Natural Areas Survey, and the LSA layer was created through a desktop GIS exercise, the existing Natural Areas System boundaries were generally considered to have greater accuracy in delineating the natural feature.

The remaining potential expansion areas were numbered from 1 to 477. These 477 sites were then categorized based on their relation to the Natural Areas System. Three categories for LSA sites were identified as "additions to existing natural areas" or "new discrete sites". Each of the 477 LSA sites was also characterized based on cover type/land use. Most polygons were categorized as one cover type but some sites could include several cover types (e.g., meadow/thicket and woodland). The classification was done on-screen using 2012 digital colour imagery. This provided the ability to "zoom in" to examine areas. Targeted field work was used to verify/refine the land cover classification.

Once the land cover had been determined a further screening was undertaken to identify other potential expansion sites that were considered inappropriate for further consideration for inclusion in the NHS. These included:

- sites that were constituted the medians or verges of highways;
- the LSA site that is a pier;
- airport lands (as the City has no policy control over them; except those that were identified as Peel Core Natural Areas by the Region);
- areas that were manicured;
- agricultural fields;
- active parkland and sports fields;
- school properties;
- treed residences with mowed or manicured understory;
- areas that were highly disturbed, e.g. by grading, piles of soil, construction activity, etc.;
- railway rights-of-way; and
- hydro corridors.

Many of these exclusions were discussed and agreed on with the core Working Team at the second meeting (July 2012).

As noted previously, most of these excluded land uses do provide ecological function (e.g., connectivity for urban-adapted wildlife, groundwater recharge, amelioration of urban heat sink, etc.). However, they are not natural features per se and are better addressed through the Green System policies. Potential expansion sites that were already within the existing NHS were also excluded from further analysis.

Evaluation of Potential Expansion Areas for Inclusion in the NHS

The overall approach to identifying areas that could be recommended as expansions to the NHS involved a combination of screening criteria and site-by-site evaluations. The first step involved screening potential expansion areas against two criteria:

1. Identify and include all potential expansion areas that were consistent with the existing criteria in the current Official Plan. This step was

subsequently re-visited once refined criteria for identifying NHS areas were completed as part of the policy analysis.

2. Include all sites that were adjacent to, or in a few cases, very near existing areas within the NHS.

Following the screening exercise, potential expansion sites were evaluated on a site-by-site basis to be sure of their candidacy for inclusion in the NHS and to determine the appropriate NHS category to place them into (i.e., Significant Natural Area, Natural Green Space or Special Management Area). Note that no additional Residential Woodland was contemplated through this process. It was decided that the Linkage designation would remain essentially the same (two very small additions were made) and that addressing linkage would be done primarily through policies and strategies involving the City's Green System.

In general, the following was considered in the site-by-site evaluation:

- site characteristics as determined through fieldwork;
- careful examination on-screen using 2012 colour aerial photography;
- knowledge of planning applications or other planning considerations; and
- context with respect to adjacent or nearby areas within the NHS.

Through this exercise a large number of expansion areas were identified and are provided on **Map 1** in the main body of the Strategy report.

APPENDIX E

OVERVIEW OF RECOMMENDED NATURAL HERITAGE POLICY DIRECTION

The following table provides an overview of the recommended policy direction that has emerged from this Strategy (as described in Strategies #3 and #4 specifically). As indicated in the report, it is the City's intent to use this policy direction (and draft policy edits to Section 6 of the Official Plan provided by the Study Team) as a basis for moving forward with an Official Plan Amendment, including a public process. Maps 1 and 2 attached to this Strategy are also meant to reflect both the revised policy direction and include proposed expansion areas, but remain working maps that still need to be subject to the OPA process prior to adoption by the City. The City is required to bring its zoning into line with the new Official Plan within three years.

CURRENT POLICY ALIGNMENTS			RECOMMENDED POLICY CATEGORIES AND DIRECTION FOR MISSISSAUGA		
Significant Natural Areas in Mississauga					
Provincial Policy Statement Category (2005)	**Aligned Category in the Regional Official Plan Amendment (ROPA) 21b**	**Aligned Category in the Mississauga Official Plan (2011)**	**Recommended Category in the Mississauga Official Plan**	**Recommended Criteria for Identification in the Mississauga Official Plan**	**Recommended policy direction in the Mississauga Official Plan**
Significant Habitat of Endangered and Threatened Species	Core Areas	Significant Natural Sites	**Significant Natural Areas**	As identified by the Province (OMNR)	Development and site alteration shall not be permitted within the feature except in accordance with Provincial requirements. Development and site alteration shall not be permitted within adjacent lands to the feature unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological function (with an Environmental Impact Study (EIS))
Significant Wetlands (including Significant Coastal Wetlands)	• Core Areas • Natural Areas and Corridors (NAC)	Significant Natural Sites	**Significant Natural Areas**	• Provincially Significant Wetlands • Provincially Significant Coastal Wetlands • Wetlands greater 0.5 ha	
Significant Woodlands	• Core Areas • NAC	Significant Natural Sites	**Significant Natural Areas (including Wooded Significant Natural Areas)**	• any woodland including cultural woodlands and plantations ≥4 ha • any woodland excluding cultural woodlands and plantations ≥2 ha • any woodland excluding cultural woodlands and plantations ≥0.5ha to 2 ha: o with old growth characteristics o within 100 m of another significant	Development and site alteration shall not be permitted within Provincial Life Science ANSIs, significant woodlands, or valley and stream corridors, or environmentally sensitive or significant areas that meet the Region's Core criteria for those features except for: • minor development and minor site alteration (as per ROPA 21b); • forest, fish and wildlife conservation; • passive recreation; and • existing uses.

				feature (as defined in the Peel Region Official Plan) o within 30 m of a watercourse or evaluated wetland, or o supporting significant species or communities*	Development and site alteration shall not be permitted within other Significant Natural Areas or within adjacent lands to the natural features unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions (with an Environmental Impact Study (EIS). Significant Natural Areas are intended to be placed within the City's Greenbelt Designation.
Significant Valleylands	Core Areas	Natural Hazard Lands	**Significant Natural Areas**	Core Valley and Stream Corridors**	
Significant Wildlife Habitat	Natural Areas and Corridors (NAC)	Significant Natural Sites	**Significant Natural Areas**	Areas meeting criteria/thresholds for Significant Wildlife Habitat in current guidance documents	
Significant Areas of Natural and Scientific Interest (ANSIs)	• Core Areas • NAC • Potential Natural Areas and Corridors (PNAC)	Significant Natural Sites	**Significant Natural Areas**	All ANSIs (Provincially and Regionally Significant; Life Science)	
Fish Habitat	• Core Areas • Natural Areas and Corridors (NAC)	Significant Natural Sites	**Significant Natural Areas**		Development and site alteration shall not be permitted in fish habitat or in lands adjacent to fish habitat, except in accordance with provincial and federal requirements.
Natural Green Spaces in Mississauga					
None	Potential Natural Areas and Corridors (PNAC)	Natural Sites	**Natural Green Spaces**	• any other woodland ≥0.5ha to 2 ha that does not fulfill the criteria for significant woodlands	Development and site alteration shall not be permitted within the feature or its adjacent lands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions
Linkages in Mississauga					
Recognized but no specific category	Recognized but no specific category	Linkages	**Linkages**	Linkages serve to connect two or more of natural heritage features and areas of the Natural Heritage System within the city, or to natural heritage features and areas outside of the city boundaries.	Development and site alteration shall not be permitted within Linkages unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. The requirement for an EIS may be waived at the

					discretion of the City in consultation with the appropriate agency if, for example, there are no natural heritage features present.
Special Management Areas in Mississauga					
None	None	Special Management Areas	**Special Management Areas**	Areas not meeting any feature-specific criteria, but that are located adjacent to Significant Natural Areas and would enhance those areas through management and restoration.	Development and site alteration shall not be permitted within Special Management Areas or their adjacent lands unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. The requirement for an EIS may be waived at the discretion of the City in consultation with the appropriate agency if, for example, there are no natural heritage features present. Where Special Management Areas are on private lands, the City will undertake landowner contact to encourage stewardship and enhancement. Where development or site alteration is approved within Special Management Areas, restoration and enhancements that will expand and/or enhance the ecological features and functions of the adjacent Significant Natural Area will be encouraged as part of the development application.
Residential Woodlands in Mississauga					
None	None	Residential Woodlands	**Residential Woodlands**	Areas where concentrations of mature trees but with minimal native understorey create a closed canopy over lands zoned and built as residential.	Require a scoped site plan approval within all residential woodlands that addresses grading and landscaping, and requires an arborist report with each application. *Further detailed studies will be undertaken by the City to update and refine the extent of Residential Woodlands and related policies.*

* "**significant species and communities**" includes any G1, G2, G3, S1, S2 or S3 plant or animal species, or community as designated by NHIC. Notably, habitat protection for species listed as Threatened or Endangered by COSSARO would now be governed under the *Endangered Species Act* (2007).

** Table 2 of ROPA 21b defines "**Core Valley and Stream Corridor**" components as:

- Main branches, major tributaries, other tributaries and identified watercourses draining directly to Lake Ontario
- Valley and stream corridors are the natural resources associated with the river systems characterized by their landform, features and functions, and include associated ravines.

- Ill-defined sections of major valleys (to be illustrated using regulatory floodplain and meander belt hazards whichever is greater)
- Associated ravines (included if they provide important ecological functions related to the valley landform; habitat for endangered/threatened species; linkage to other natural features of the Regional Greenlands System; flood and erosion hazards; or restoration potential)
- discontinuous valleyland features and other non-valley landforms are not included as significant valleylands

Note that, the Valleylands captured in Map 1 of this report may not be entirely consistent with the Core Valleylands mapped as part of the Region's ROPA 21b. In all cases the applicable policies will apply, and mapping discrepancies will need to be resolved based on the applicable policies through site-specific planning studies.

APPENDIX F
FEASIBILITY ANALYSIS OF A RAVINE BY-LAW FOR MISSISSAUGA

More than 80% of the City's Natural Areas, and the most contiguous forested areas, are found within its valleylands. In recognition of this fact, one of the actions coming out of the *Living Green Master Plan* (2012) (#47) is to: "*Consider introducing a regulatory tool to protect and enhance the green system"* with specific direction to look at the value of a tool similar to Toronto's Ravine and Natural Features Protection By-law for Mississauga.

For this Strategy, analysis of the relevant policies and legislation in the City's valleylands, as well as of the applicable Official Plan mapping, and consideration of Toronto's ravine by-law (in terms of what a comparable by-law would add in terms of protection in the City of Mississauga) was undertaken in response to LGMP action #47. The key findings and recommendations are presented below. Notably, neither "valleylands" nor ravines are specifically defined or mapped in Mississauga, but for the purposes of this exercise they have been considered synonymous with the Natural Hazard Lands associated with the main watercourses running through the City, as identified in the Official Plan.

Based on the policy and mapping analyses conducted, our key findings are as follows:

- Just over 65% of the City's Natural Heritage (Areas) System is within the Natural Hazard Lands, and just over 76% are within the City's Greenbelt designation. Under the current Official Plan policies, these lands are protected from development.
- Almost 22% of the City's Natural Areas System is adjacent to but outside of the mapped Natural Hazard Lands (and therefore could potentially be captured by a ravine type by-law that included natural lands adjacent to the City's Natural Hazard Lands). Of these lands about 9% are Natural Areas, 4% are Linkages, 2% are Special Management Areas, and 7% are Residential Woodlands.
    - More than half of the Natural Areas overlap with Provincially Significant Wetlands in which development is not permitted.
    - Under the current policies, the remaining Natural Areas require an Environmental Impact Study, as well as a Tree Inventory and Preservation Plan where appropriate for any proposed development under the *Planning Act* within their boundaries. Although generally not treed, Linkages and Special Management Areas are also currently subject to an Environmental Impact Study, as well as a Tree Inventory and Preservation Plan where appropriate for any development proposed within their boundaries under the *Planning Act*.
    - In Residential Woodlands, Tree Inventory and Preservation Plans, and sometimes an EIS, are required in response to proposed developments under the *Planning Act* and as part of the Site Plan process where they are within the Site *Plan Contro*l Area. Recommendations for expanding this zoning to capture all Residential Woodlands have been made in this paper, and if so will strengthen this process.

In addition to the policy controls under the *Planning Act* identified above for the lands within and adjacent to the City's ravines, there are already a number of regulations that provide mechanisms to control the removal (and placement) of topsoil, as well as the removal (and replacement) of vegetation, including trees, in the City's ravines and across the City:

- Activities within the City's Natural Hazard Lands, and in many cases beyond (e.g., as within 30 m to 120 m of these lands) are regulated by the conservation authorities. This includes any movement of topsoil and/or vegetation.
- Tree injury and removal on public lands is currently restricted through the City's Parks By-law (186-05) and Encroachment By-law (57-04)), and the majority of the lands in the City's ravines are publicly owned. The Public Tree By-law being developed will further consolidate and support these restrictions.
- Topsoil, and associated vegetation removal, is regulated on all lands within 30 m of a watercourse and all areas of disturbance greater than 1 ha throughout the City are regulated through the City's Erosion Control By-law (512-91), which is currently under review. Recommendations have been made through this Strategy to revise this by-law so that it more explicitly conforms with the City's Private Tree Protection By-law (254-12) and more directly supportive of urban forestry objectives.

- Tree injury and removal on private lands is currently restricted in part (i.e., only two trees of 15 cm dbh and more can be removed per calendar year) through the City's Private Tree Protection By-law (254-12).

Toronto's Ravine Protection By-law is unique, although there are some municipalities that regulate tree injury and removal in their ravines through private tree by-laws (e.g., Town of Whitby). Toronto's Ravine Protection By-law requires a permit for any of the following activities in the regulated areas: the injury or destruction of any tree, any changes to the natural topography, the dumping or placement of any type of debris, and construction of new or replacement structures or retaining walls. Where the regulated ravine areas overlap with conservation authority regulated lands (which they do in many areas), the City of Toronto and conservation authority work together to ensure the requirements of both of their by-laws are met.

While Toronto and Mississauga are both largely built-out jurisdictions that have much of their remaining natural heritage (and natural wooded areas) concentrated along the ravines of their river and stream corridors, their policy and regulatory frameworks differ. One of the primary differences is that in Mississauga the majority of the ravine lands (76%) are protected under the City's Greenbelt designation as "no development" areas, while the City of Toronto does not have a comparable designation, except for the Environmentally Significant Areas designated within the ravines for the former City boundaries. Therefore, it would seem redundant to impose an additional by-law on the lands already protected as Greenbelt in Mississauga.

Both Mississauga and Toronto have fairly comprehensive regulation of the trees on their own lands. In addition to this, Mississauga has an Encroachment By-law which can be applied specifically to private landowners extending activities into public ravines. This is particularly relevant in Mississauga because well over half of the ravine lands are public.

In terms of controls on private lands outside the purview of the *Planning Act*, both Mississauga and Toronto have comparable regulation of their ravines or valleylands through their respective conservation authorities. However, their private tree by-laws differ, with Toronto's protecting all trees of at least 30 cm dbh, and Mississauga's protecting trees of 15 cm dbh and greater, but allowing for the removal of two annually without a permit. This Strategy (through the Urban Forest Management Plan (UFMP)) recommends tightening up of this by-law over the next four to 10 years to make it more comparable to Toronto's. Mississauga's erosion control by-law also has the potential to be used to support urban forest and natural heritage objectives with some relatively minor revisions.

As Mississauga re-develops and intensifies, there will be more pressure to expand uses adjacent to its Greenbelt designated ravine lands, however, the policy and mapping analyses conducted indicate that there are already a number of policy and regulatory mechanisms in place to: (a) protect trees, and associated vegetation and soils, on City lands, (b) restrict development into sensitive areas on private lands, and (c) identify opportunities to work with proponents to minimize impacts on the ravines and enhance degraded natural areas where development is permitted.

The recommendations made in this Strategy (and the supporting UFMP) to strengthen existing policies and by-laws, if implemented, would further strengthen the City's ability to support both urban forest and natural heritage targets. Therefore, we recommend that Mississauga does not pursue a Ravine By-law like Toronto's, but instead strengthens its existing policies and by-laws to better support urban forest and natural heritage targets both in the lands adjacent to the City's ravines and throughout the City.

APPENDIX G
OVERVIEW OF FUNDING OPPORTUNITIES

Program Name	Program Sponsor(s)	Target Group(s)	Required Lead for Application	Brief Program Description	Funding / Incentive(s) Offered	Contact / More Information
CN EcoConnexions From the Ground Up	CN with Tree Canada	Community and Schools	Municipalities or First Nations	To support greening of municipal and First Nations properties across Canada, especially areas in close proximity to its rail lines. Proposals must demonstrate the intent to enhance local environmental/social health and wellbeing by planting vegetation in community open spaces, along railway tracks, in schools, in brownfields or in parks.	Grants up to $25,000	http://www.tcf-fca.ca/cnfromthegroundup/
Common Grounds	Evergreen	Community	Non-profit community group	Common Grounds works with community organizations, local volunteers, urban planners, park managers and other land use professionals to restore, design, maintain and steward public open spaces.	Grants of $1,000 to $12,000	http://www.evergreen.ca/docs/media/common-grounds.html
Community Grants Program	Ontario Trillium Foundation	Community	Non-profit or charitable organization	Provides grants for proposals that have primarily a local impact. The decision to fund all or part of a request depends on how well an application fits with the Foundation's sector priorities, their desired outcomes, the local areas of granting focus, the assessment criteria as well as the overall demand and granting budget in the catchment area.	Grant investments of up to $375,000 over five years. This can include up to $75,000 per year for operating or project expenses and up to $150,000 over one or more years for capital initiatives such as building renovations and/or equipment purchases.	http://www.otf.ca/en/applyForaGrant/community_grants.asp
Conservation Land Tax Incentive Program (CLTIP)	Province of Ontario (OMNR)	Private Landowners	Private Landowner	The Conservation Land Tax Incentive Program is a voluntary participation program that provides property tax relief to private landowners who commit to the protection of important features and rare species on their properties. The program is designed to recognize, encourage and support the long-term private stewardship of Ontario's significant conservation lands.	Property tax relief	www.mnr.gov.on.ca/en/business/cltip/index.html
Corporate Greening for Carbon Credits	Tree Canada	Corporations	Local Businesses	Tree Canada estimates the amount of carbon potentially sequestered by the number of trees planted. Useful to businesses who wish to enter their carbon credits on to the Voluntary Challenge Registry.	Businesses are required to plant and maintain the trees themselves, but are provided with a "Carbon Certificate" at no cost.	http://treecanada.ca/en/programs/
EcoAction Community Funding Program	Environment Canada	Community	Non-profit community group	Program supports projects that address clean air, clean water, reducing greenhouse gas emissions that contribute to climate change and nature.	Grant (values vary)	http://www.ec.gc.ca/ecoaction/

Program Name	Program Sponsor(s)	Target Group(s)	Required Lead for Application	Brief Program Description	Funding / Incentive(s) Offered	Contact / More Information
Edible Trees	Tree Canada	Community	Non-profit community group	Tree Canada will consider projects that: increase equitable access to healthy food, empower neighbours to share in the harvest and care of city-grown food resources, provide access to the trees and their fruit, include creative plans for the produce grown, protect and preserves the Canadian environment, and assist residents in understanding and participating in environmental activities in local communities.	Grant (values vary)	http://treecanada.ca/en/programs/
Greening Canada's School Grounds	Tree Canada	Schools / Youth	School	Provides to the selected schools: educational information, technical advice and financial support towards the transformation of their school grounds into environmentally enriched learning landscapes.	Grants up to $10,000	http://treecanada.ca/en/programs/
Jack Kimmel Grants	Canadian Tree Fund		Most suited for an academic institution	Could be pursued in partnership with someone at a local college or university (e.g., to explore success of different species in streetscapes, or success of trees in streetscapes using different soil amendments).	Grant (values vary)	http://www.canadiantreefund.org/site/index.php?option=com_content&view=category&layout=blog&id=35&Itemid=68
In-Store Native Tree/Shrub Rebates	LEAF	Community	Would need to be coordinated by City	LEAF offers a wide range of programs in support of urban forestry, but does not provide its full range of programs outside the GTA. This incentive program has been piloted in other communities west of the GTA (i.e., Kitchener-Waterloo/Guelph/Cambridge) and may be feasible in Mississauga.	Rebates (up to $100) for the purchase of a native tree or shrub at partner local nurseries	http// www.yourleaf.org/
Managed Forest Tax Incentive Program (MFTIP)	Province of Ontario (OMNR)	Private Landowners	Private Landowner	The Managed Forest Tax Incentive Program is a voluntary program administered by the MNR to provide lower property taxes to participating landowners who agree to conserve and actively manage their forests. Under MFTIP, participating landowners have their property reassessed and classified as Managed Forest and are taxed at 25 percent of the municipal tax rate set for residential properties.	Property tax relief	http://www.mnr.gov.on.ca/en/Business/Forests/2ColumnSubPage/STEL02_166346.html
TD Green Streets Program	Tree Canada (with TD Canada Trust)	Community	Municipality	TD Green Streets encourages and supports the adoption of leading-edge practices in municipal forestry.	Grants up to $15,000	Requires 50% matching funds from the municipality http://treecanada.ca/en/programs/
Toyota Learning School Grounds Greening	Evergreen	Students / Youth	School	Helps schools create outdoor classrooms to provide students with a healthy place to play, learn and develop genuine respect for nature.	Grants of $500 to $3500 for schools, $500 to $2000 for daycares	

Natural Heritage & Urban Forest Strategy

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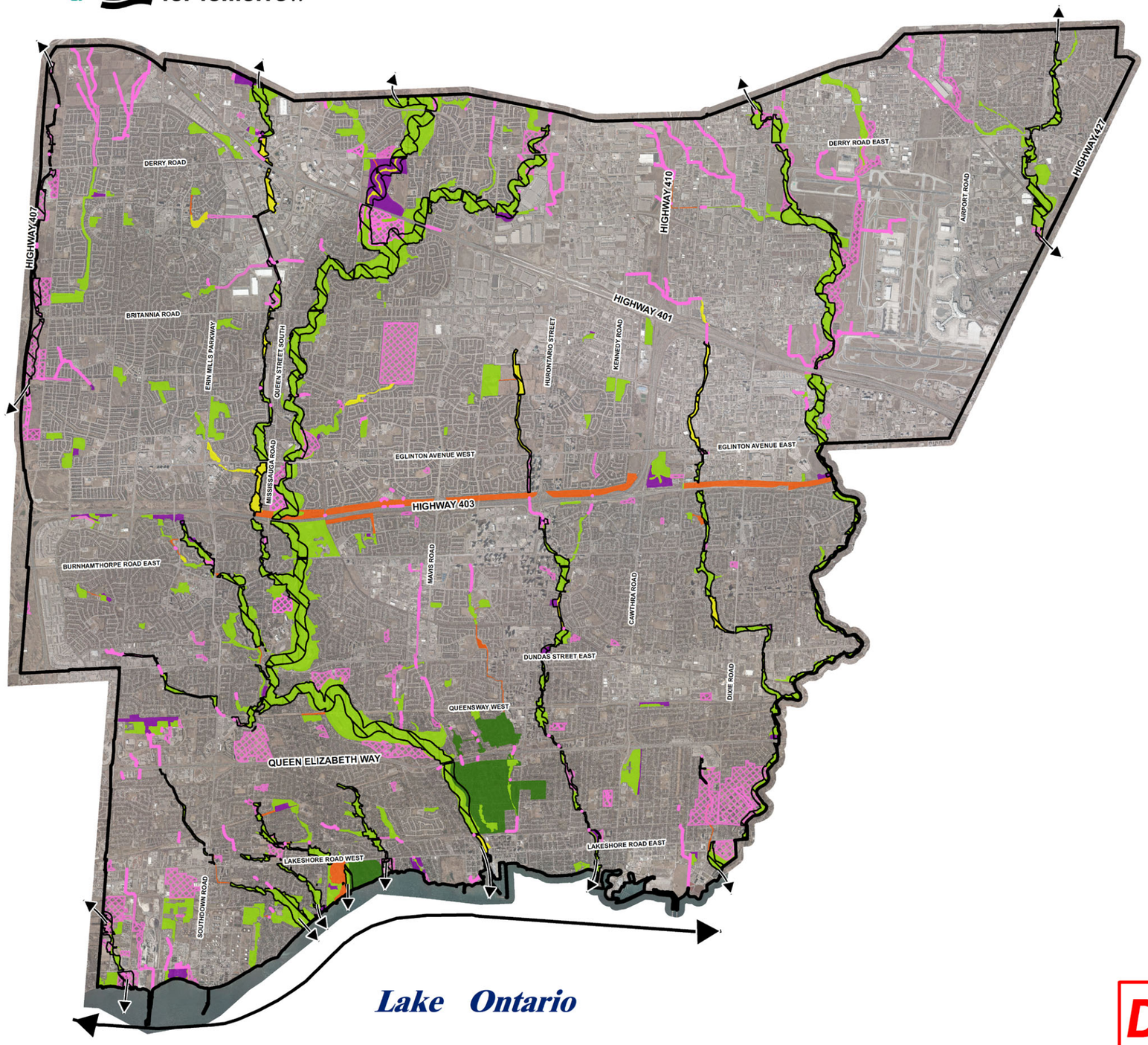
Natural Heritage and Urban Forest Strategy

Map 1: Natural Heritage System with Proposed Expansions (DRAFT)



Draft

Legend

- Significant Natural Areas
- Natural Green Space
- Residential Woodland
- Special Management Areas

Natural Heritage System Linkages

- Primary NHS Linkages
- Contributing NHS Linkages
- Proposed Expansions
- Natural Green Space Watercourse Proposed Expansion
- Arrows indicate linkage to areas outside Mississauga's NHS
- City of Mississauga Boundary

Note:
Alll Significant Natural Areas, Natural Green Space, Residential Woodlands and Special Management Areas outside of the Primary Linkages are considered "Secondary Linkages", (see Figure 2), but are not mapped for clarity.

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Meters

October 25, 2013

Natural Heritage & Urban Forest Strategy

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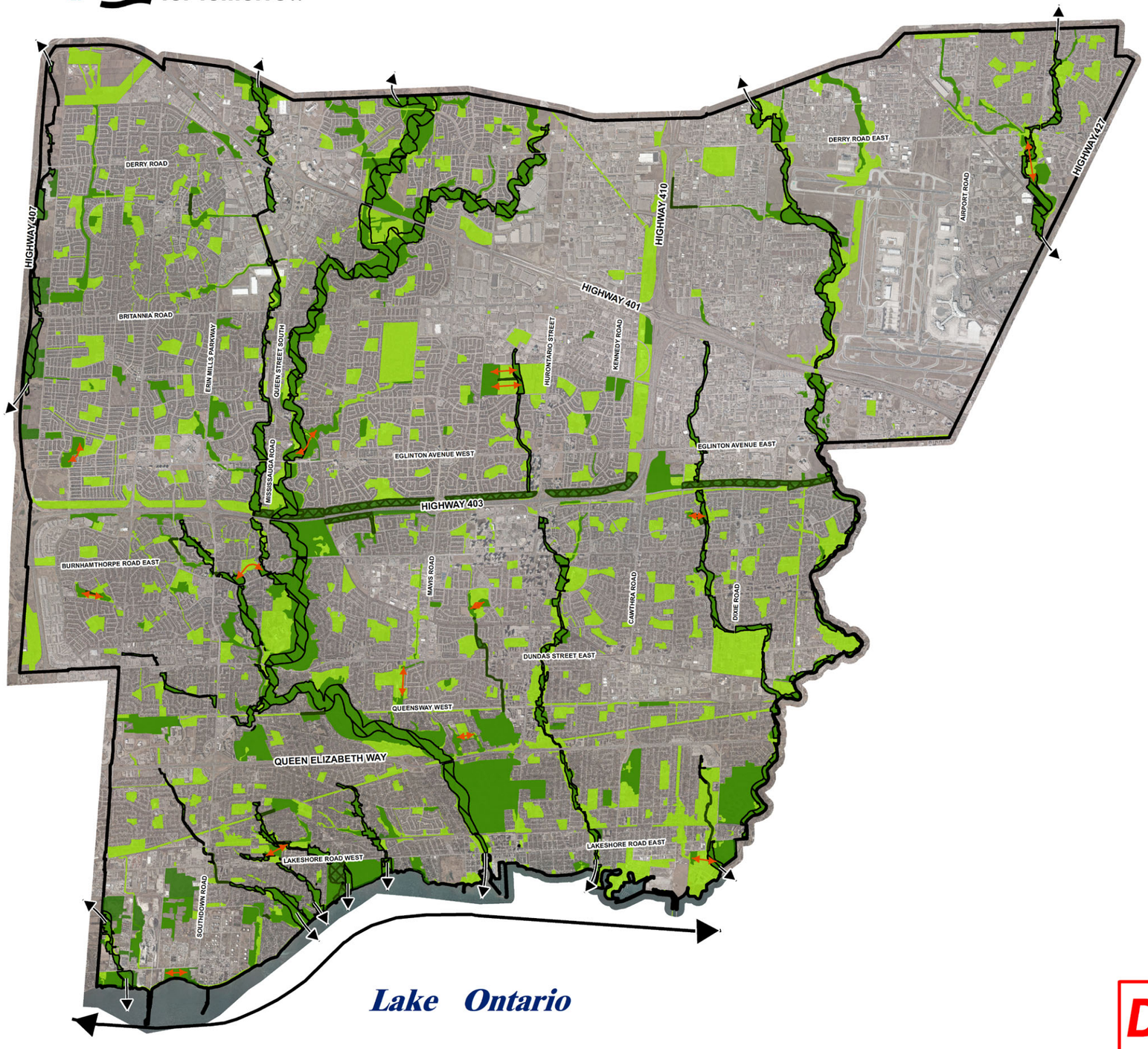

Natural Heritage & Urban Forest Strategy

Map 2: Ecological Connectivity Provided by the Green System

Legend

- Watercourse Connections
- Natural Heritage System Connections
- Natural Heritage System Linkages
- Green System Connections
- Direct Green System Connections
- Connections to Areas Outside Mississauga's Natural Heritage System
- City Boundary

Notes:

1. This map illustrates the different ecological connections within and between the City's Natural Heritage System, broader Green System and natural areas outside the city.

2.The Natural Heritage System is part of the Green System.

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October 18, 2013