AGENDA

ENVIRONMENTAL ADVISORY COMMITTEE

THE CORPORATION OF THE CITY OF MISSISSAUGA

TUESDAY, DECEMBER 10, 2013 – 9 A.M.

COUNCIL CHAMBER
SECOND FLOOR, CIVIC CENTRE
300 CITY CENTRE DRIVE, MISSISSAUGA, ONTARIO, L5B 3C1
www.mississauga.ca

Members

Councillor George Carlson, Ward 11 (CHAIR)
Michael DeWit, Citizen Member (VICE-CHAIR)
Councillor Jim Tovey, Ward 1
Councillor Frank Dale, Ward 4
Dr. Brad Bass, Citizen Member
Andre Plant, Sheridan College, Office for Sustainability
Steven Jia, Peel Environmental Youth Alliance
Lea Ann Mallett, Citizen Member
Val Ohori, Citizen Member
Maureen Ricker, Citizen Member
Carl Rodgers, Citizen Member
Lucia Salvati, University of Toronto Mississauga
Amy Zi-Xuan Liou, Peel Environmental Youth Alliance

Agency Liaison

Stephanie Crocker, Executive Director, EcoSource

CONTACT PERSON: Mumtaz Alikhan, Legislative Coordinator
Office of the City Clerk, Telephone: 905-615-3200, ext. 5425; Fax 905-615-4181
Mumtaz.Alikhan@mississauga.ca

CALL TO ORDER

APPROVAL OF AGENDA

DECLARATIONS OF DIRECT (OR INDIRECT) PECUNIARY INTEREST

PRESENTATIONS/DEPUTATIONS

A. Item 2(a) Natural Heritage and Urban Forest Strategy (NH&UFS) and Urban Forest Management Plan (UFMP)

1. Olav Sibille, Planner and Project Lead, NH&UFS
2. Mirek Sharp, Principal, North South Environmental
3. Margot Ursic, Planning Ecologist, Beacon Environmental

Michelle Walmsley, Resident on the *NH&UFS*

Item 2(b) Expanding the Provincial Greenbelt into Mississauga

4. Olav Sibille, Planner and Project Lead, NH&UFS;
5. Paul Lowes, Principal, Sorensen Gravely Lowes Planning Associates Inc.

MATTERS TO BE CONSIDERED

1. Approval of Minutes of Previous Meeting
Minutes of the meeting held November 5, 2013.

2. Natural Heritage & Urban Forest Strategy (NH&UFS) and Urban Forest Management Plan (UFMP), and Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga
Corporate Report dated November 28, 2013 from Paul Mitcham, Commissioner, Community Services

RECOMMEND APPROVAL

3. Gasoline Pump Warning Labels
Corporate Report dated November 15, 2013 from Paul Mitcham, Commissioner, Community Services

RECOMMEND APPROVAL

4. Bottled Water in City Facilities
Corporate Report dated November 22, 2013 from Paul Mitcham, Commissioner, Community Services

RECOMMEND APPROVAL

5. Banning of Plastic Shopping Bags

Region of Peel Waste Management Committee Decision dated November 7, 2013

RECOMMENDATION
That the Report dated October 8, 2013 from the Region of Peel to its Waste Management Committee entitled "Region of Peel's Response to the Potential Ban of Plastic Shopping Bags in Mississauga" be received, and that the Environmental Advisory Committee supports the Region of Peel's Waste Management Committee Recommendation WM-18-2013 dated November 7, 2013 citing *"That the Region of Peel not support a ban of plastic shopping bags at this time"* which was subsequently approved by the Council of the Regional Municipality of Peel on November 28, 2013.

RECOMMEND APPROVAL

6. *Let Your Green* Show Update
Verbal Update by Andrea J. McLeod, Environment Specialist, Environment Division

7. Upcoming Agenda Items and Environmental Advisory Committee (EAC) Role
Chart from Environment staff with respect to upcoming agenda items and Environmental Advisory Committee (EAC) role.

RECOMMEND RECEIPT

8. Status of Outstanding Issues from the Environmental Advisory Committee (EAC)
Chart dated November 5, 2014, 2013 from Mumtaz Alikhan, Legislative Coordinator, Environmental Advisory Committee, with respect to the status of outstanding issues from the Environmental Advisory Committee.

RECOMMEND RECEIPT

INFORMATION ITEMS

DATE OF NEXT MEETING – February 4, 2014 at 9 a.m., **Committee Room A**, 2nd Floor, City Hall

OTHER BUSINESS

ADJOURNMENT

DRAFT MINUTES

ENVIRONMENTAL ADVISORY COMMITTEE

THE CORPORATION OF THE CITY OF MISSISSAUGA

TUESDAY, NOVEMBER 5, 2013 – 9 A.M.

COUNCIL CHAMBER
SECOND FLOOR, CIVIC CENTRE
300 CITY CENTRE DRIVE, MISSISSAUGA, ONTARIO, L5B 3C1
www.mississauga.ca

MEMBERS/AGENCY LIAISONS PRESENT:
Councillor George Carlson, Ward 11 (CHAIR)
Michael DeWit, Citizen Member (VICE-CHAIR)
Councillor Jim Tovey, Ward 1
Dr. Brad Bass, Citizen Member
Elaine Hanson, Sheridan College, Office for Sustainability
Lea Ann Mallett, Citizen Member
Maureen Ricker, Citizen Member
Carl Rodgers, Citizen Member
Val Ohori, Citizen Member
Steven Jia, Peel Environmental Youth Alliance
Amy Zi-Xuan Liou, Peel Environmental Youth Alliance

MEMBERS/AGENCY LIAISONS:
Stephanie Crocker, EcoSource

MEMBERS ABSENT:
Councillor Frank Dale, Ward 4
Lucia Salvati, University of Toronto Mississauga

STAFF PRESENT:
Brenda Osborne, Director, Environment Division
Mary Bracken, Environmental Specialist
Andrea J. MacLeod, Environmental Specialist
Julius Lindsay, Community Energy Specialist
Lisa Urbani,

CONTACT PERSON: Mumtaz Alikhan, Legislative Coordinator
Office of the City Clerk, Telephone: 905-615-3200, ext. 5425; Fax 905-615-4181
Mumtaz.Alikhan@mississauga.ca

DRAFT

CALL TO ORDER – 9:00 a.m.

APPROVAL OF AGENDA

Approved (Councillor J. Tovey)

DECLARATIONS OF DIRECT (OR INDIRECT) PECUNIARY INTEREST – Nil

PRESENTATIONS/DEPUTATIONS

A. 2013 Community Garden Program Update:

Brenda Osborne, Director, Environment Division, Community Services Department advised the Committee that the Environment Division has three budget requests for 2014. One of these requests is to support the development and programming of new community gardens by EcoSource. The funding request will ensure three new gardens every year.

Stephanie Crocker, Executive Director, and Carolyn Bailey, Associate Director, Ecosource, provided a PowerPoint update on the 2013 Community Garden Program. A short video was screened showing students participating in organic gardening helping to grow fresh produce, weeding and harvesting crops as well as learning about soil, composting and crop rotation.

The intent of the program is for a community garden located in each ward of the City.

The Committee raised the following issues/comments:

- Selection process for space;
- Innovations such as rooftop gardens, living walls and container gardening where public park space is not available;
- Students add innovation and new ideas;
- Providing recreation for communities, older adults and the youth;
- Funding options

Ms. Crocker, Ms. Bailey and Ms. Osborne responded to the above noted comments.

The Chair thanked Ms. Crocker and Ms. Bailey for their presentation.

Recommendation
EAC-0045-2013
That the PowerPoint and Video update from Stephanie Crocker, Executive Director, and Carolyn Bailey, Associate Director, Ecosource, with respect to the 2013 Community Garden Program, to the Environmental Advisory Committee on November 5, 2013, be received.

Received (Dr. B. Bass)

DRAFT

MATTERS CONSIDERED

1. Approval of Minutes of Previous Meeting

Minutes of the meeting held on October 1, 2013.

Approved (M. DeWitt)

2. Drive-Through Facilities – Appeals to Mississauga Official Plan

Angela Dietrich, Manager of City-wide Planning, Planning and Building Department, reviewed the highlights of the settlement, with respect to Drive-Through Facilities, between the City and Quick Service Restaurants (QSR) composed of McDonalds Restaurants of Canada Limited, A&W Food Services Canada Inc., Wendy's Restaurants of Canada, TDL Group Corporation and the Ontario Restaurant Hotel and Motel Association. This was as a result of a decision issued by the Ontario Municipal Board on July 8, 2013 regarding appeals to the Mississauga Official Plan (MOP).

Recommendation
EAC-0046-2013
That the Memorandum dated October 23, 2013 from John Calvert, Director, Policy Planning Division, Planning and Building Department, with respect to Drive-Through Facilities – Appeals to Mississauga Official Plan, be received.

Received (V. Ohori)

3. Draft Public Environment Survey

Ms. Osborne advised that online surveys will be a useful tool for benchmarking and measurement purposes. Previous research had been conducted by Environics and the Environment Division wish to continue to survey the community on the importance of environmental initiatives. She noted that the survey will be conducted once annually in the fall.

The Committee made the following comments:

- Ensuring appropriate phrasing such as 'improving' as opposed to 'protecting' the environment;
- Application of demographics, level of education, residency, age, gender, etc., to determine level of engagement;
- Linking environment to sustainable employment;
- Using a rating system to determine level of importance;
- Providing links for more information against survey questions
- Provide space for respondents to address any area not covered in the survey;
- Font size

Ms. Osborne thanked the Committee members for their input.

DRAFT

Recommendation
EAC-0046-2013
That the Draft Public Environment Survey Questionnaire from Brenda Osborne, Director, Environment Division, Community Services Department, and feedback from the Environmental Advisory Committee dated November 5, 2013, be received.

Received (Councillor Tovey)

4. Conference Update

Brenda Osborne, Director, Environment Division, Community Services Department, provided a verbal update with respect to upcoming conferences. She noted that Environmental Division staff will be making a presentation on the Let Your Green Show Awareness campaign at the A.D. Latornell Conservation Symposium. As well, that staff will also be attending the Quality Urban Energy Systems of Tomorrow (QUEST) Conference promoting community energy planning, as well as moderating a session on Retrofitting Suburbia.

5. EAC Offsite Planning Session

Brenda Osborne, Director, Environment Division, Community Services Department, advised that an educational tour has been arranged with the Region of Peel on Saturday, November 16, 2013 of the G.E. Booth (Lakeview) Wastewater Treatment Plant and the Lakeview Water Treatment Plant. She advised that an itinerary of the day's events will be forwarded to Committee members shortly. Lunch will be provided.

6. Upcoming Agenda Items and Environmental Advisory Committee (EAC) Role

Chart from Environment staff with respect to upcoming agenda items and Environmental Advisory Committee (EAC) role.

Ms. Osborne advised that with respect to the campaign to place stickers on gas nozzles at gas stations, she was awaiting legal direction prior to reporting back to EAC. The Committee requested staff to continue to track the findings of Dr. Sherri Mason, Professor of Chemistry, SUNY Fredonia, New York, with respect to her research on plastic sampling in the Great Lakes.

Recommendation
EAC-0047-2013
That the chart from Environment staff with respect to upcoming agenda items and Environmental Advisory Committee (EA) role, be received.

Received (Lea Ann Mallett)

DRAFT

7. Status of Outstanding Issues from the Environmental Advisory Committee (EAC)

Chart dated November 5, 2013 from Mumtaz Alikhan, Legislative Coordinator, Environmental Advisory Committee, with respect to the status of outstanding issues from the Environmental Advisory Committee.

Recommendation
EAC-0048-2013
That the chart dated November 5, 2013 from Mumtaz Alikhan, Legislative Coordinator, Environmental Advisory Committee, with respect to the status of outstanding issues from the Environmental Advisory Committee, be received.

Received (Dr. B. Bass)

INFORMATION ITEMS

(a) Municipal Energy Plan Program
Julius Lindsay, Community Energy Specialist, advised that after reviewing the Program, staff has decided not to apply for funding, as had previously been indicated, because the Ministry was targeting smaller municipalities of 150,000 population or less at this time.

DATE OF NEXT MEETING – Tuesday, December 10, 2013 at 9 a.m., Council Chamber

OTHER BUSINESS

Nil.

ADJOURNMENT – 10:26 a.m. (M. Ricker)

DRAFT

Corporate Report

Clerk's Files

Originator's Files EC. 10 NAT

DATE: November 28, 2013

TO: Chair and Members of Environmental Advisory Committee
Meeting Date: December 10, 2013

FROM: Paul A. Mitcham, P. Eng., MBA
Commissioner of Community Services

SUBJECT: **Natural Heritage and Urban Forest Strategy (NH&UFS), Urban Forest Management Plan (UFMP), and Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga**

RECOMMENDATION:

1. That the report dated November 28, 2013 from the Commissioner of Community Services entitled "Natural Heritage and Urban Forest Strategy (NH&UFS), Urban Forest Management Plan (UFMP), and Feasibility Analysis for Expansion of the provincial Greenbelt Plan Area into Mississauga", be endorsed; and
2. That staff begin preliminary work required to pursue application to the Region of Peel for the designation of Urban River Valley (URV) lands along the Credit River and Etobicoke Creek including preparing an estimate of related costs, and report back to the Committee.

REPORT HIGHLIGHTS:

- This report addresses three separate elements under the umbrella of the Natural Heritage and Urban Forest Strategy (NH&UFS) study: (A) the Strategy proper, (B) the Urban Forest Management Plan, and (C) the Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga.

(A) NATURAL HERITAGE & URBAN FOREST STRATEGY

- Long-term strategic plan to manage the City's natural areas and urban forest.

- Vision Statement: *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.*
- Includes 26 ***Strategies*** under four themes (planning, management, engagement and tracking).
- Several strategies support the Urban Forest Management Plan.

(B) URBAN FOREST MANAGEMENT PLAN (UFMP)

- Long-term operational plan to manage the urban forest.
- Contains 30 ***Actions*** that connect to the NH&UFS strategies.
- The document provides guidance for urban forest program administration, tree health and risk management, tree establishment, urban forest expansion and preservation, tree protection, and promotion, education, stewardship and partnerships.

(C) FEASIBILITY ANALYSIS OF EXPANDING THE PROVINCIAL GREENBELT INTO MISSISSAUGA

- Viability of expanding the provincial Greenbelt Plan Area was assessed to fulfill Council Recommendation GC-0288-2010.
- Expansion can be achieved by designating publicly-owned lands as Urban River Valley (URV) lands within the Credit River and Etobicoke Creek watersheds.
- Designating URV lands in the City can raise the profile of lands as connections to a larger natural heritage system and create City leadership, educational and stewardship opportunities.
- No clear policy-related benefits from URV designation.
- Further work required to determine appropriate lands and costs for the URV designation process.

BACKGROUND:

The Natural Heritage and Urban Forest Strategy (NH&UFS) study was initiated in 2012 in response to a recommendation from the 2009 Master Plan for Parks and Natural Areas, to develop a guiding document to improve the long-term management of the City's natural areas. The Study includes an Urban Forest Management Plan (UFMP) that focuses on the operational and technical aspects required to implement the broader strategies.

A Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga was added to the Study scope to fulfill Council

Recommendation GC-0288-2010. This analysis assesses the implications of designating public lands within the Credit River and Etobicoke Creek watersheds as Urban River Valley (URV).

Study Direction and Stakeholder Engagement

Direction and technical guidance to the Study has been provided by the cross departmental Project Steering Committee and Core Working Team with representation from Parks and Forestry, Environment, Planning and Building, Transportation and Works, Region of Peel and the three local conservation authorities.

The Study has also received input from a wide range of stakeholders including provincial and federal governments; environmental organizations; educational institutions; recreational groups; resident associations, utilities, and arboriculture firms. Aboriginal organizations were also consulted.

In addition, two rounds of public consultation on the overall Study were held in November–December 2012 and in June 2013, and draft versions of the Strategy, the UFMP and the Feasibility Analysis for Expanding the Provincial Greenbelt Plan Area were posted for public comment for a month.

COMMENTS:

(A) NATURAL HERITAGE & URBAN FOREST STRATEGY

The Strategy is a long-term plan to manage the City's natural areas and urban forest that will be guided by its 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.*

The primary purpose of the 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, while still recognizing the need to accommodate continued growth and economic development in the City.

A total of 26 STRATEGIES have been identified to support the vision and objectives, as well as guide the City in achieving established targets, under the following four themes: (1) planning,

(2) management, (3) engagement and (4) tracking. These NH&UFS Strategies apply to both public and private lands.

The Executive Summary of the attached NH&UFS report (Appendix 1, page xii) presents the strategies with their corresponding implementation Actions as identified through the Urban Forest Management Plan.

To measure the impact and success of the overall Strategy, several targets are recommended including:

- Size of the Natural Heritage System (NHS): increase from 9.5% of total City area to 12%-14%.
- NHS linkages: 75% of the watercourses have vegetation for at least 30 m on either side (currently at 62%); and
- NHS Quality: substantially improve overall terrestrial and aquatic quality across the City using 2013 as a baseline.
- Urban Forest Canopy: increase from 15% of total City area to 15%-20%.

A comprehensive list of targets and explanatory notes, is provided in the table titled Recommended Natural Heritage System and Urban Forest targets for 2033 (Appendix 1, Executive Summary, page x).

The proposed NH&UFS' vision, guiding principles and objectives were well received and public feedback was overall supportive of the recommended strategies and the identified Targets.

(B) URBAN FOREST MANAGEMENT PLAN (UFMP)

The UFMP is a long-term operational plan to manage the urban forest. It contains 30 ACTIONS that connect to the NH&UFS strategies.

The Plan provides guidance for urban forest program administration, tree health and risk management, tree establishment, urban forest expansion and preservation, tree protection, and promotion, education, stewardship and partnerships. These activities are further detailed in the attached UFMP (Appendix 2).

Key UFMP Actions (Appendix 2, Executive Summary, page vii) include: adopting a three-tiered framework for implementation and monitoring (four-year management plans; annual operating plans,

monitor status of both), improving the inventory of City street and park trees; working with City staff and external partners to implement urban forest expansion; and implementing an urban forest pest management plan.

Feedback received to date has been positive, and all consulted parties have expressed overall support to the UFMP recommended Actions.

(C) FEASIBILITY ANALYSIS OF EXPANDING THE PROVINCIAL GREENBELT INTO MISSISSAUGA

The discussion paper Draft Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga has been completed (Attached as Appendix 3). The analysis includes consideration of new developments in provincial legislation, in particular Amendment 1 to the Greenbelt Plan, approved by the Province in January 2013 that introduced the Urban River Valley (URV) land designation. It also examines the implications of having such designation applied to City owned lands with respect to recreational uses, facilities and infrastructure. The discussion paper has received input from City staff, the Region of Peel, local conservation authorities, and neighbouring municipalities.

The analysis indicates that there would appear to be no clear policy-related benefits for designating publicly owned lands as URV lands as it will not result in any increased protection of natural heritage features.

The benefits for designation include raising awareness of the role of the urban river valleys in supporting connection to a larger, regional natural heritage system; reinforcing land securement undertakings; and creating restoration, educational and stewardship opportunities. Expanding the Greenbelt locally would raise the profile of these lands through their inclusion in a Provincial plan that has a strong symbolic value and enjoys widespread positive recognition and support. In addition, designating URV lands locally would offer an opportunity for the City to show leadership in being the first GTA municipality undertaking the Greenbelt expansion through this new designation.

Public comments to the Feasibility Analysis paper were also generally supportive.

Staff support pursuing designation of suitable public lands along the Credit River and Etobicoke Creek as URV lands for the reasons outlined in the Feasibility Analysis, and recommend beginning preliminary work required, including costing, to pursue application through the Region for such designation.

NEXT STEPS

Final Drafts of the Strategy, the UFMP and a recommendation to begin work required to pursue expansion of the provincial Greenbelt will be presented to General Committee for its adoption on January 15, 2014.

STRATEGIC PLAN: The completion of the Natural Heritage and Urban Forest Strategy and the Urban Forest Management Plan supports the Strategic Plan's Green Pillar. Through its implementation, the NH&UFS will advance our City's strategic goals to lead and encourage environmentally responsible approaches; and, to conserve, enhance and connect natural environments.

FINANCIAL IMPACT: The following are the costs for implementation of the Strategy, the UFMP and the URV land designation over a 20-year period. Necessary funds will be requested through the Corporate Business Planning Process, and where possible, opportunities to partner will be sought to offset cost to City.

(A) NH&UFS Costs: staff resources for environmental and natural heritage planning, and additional funding of $169,000 over 20 years, for workshops, educational and promotional materials, and engagement.

(B) UFMP Costs: approximately $2.87M over a 20-year period. Include development of tree preservation and tree planting standards specifications, improving the inventory of City street and park trees, making inventory information available to the public on the City's website, undertaking targeted invasive plant management in Natural Areas, plus staff resources to support expanded stewardship efforts.

(C) URV Designation Costs: Costs for designating URV lands in the City include; land surveying, public consultation and reporting. Detail costing for land surveying is not yet available as specific suitable land parcels to be considered for designation need to be

identified first. The Province has advised that costs related to land surveying may be reduced as there will be some flexibility when assessing legal descriptions of land parcels proposed for designation. In addition, the Friends of the Greenbelt Foundation has informed that partial funding could be made available to the City for work conducive to the URV land designation, should the City decide to undertake it.

CONCLUSION:

The Natural Heritage and Urban Forest Strategy provides a long-term strategy for the City to plan for and manage Mississauga's natural heritage system and urban forest, as well as tools to engage stakeholders and the community more widely. Community engagement and public input supports the overall Strategy and the actions outlined in the plans.

Final Drafts of the Natural Heritage and Urban Forest Strategy (NH&UFS) and the Urban Forest Management Plan (UFMP) will be presented to General Committee for adoption at their January 15, 2014 meeting.

Further to the draft Feasibility Analysis for the Expansion of the provincial Greenbelt Area into Mississauga, City staff recommends conducting internal preliminary work, including costing required to designate public lands within the Credit River and Etobicoke Creek as Urban River Valley lands.

ATTACHMENTS:

Appendix 1: Natural Heritage and Urban Forest Strategy
Appendix 2: Urban Forest Management Plan (UFMP)
Appendix 3: Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga



Paul A. Mitcham, P. Eng., MBA
Commissioner of Community Services

Prepared By: Olav Sibille, Planner, Park Planning

Natural Heritage &
Urban Forest Strategy

Final Draft

Natural Heritage and Urban Forest Strategy

November 2013



Appendix 1

NATURAL HERITAGE & URBAN FOREST STRATEGY CONSULTING TEAM
Mirek Sharp (Project Manager), North-South Environmental Inc.
Margot Ursic (Project Co-Manager), Beacon Environmental Ltd.
Sarah Piett (Ecologist), North-South Environmental Inc.
Richard Czok (GIS Analyst and Mapping), North-South Environmental Inc.

In association with:
Paul Lowes (Senior Planner), Sorensen Gravely Lowes Planning Associates Inc.
Philip van Wassenaer (Senior Urban Forestry Consultant), Urban Forest Innovations Inc.
Alex Satel (Urban Forestry Consultant), Urban Forest Innovations Inc.
Susan Hall (Senior Facilitator), LURA Consulting

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All photos in this document were provided courtesy of the City of Mississauga's Communications Department, North-South Environmental Inc., Urban Forest Innovations Inc. and Beacon Environmental Ltd.

ACKNOWLEDGEMENTS

Thanks are extended to all those who generously gave their time, energy and insight to this project. This project would not have been possible without their valuable contributions. We would specifically like to acknowledge the following individuals who contributed to the development of this Natural Heritage & Urban Forest Strategy (NH&UFS).

CITY LEADERSHIP TEAM

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

CITY STEERING COMMITTEE

John Calvert, Lincoln Kan, Gavin Longmuir, David Marcucci, Brenda Osborne, and Laura Piette (Project Sponsor), as well as previous Steering Committee members who participated in the process: Stu Taylor and Andy Wickens.

CITY COUNCIL

Mayor Hazel McCallion; Councillors Jim Tovey (Ward 1), Pat Mullin (Ward 2), Chris Fonseca (Ward 3), Frank Dale (Ward 4), Bonnie Crombie (Ward 5), Ron Starr (Ward 6), Nando Iannicca (Ward 7), Katie Mahoney (Ward 8), Pat Saito (Ward 9), Sue McFadden (Ward 10) and George Carlson (Ward 11).

CITY RESOURCE TEAM

Muneef Ahmad, Mumtaz Alikhan, Scott T. Anderson, Wes Anderson, Dolores Bartl Hofmann, Nick Biskaris, Laurel Christie, Jessika Corkum-Gorrill, Sarah Cuddy, Jane Darragh, Audrey Desouza, Angela Dietrich, Elaine Eigl, Jay Esteron, Anne Farrell, Teresa Gonçalves, Geeta Gosain, Lucia Hlasna, Mark Howard, Blair Johnsrude, Lori Kelly, Irene Kiourdi, Tina Mackenzie, Sue Ann Laking, Sally LePage, Angela Li, Sangita Manandhar, Ruth Marland, Mercedes Martínez, Finola Pearson, Karen Mewa Ramcharan, Diane Relyea, Josh Remaski, Brent Rice, Chris Rouse, Janet Squair, Sacha Smith, Stephen Torreno, Lisa Urbani, Magdalena Wojewodka and Paula Wubbenhorst.

CONSERVATION AUTHORITY RESOURCE TEAM

Credit Valley Conservation: Joshua Campbell, Bob Morris, Judy Orendorff, Mike Puddister, Scott Sampson and Leah Smith.

Toronto Region Conservation: David Burnett, Meaghan Eastwood and Adam Miller.

CORE WORKING TEAM

City of Mississauga: Jeremy Blair, Mary Bracken, Eva Kliwer, Katherine Mahoney, Jessica McEachren, William Montague, Olav Sibille (Project Lead), Geoff Smith (Project Controller), Andy Wickens, and Haig Yeghouchian.

Region of Peel: John Hardcastle, Melanie Williams

Conservation Authorities: Lesley Matich (Halton Conservation), Lionel Normand (Toronto Region Conservation), Aviva Patel (Credit Valley Conservation).

Previous Core Working Team members who participated in the process: Kim Barrett (Halton Conservation), Brock Criger (Region of Peel) and Mark Head (Region of Peel).

ENVIRONMENTAL ADVISORY COMMITTEE

Brad Bass, Councillor George Carlson (Ward 11), Stephanie Crocker, Councillor Frank Dale (Ward 4), Michael DeWit, Elaine Hanson, Lea Ann Mallett, Val Ohori, Maureen Ricker, Carl Rodgers, Lucia Salvati and Councillor Jim Tovey (Ward 1).

Previous Environmental Advisory Committee members who participated in the process: Hassan Basit, Lucas Krist, Peter Orphanos (in memoriam) and Diana Yoon.

STAKEHOLDERS

We would also like to thank the many individuals and organizations who attended workshops and provided input to the development of the NH&UFS including but not limited to the following:

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 Credit Valley Conservation and Peel Region for providing project-specific technical support related to natural heritage and urban forest analyses respectively.

EXECUTIVE SUMMARY

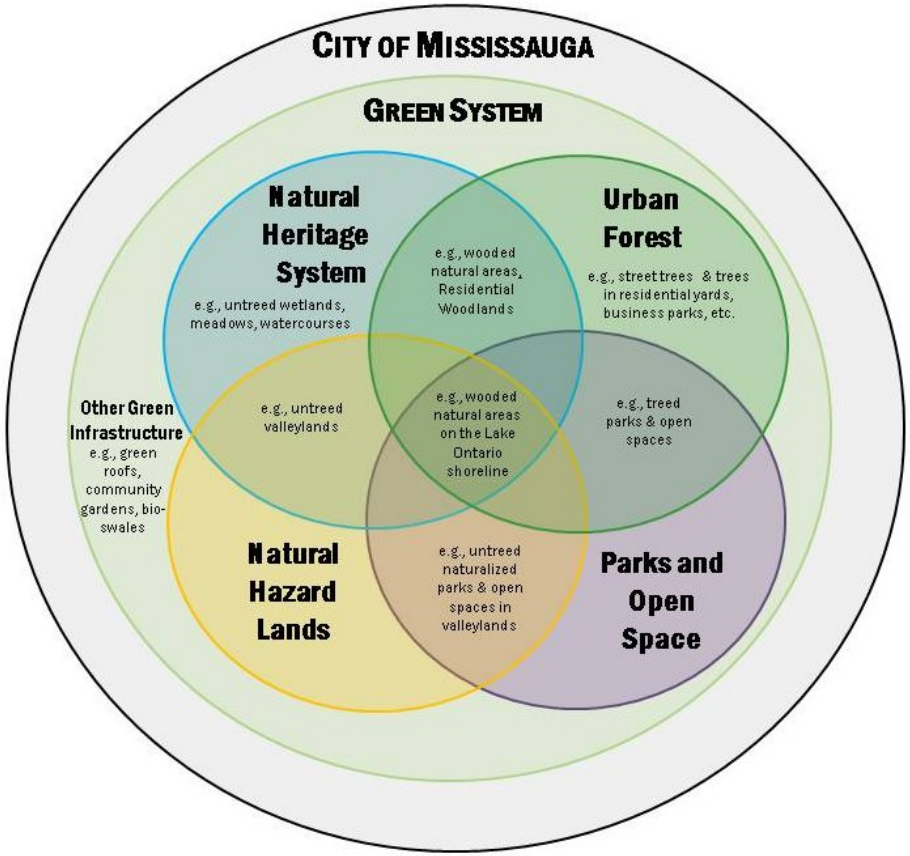
Introduction

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 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).

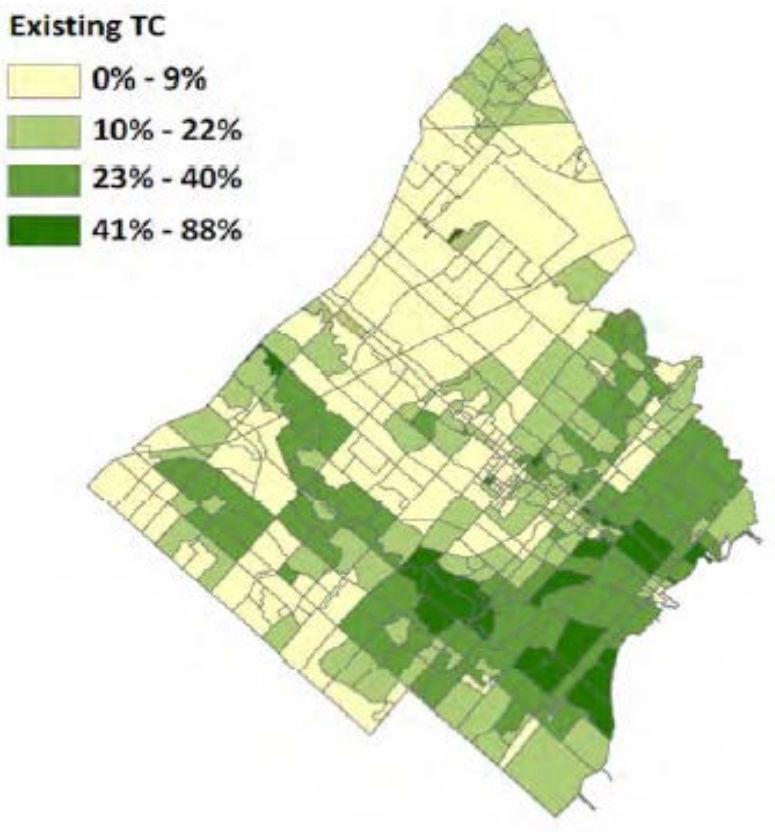
Mississauga's Urban Forest is fundamental to the City's environmental, social and economic well-being. The City's estimated 2.1 million trees (along with the untreed natural areas) provide valuable ecosystem services such as pollution filtration, flood control, carbon storage, benefits related to mental 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 Region Conservation 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 Region Conservation Authority and Credit Valley Conservation.



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)

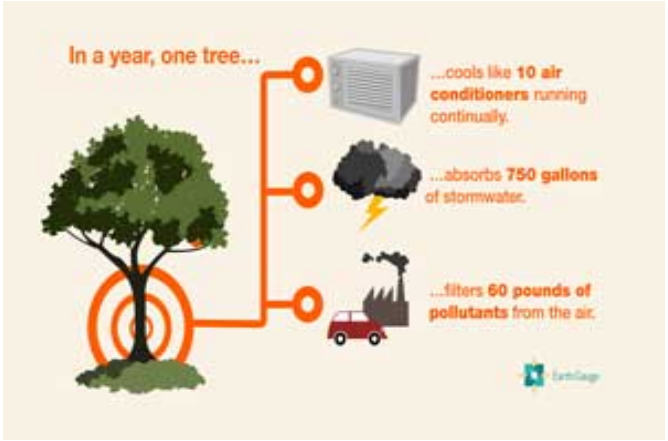
Research in Portland Oregon found that the presence of street trees, on average, added $8870 to the sales price of the house and reduced the time on the market, on average, by 1.7 days.
Donovan, G. H. and D. T. Butry. 2010. "Trees in the city: Valuing street trees in Portland, Oregon". Landscape and 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 at Various Scales
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 (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).

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. Non-native and 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	Canopy cover meets or exceeds the total UF cover in 50% to 75% or more of the neighbourhoods and/or land uses identified as high priority for reforestation

* Data Source: *City of Mississauga Urban Forest Study* (2011) and subsequent analyses by the Peel Urban Forest Working Group.
** Data is 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 and Toronto Region Conservation 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, invasive trees still 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: As this Strategy is being completed, the Region of Peel will be launching a unique tree planting prioritization study designed to incorporate a range of environmental, human health and social considerations. This study, to be undertaken in partnership with the City of Mississauga (and other area municipalities) will be an excellent opportunity to develop a transparent, practical and progressive framework identifying tree planting priorities within the City.

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 Planner position, with the remaining costs linked to activities supporting broader education and engagement related to the Natural Heritage System and Urban Forest.

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. Allocation of the required funds will be a cost-effective investment into Mississauga's sustainability that will help ensure the physical and mental well-being of the community for the long term.





CONTENTS

1 Introduction 1
1.1 Strategy Contents and Organization 3
1.2 A Unique Approach: a Joint Strategy for the Natural Heritage System and Urban Forest 3
1.3 Relationship of the NH&UFS to the UFMP 5
1.4 NH&UFS Framework and Performance Review 6
1.4.1 NH&UFS Monitoring and Review Framework 6
1.4.2 Adaptive Management 7
1.5 Strategy Implementation 7
2 Development of the Strategy 9
2.1 Overview of Past and Current Initiatives 9
Research and Analyses 11
2.1.1 Analysis of Current Conditions 11
2.1.2 Analysis of Potential Expansion Areas 12
2.2 Policy Review and Assessment 12
2.2.1 Provincial Greenbelt Expansion Feasibility Assessment 12
2.3 Study Process 13
2.3.1 Consultations 14
3 State of Mississauga's Natural Heritage 16
3.1 The Evolution of Mississauga's Natural Heritage 16
3.2 Natural Heritage Systems in an Urban Context 17
3.3 Mississauga's Current Natural Heritage System 18
3.4 Mississauga's Urban Forest 20
4 Ecosystem Services Provided by Mississauga's Green System 21
4.1 Flood Management 22
4.2 Air and Water Purification 23
4.3 Local Adaptation to Climate Change 23
4.4 Pollination of Crops and Other Vegetation 24
4.5 Safer Cities 24
4.6 Economic Spin-offs 25
4.7 Human Physical Health 25
4.8 Human Mental Health and Spiritual Well-Being 26
4.9 Social Networking Opportunities 26
4.10 Habitat for Native Biodiversity and Ecological Connectivity 27
5 Planning Context and Precedents 28
5.1 Federal Direction 28
5.2 Provincial Direction 29
5.2.1 Feasibility of Extending the Provincial Greenbelt into Mississauga 31
5.3 Regional Scale Direction 31
5.4 City-Wide Direction 33
5.4.1 Key Gaps Identified in the Official Plan (2011) 37
6 Vision, Guiding Principles and Objectives 38
7 Natural Heritage System and Urban Forest Targets 41
7.1 Natural Heritage Targets Discussion 42
7.2 Urban Forest Targets Discussion 45
7.3 Beyond Targets : Looking at the Bigger Picture 48
8 Big Picture Challenges and Opportunities 49
8.1 Instilling a New Mind-Set: The Total Landscape as a Life-Support System 50
8.2 Improving Natural Heritage System Connectivity 51
8.3 Balancing Natural Heritage and Urban Forest Objectives with Urbanization, Infill and Intensification 52
8.4 Building Resilience to Climate Change and Other Stressors 53
8.5 Sharing the Responsibility 54
8.6 Accepting the Need for Sustained Management 54

9 Strategies for Meeting Natural Heritage and Urban Forest Objectives and Targets 55
9.1 Planning for the Natural Heritage System and Urban Forest 55
9.2 Protecting and Managing Natural Heritage and the Urban Forest 67
9.3 Engaging the Community and Building Partnerships in Caring for Natural Heritage and the Urban Forest 75
9.1 Tracking the State of the Natural Heritage System and Urban Forest 81
10 Overview of Implementation 83
11 Glossary of Technical Terms 85

FIGURES

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

Figure 2. Diagrammatic representation of a natural heritage system illustrating the connection of natural core areas with three different types of ecological corridors

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

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

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)

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

Figure 7. Map of the major and minor watersheds in the City of Mississauga

Figure 8. Sample Natural Areas Survey factsheet map

Figure 9. Cartoon illustrating attempts to put dollar values onto ecosystem services

Figure 10. Illustration of the global carbon cycle

Figure 11. Context map showing the Greenbelt Plan Area in the context of the Greater Toronto Area

Figure 12. Regional Greenlands System

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

Figure 14. Existing tree canopy cover by small geographic units in Mississauga

Figure 15. Conceptual Priority Planting Index mapping developed by Toronto Region Conservation

Figure 16. The proposed Green System Framework

Figure 17. Regional Greenbelt Plan Area with river valley connections shown in green dots

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

TABLES

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

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

APPENDICES

Appendix A. PHASE 1 Stakeholder and Public Consultation Summaries

Appendix B. PHASE 2 Stakeholder and Public Consultation Summaries

Appendix C. Summary of documents reviewed in support of this Strategy

Appendix D. Overview of methodology used to identify recommended expansion areas for the Natural Heritage System

Appendix E. Overview of recommended natural heritage policy direction

Appendix F. Feasibility analysis of a ravine by-law for Mississauga

Appendix G. Overview of Funding Opportunities

MAPS (Appended to end of Strategy)

Map 1. Natural Heritage System with proposed expansions (DRAFT)

Map 2. Ecological Connectivity Provided by the Green System

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.

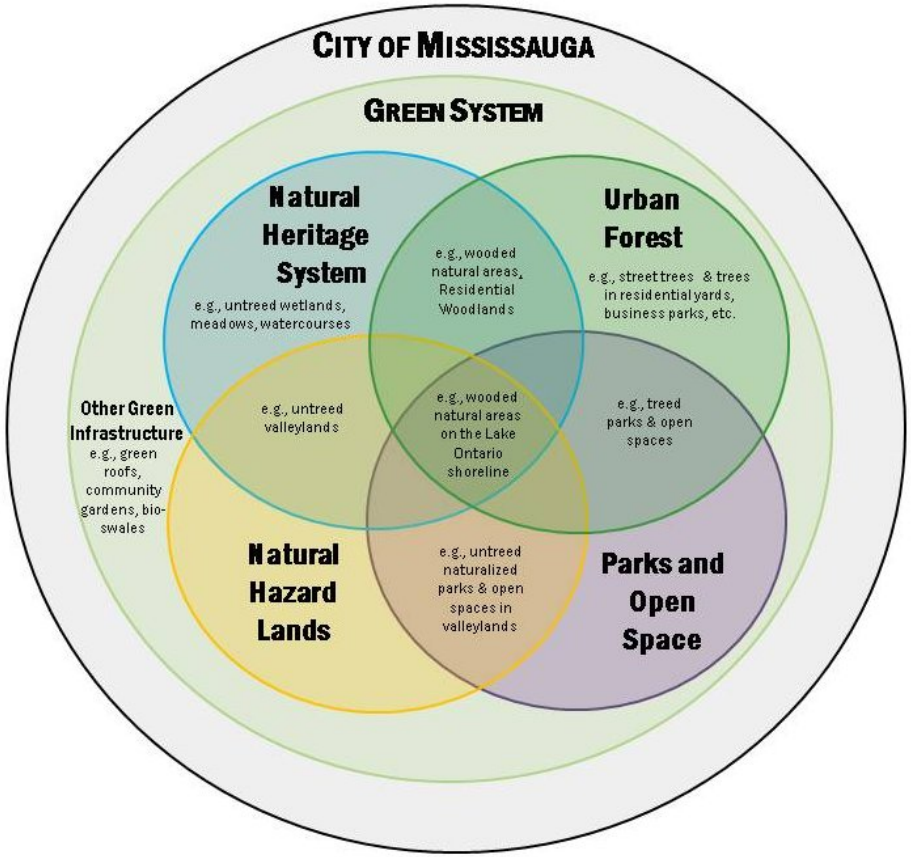


Figure 1. Conceptual illustration of the interrelatedness of the Natural Heritage System and the Urban Forest, with other components of the City's Green System, and the central importance of the Green System within Mississauga as a whole

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.

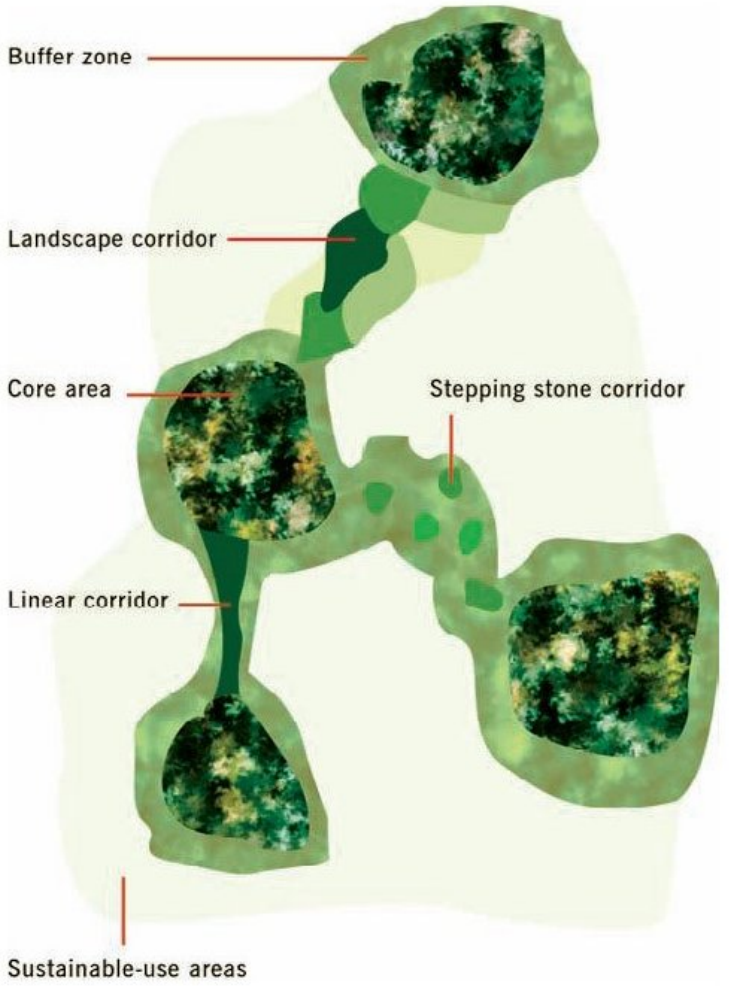


Figure 2. Diagrammatic representation of a natural heritage system illustrating the connection of natural "core" areas" with three different types of ecological "corridors" (from Bennett and Mulonguoy 2006[11])

[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.

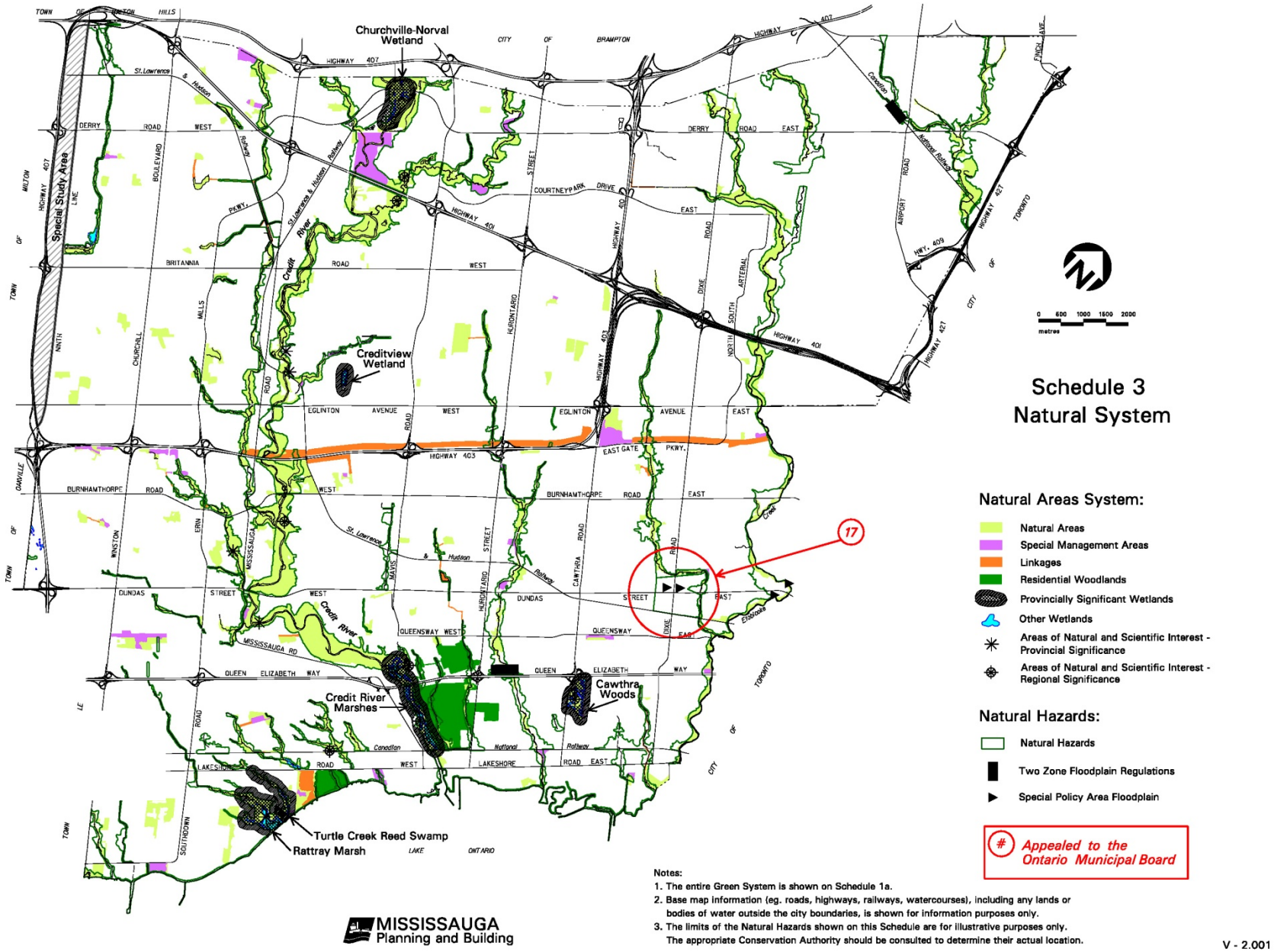


Figure 3. Current Natural Areas System (herein called a Natural Heritage System) identified in the City of Mississauga's Official Plan (2011)

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

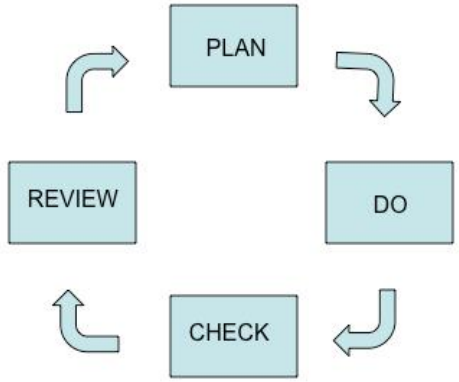


Figure 6. Illustration of the basic cycle of adaptive management (in which "check" could be replaced with "monitor")

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 Region Conservation Authority in association with the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, and Credit Valley Conservation.

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:

- $169,000 (with between $27,800 and $47,800 identified as new funding needed for each four years), and
- creation of an Environmental Planner position which it is anticipated can be created through role re-assignment of a vacant position in Planning and Building in the coming years, and therefore will not require new resources, but will be critical for implementation of this Strategy nonetheless.

Notably, substantial additional new costs are found within the UFMP Implementation Guide, which identifies $1,840,000 of new budget being required over the 20 year period of the Plan plus one temporary staff and one student required to support broader stewardship initiatives.

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 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) which 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 and Toronto Region Conservation, as well as Conservation Halton)
- 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 both useful planning and management, as well as a valuable resource for assessing trends within the Natural Heritage System that was integral to this Strategy.



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 Credit Valley Conservation'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**.

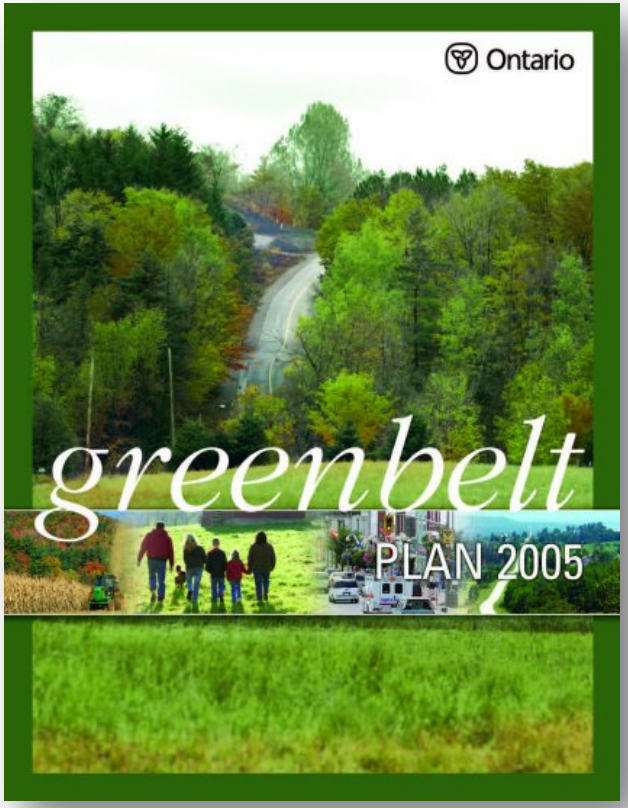
2.3.1 PROVINCIAL GREENBELT EXPANSION FEASIBILITY ASSESSMENT

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.

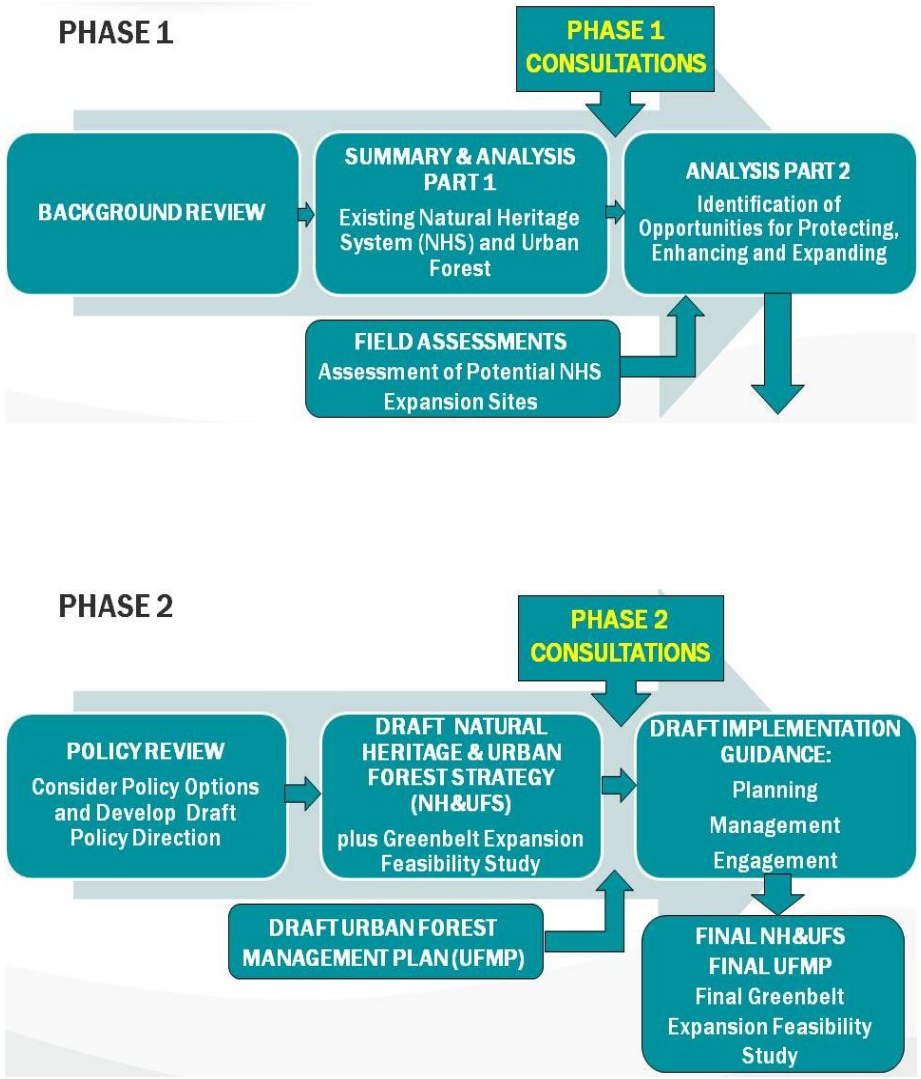


Figure 4. Illustration showing the process for the Natural Heritage & Urban Forest Strategy (NH&UFS) project

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.

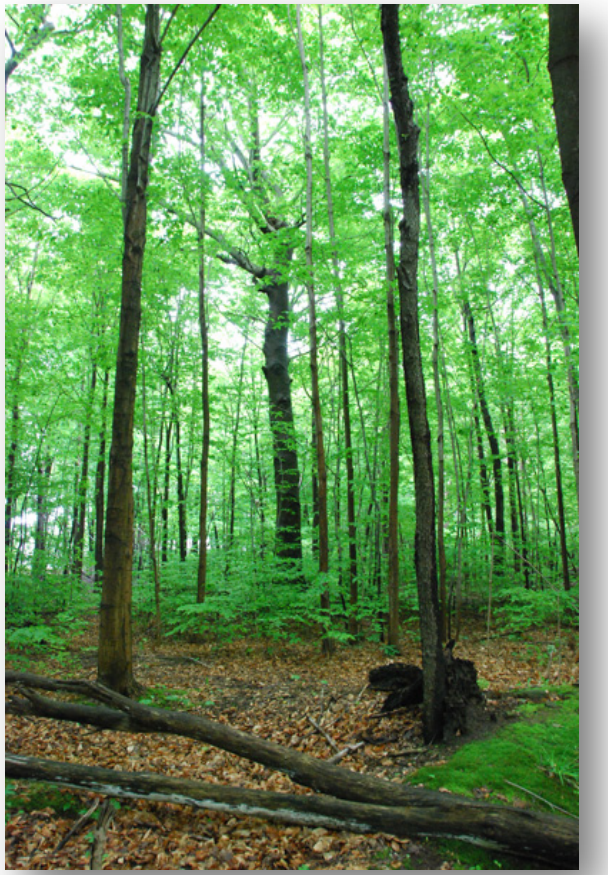
Although one of the main products of the NH&UFS are Strategies related to engaging a wide range of stakeholders and the public, as well as City staff, the meetings undertaken as part of this project were viewed as opportunities for outreach as well as for soliciting feedback, and were considered starting 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.

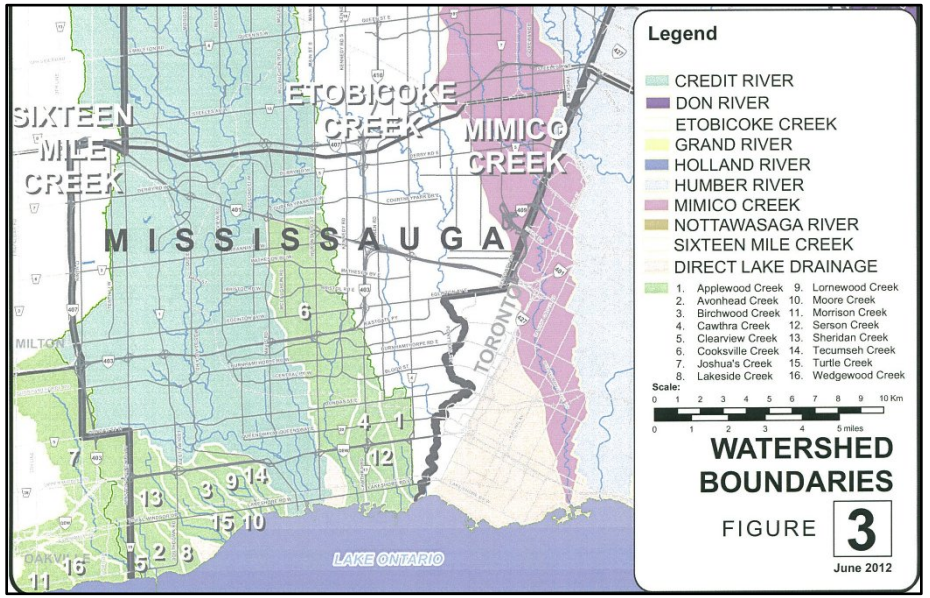


Figure 7. Map of the major and minor watersheds in the City of Mississauga (from the Region of Peel Official Plan, 2013 consolidation).

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
- continuation and expansion of 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.

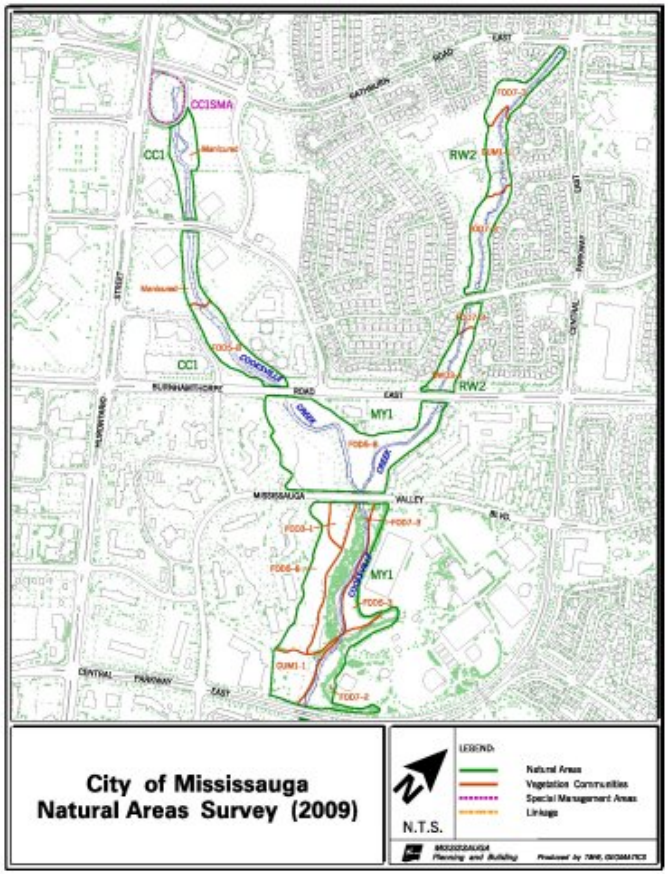


Figure 8. Sample Natural Areas Survey factsheet map

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 Toronto Region Conservation 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 Region Conservation and Credit Valley Conservation.

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 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 controlling the water at source with storm water management ponds (for detention and quality control) and, more recently, a renewed push to design developments to allow for more infiltration and treatment of water (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.

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.

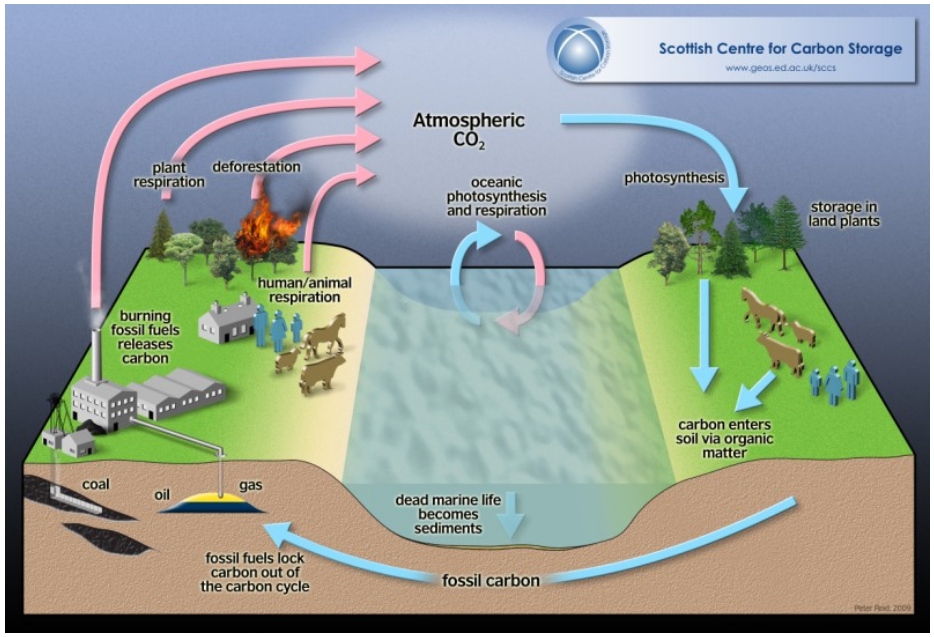


Figure 10. Illustration of the global carbon cycle (image source: Scottish Centre for Carbon Storage at http://www.geas.ed.ac.uk/sccs)

[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 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 human 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)*

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]*

[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

[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).

Credit Valley Conservation 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

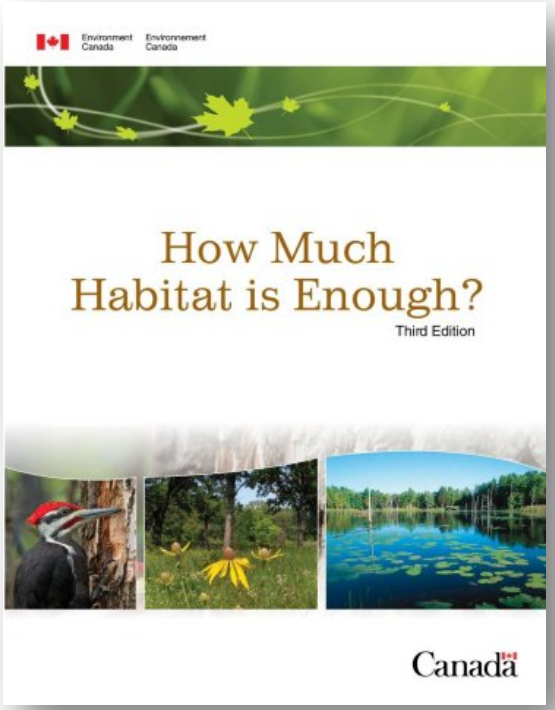
The primary source of upper-level policy direction with respect to planning is provided by the Province, however, there are some important Federal pieces of legislation and sources of guidance that relate to natural heritage and the urban forest.

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.

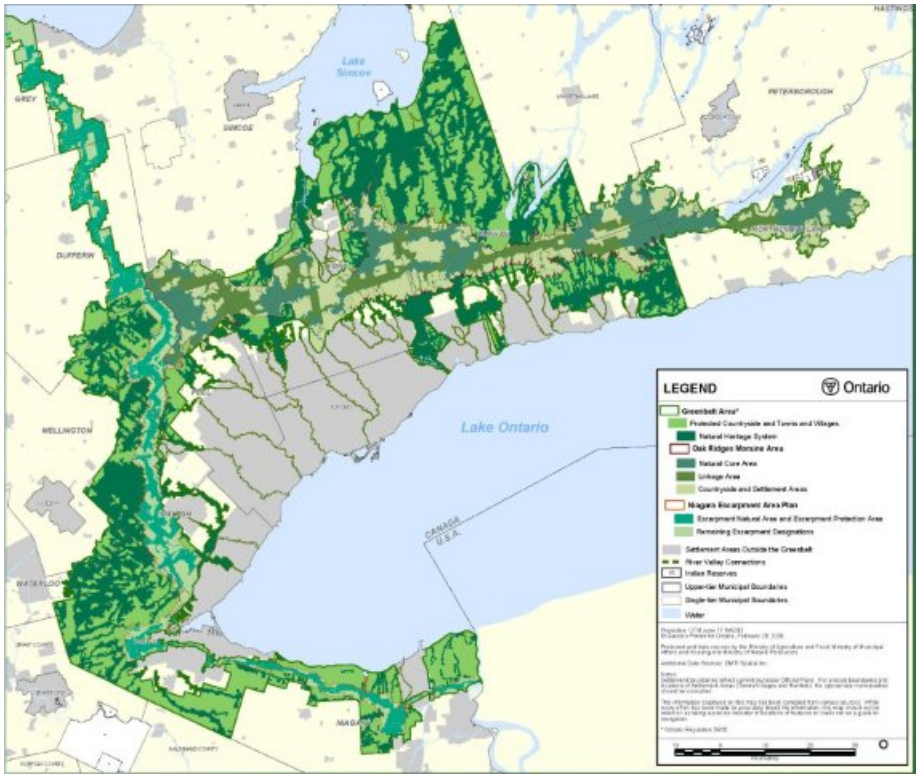


Figure 11. Context map showing the Greenbelt Plan Area in the context of the Greater Toronto Area (from the Provincial Greenbelt Plan, 2005)

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.

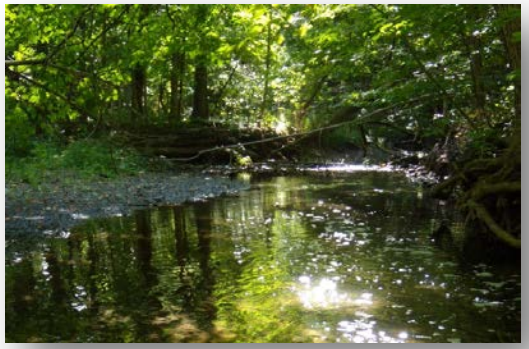
The analysis concluded that the expansion is feasible, although there are no clear policy-related benefits from including publicly owned lands as Urban River Valleys within the Greenbelt Plan (because it will not result in any greater level of protection of natural heritage features beyond what the City 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.

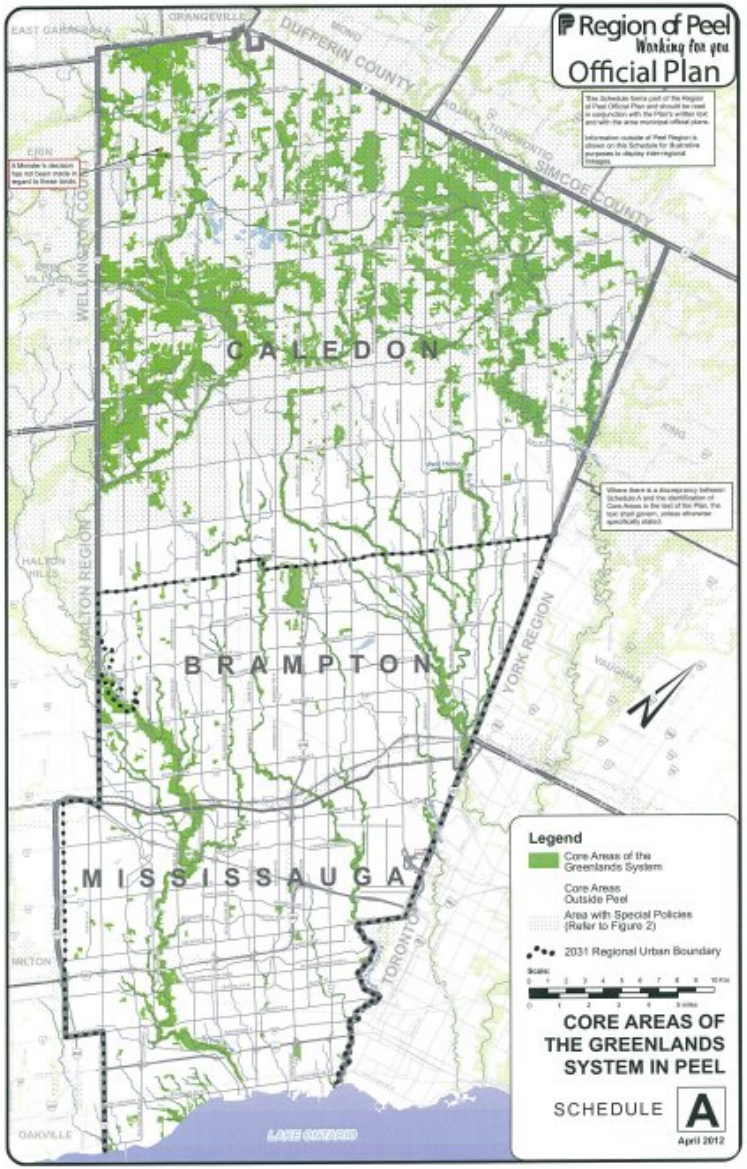


Figure 12. Regional Greenlands System (from the Region of Peel Official Plan, 2013 consolidation)

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 (Credit Valley Conservation, Toronto and Region Conservation, Conservation Halton, 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: Conservation Halton, Credit Valley Conservation (CVC) and Toronto Region Conservation, 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 are also responsible for implementing the federal *Fisheries Act* (1985), with support from Fisheries and Oceans Canada where required, and 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 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.



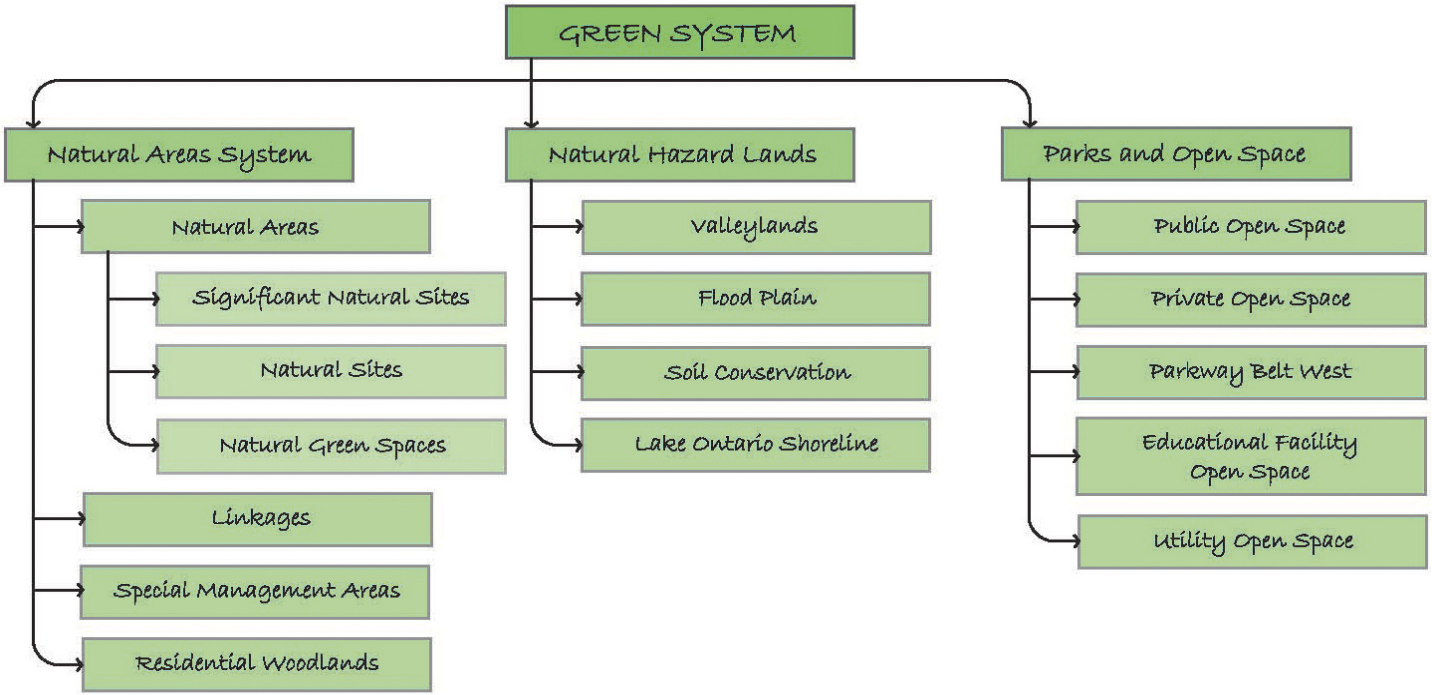
Strategic Plan (2009)

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 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



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*[32]
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 Toronto Region Conservation in collaboration with the Region, Area Municipalities (Mississauga, Brampton and Caledon), and Credit Valley Conservation, 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.

[32] 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 AT VARIOUS SCALES: 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[33]: Tracking the state of the Natural Heritage System and Urban Forest provides measures for assessing if strategies are working (or not). 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

10. 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.
11. 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.
12. 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.
13. 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

14. Protect the Natural Heritage System and Urban Forest on public lands through proactive management, enforcement of applicable regulations, and education.
15. 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.
16. 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

17. 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.
18. 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.



[33] "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 AND URBAN FOREST 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.

Differentiating Natural Heritage System and Urban Forest targets

As illustrated in Figure 1, the Natural Heritage System and the 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. Non-native and 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	Canopy cover meets or exceeds the total UF cover in 50% to 75% or more of the neighbourhoods and/or land uses identified as high priority for reforestation

* Data Source: *City of Mississauga Urban Forest Study* (2011) and subsequent analyses by the Peel Urban Forest Working Group.
** Data is 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 Credit Valley Conservation, 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[34].

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.

[34] 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 Credit Valley Conservation and Toronto Region Conservation have programs to collect and assess data from representative aquatic and terrestrial sites across the city. These programs measure the status of key paramaters (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 [35] (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 Credit Valley Conservation in a number of these areas.

[35] 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.

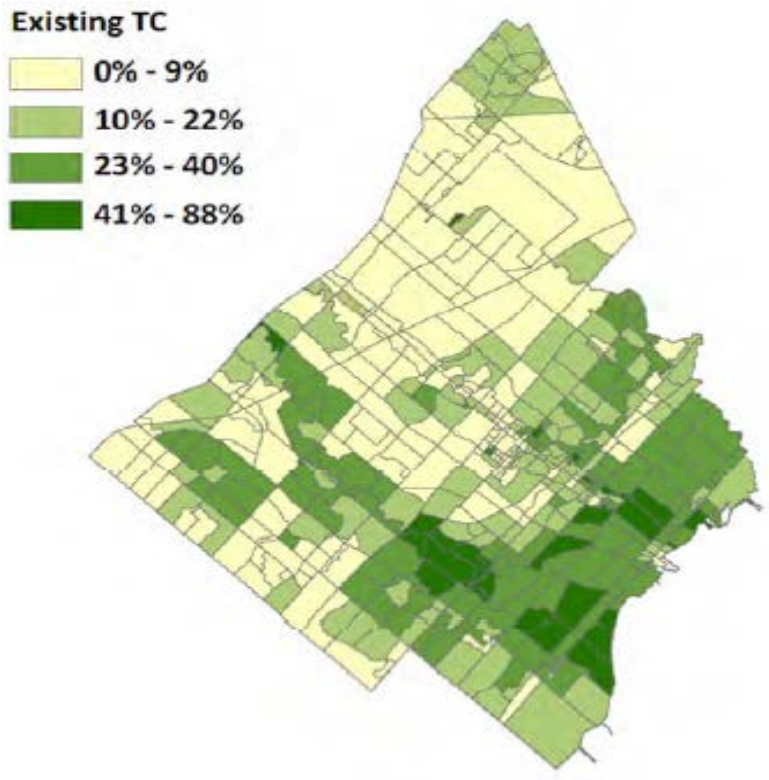


Figure 14. Existing tree canopy cover by small geographic units in Mississauga
(City of Mississauga Urban Forest Study 2011)

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[36] 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.

[36] 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[37] and should be achievable in most settings if the full range of native and non-invasive tree species suited to Mississauga's climate and growing conditions are considered.

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 with non-invasive species as trees are removed as part of planning or maintenance. Therefore a reduction in the proportion of invasive street and park trees of 7% over 20 years is considered appropriate.

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

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 reflects the history of development in Mississauga (e.g., older residential neighbourhoods, particularly those with large lots, tend to have high canopy coverage, while newer neighbourhoods do not) and some of it reflects constraints outside the City's control (e.g., extensive tree cover is not permitted within the Pearson airport lands because of safety reasons).

As this Strategy is being completed, the Region of Peel will be launching a unique tree planting prioritization study designed to incorporate a range of environmental, human health and social considerations. This study, to be undertaken in partnership with the City of Mississauga (and other area municipalities) 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), authored by Toronto Region Conservation, 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 areas identified as possible priorities for tree planting on this basis 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 this cover and targets areas where it provides the most benefits.

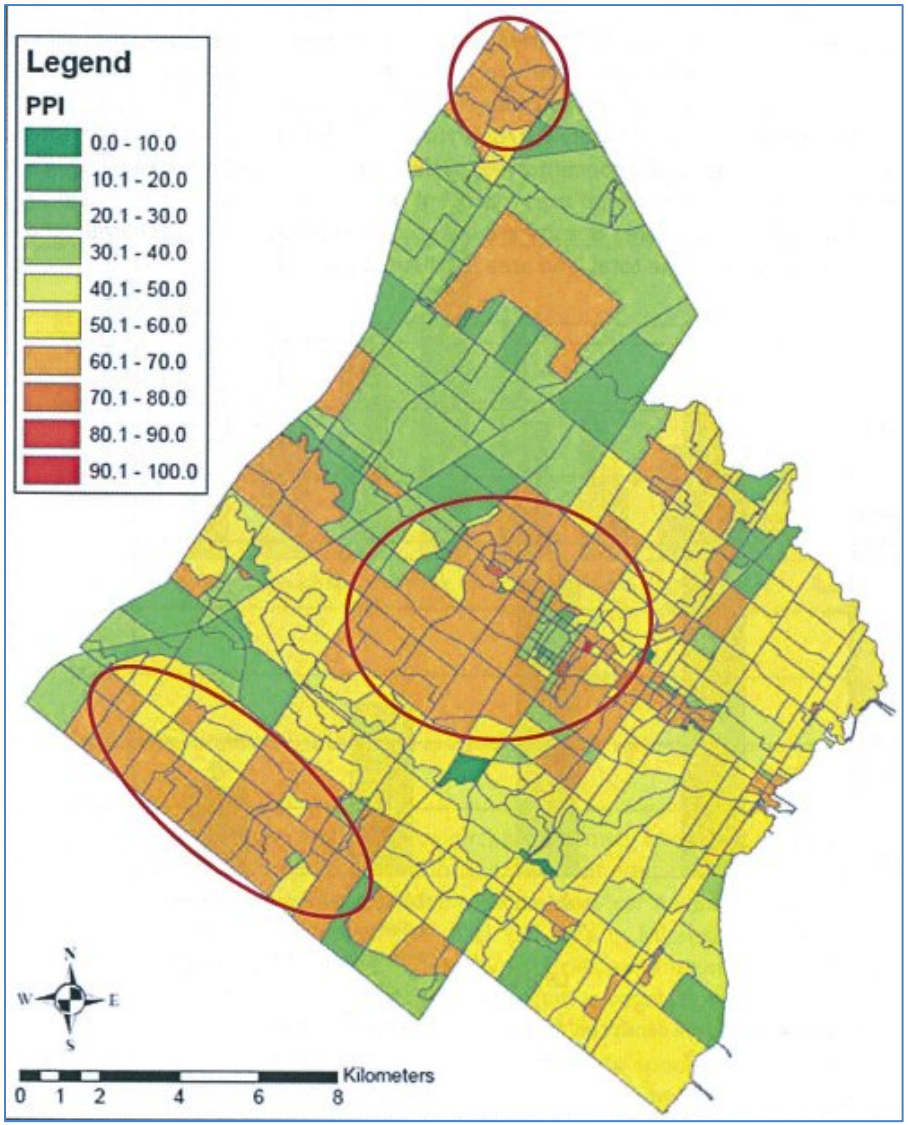


Figure 15. Conceptual Priority Planting Index mapping developed by the Peel Urban Forest Working Group (from City of Mississauga Urban Forest Study, 2011)

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[38] 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.

[38] 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[39]:

- 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[40], 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

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

[40] 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 purse 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 ecopassages, 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 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, 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[41]. 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[42]. 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.



[41] 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/

[42] 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"[43]
- 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**) 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

[43] Note that the shift in nomenclature from "Natural Areas System" to "Natural Heritage System" has already been approved by the Steering Committee and Core Working Team for this project, and has therefore been adopted for use in this Strategy but will not be formalized until the Strategy finalized and adopted by Council.

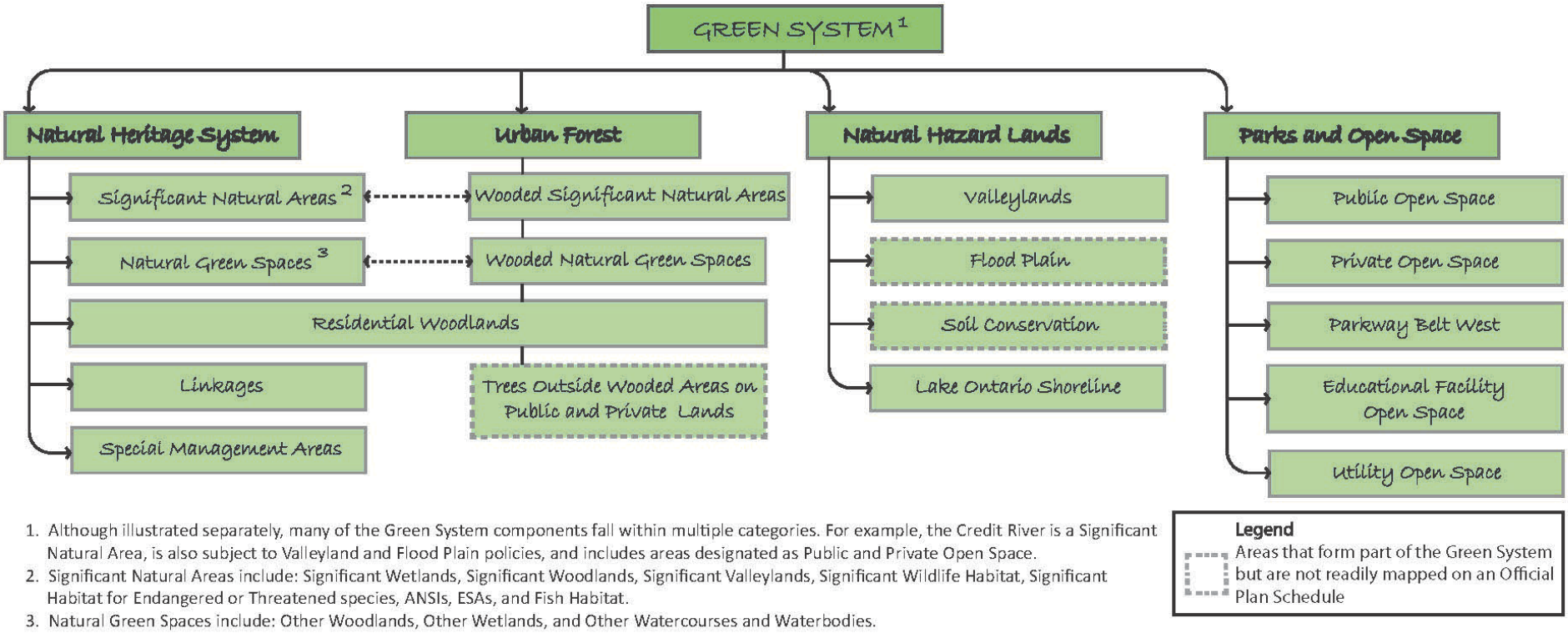


Figure 16. The proposed Green System policy Framework (refer to the current framework provided in **Figure 13**)

- 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 recognize it includes areas required to achieve natural heritage system targets identified by the conservation authorities

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 what significant natural features are to be protected from development and site alteration, and provide a clear link to the natural heritage policies in the Provincial Policy Statement and the Regional Official Plan thereby providing a defensible policy framework. Defining what constitutes a significant woodland in Mississauga within the Natural Heritage System, and adopting criteria and policies that align with Provincial guidance and the Regional technical requirements to further clarify and strengthen the City's policies.

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 based on site-specific considerations, and with consideration for applicable conservation authority policies and/or guidelines, through an EIS. 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, and encourage their restoration and enhancement, with specific reference to their role in Natural Heritage Systems identified by the conservation authorities.
- Update Environmental Impact Study (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.

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.

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.

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 ecopassages 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

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 scale (e.g., Niagara Escarpment) to local scale (e.g., river and stream valley systems) to site-specific scale (e.g., amphibian movement corridor between two wetlands). They may be continuous or "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[44], 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.



[44] 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, the distribution of canopy cover across the City)
    - 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"

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 (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 Storm water 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 agency
- 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.

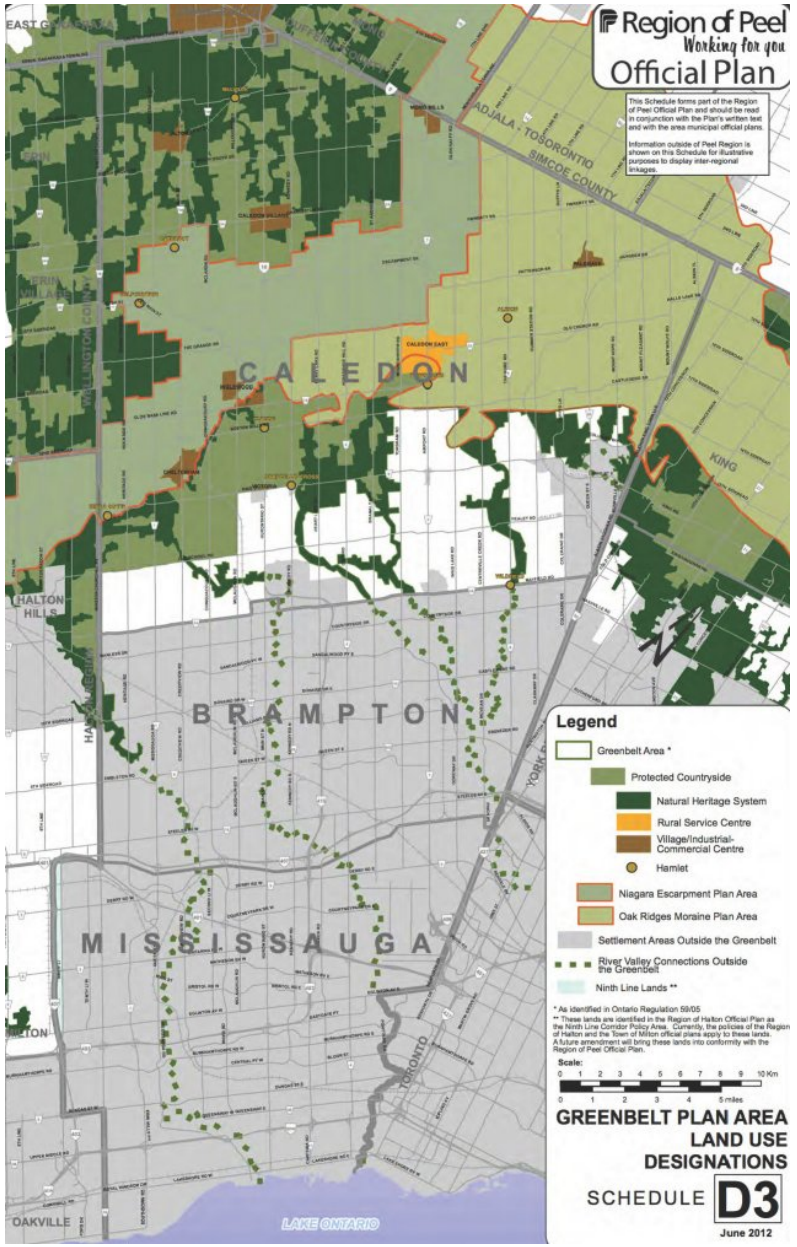


Figure 17. Regional Greenbelt Plan Area with river valley connections shown in green dots (from the Region of Peel Official Plan, 2013 consolidation)

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 [45](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 Areas 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)

[45] 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)

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 varies 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 ecopassages or traffic-calming (Strategy #5), or mitigative 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 Toronto Region Conservation Authority 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 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. Toronto Region Conservation 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.

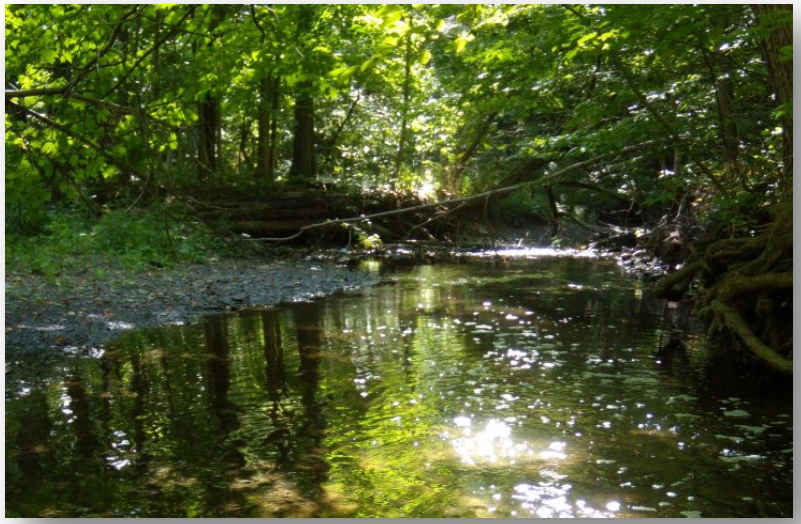
Rationale: Shifting towards tree health and risk management practices that are more proactive requires an initial investment, but quickly results in cost savings (as a result of taking a preventative approach), as well as a healthier Urban Forest. Increased maintenance frequency, particularly of young 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 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 for implementation guidance)
- 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, and elsewhere if applicable
- 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 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, eeffective 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 he 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 Green System.
- Continue to work with various partners to undertake stewardship on public lands (see UFMP Action #27 for implementation guidance)
- Design and build 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 Conservation Halton's educational programs
    - work with large open space land owners/managers and expand the relationship with Partners in Project Green and CVC's *Greening Corporate Grounds* by working to engage new businesses around the airport and beyond
    - support stewardship programs targeted to schools
- Build on the existing Significant Tree Program by (a) making the list of trees available to the public and (b) formalizing criteria for which trees should be recognized



- Promote the ongoing Sustainable Natural 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 often holds 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:

- 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 curriculua expectations

Rationale: Particular groups identified as priorities for targeted outreach related to natural heritage and the 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 influence the future development of Mississauga's landscape. 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:

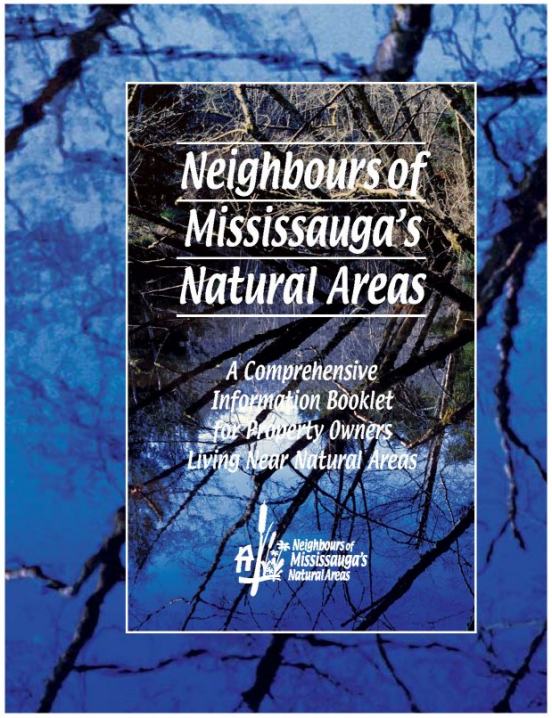
- Create short video clips on topics and issues related to the Natural Heritage System (see UFMP Action #21 for implementation guidance)
- Implement a classification system in the City that clearly distinguishes publicly accessible natural areas (e.g., Rattray Marsh, Erindale Woodlot, Creditview Wetland, 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:
    - incorporate the new promotional 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.

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 natural heritage "in their backyards" will encourage exposure to and enjoyment of these areas, which will also lend itself to stewardship.



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 Environmental Urban Design award 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 tax rebate 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 tax rebate tied to maintaining a certain proportion of the yard in permeable surface to recognize its 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 the UFMP, Appendix D.

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—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 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 priority 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[46]
- 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[47]
- 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. 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: It is expected that a number of the Strategies related to planning can be completed with the use of existing staff resources, but that Strategy #7 (related to updating the Residential Woodlands mapping and zoning) as well as a number of the other Strategies, will require an Environmental Planner with combined expertise in natural heritage and urban forest planning, as well as some background in ecology and arboriculture. This position will be critical for implementation of many aspects of this Strategy. The location of this position is to be determined. The costs for this new position account for about 80% of the new resources required.

PROTECTION AND MANAGEMENT STRATEGIES: None of these Strategies have any related new budget or staffing requirements, however it is important to recognize that this is because the new costs related to many of these strategies are found within the UFMP Implementation Guide, which identifies $2,866,970 of new budget being required over the 20 year period of the Plan.

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) 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 wide 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 is critical. Notably, some of the additional new costs associated with expanded stewardship efforts are identified in the UFMP Implementation Guide, as described above.

[46] 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).

[47] 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.

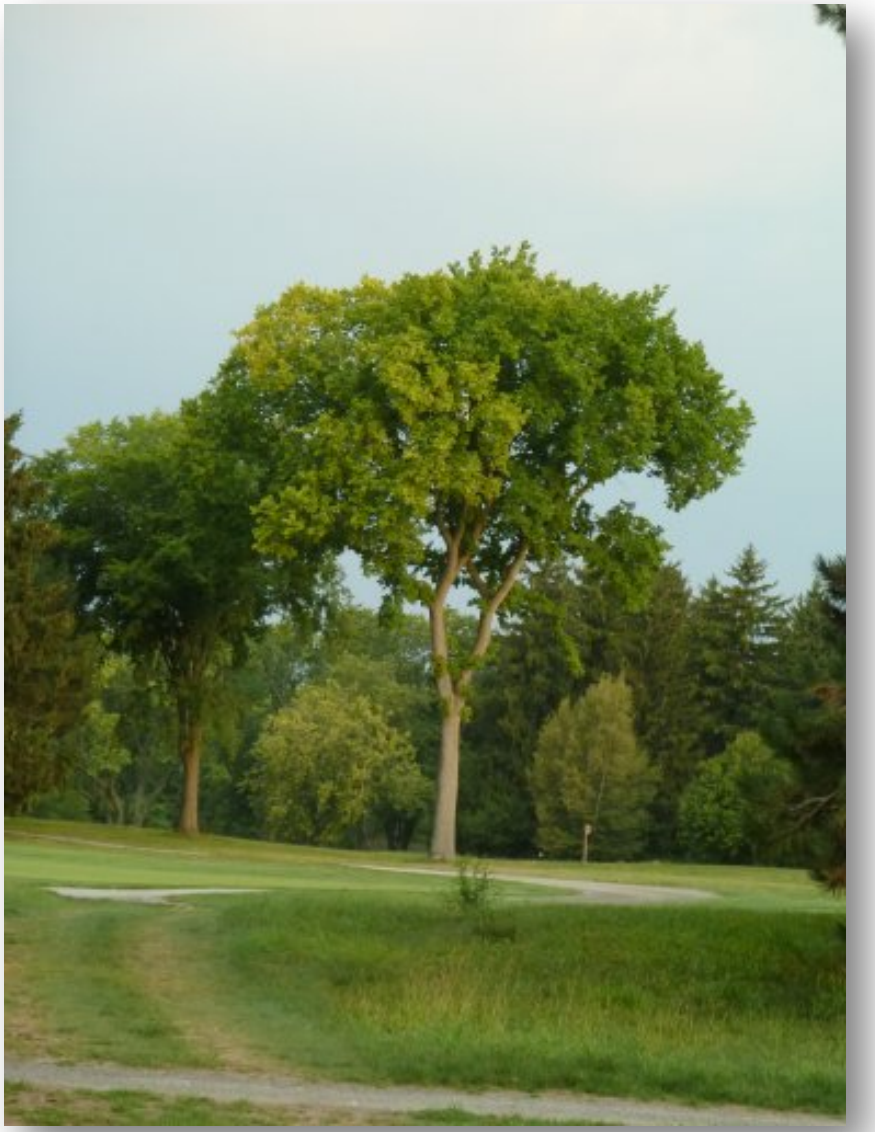
Recommended items with associated costs include pamphlets (on-line and hardcopy) that summarize by-laws applicable to the Urban Forest, signs and hoarding identifying Tree Protection Zones (on public and private projects), and a campaign to promote the value of the City's Natural Heritage System. All 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 Credit Valley Conservation) and Region at no additional cost. The 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.

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 should be viewed not so much as an expense, but more as a cost-effective investment into Mississauga's sustainability that 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 Civic Centre, Rick Henson Room and Committee Room C

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 Civic Centre , Rick Henson Room and 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 (Project Lead for the North-South Environmental 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 this 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 were 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 Jorgerson (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 (Project Lead for the North-South Environmental 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 tax rebate 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, the number and order 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 Region Conservation)
- 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 (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 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 mapping errors. 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 mapping errors 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

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 jurisdiction 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 feature 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 woodlands that meet the Region's Core woodlands criteria except for: • minor development and minor site alteration (as per ROPA 21b); • forest, fish and wildlife conservation; • passive recreation; and • existing uses. Development and site alteration shall not be permitted within non- Regional Core features that are designated as City Greenbelt lands.
Significant Valleylands	Core Areas	Natural Hazard Lands	**Significant Natural Areas**	Core Valley and Stream Corridors**	Development and site alteration shall not be permitted within non- Regional Core features or within adjacent lands to the natural features unless it has been
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	demonstrated that there will be no negative impacts on the natural features or their ecological functions (with an Environmental Impact Study (EIS)
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)	
Environmentally Sensitive Areas or Environmentally Significant Areas* **	• Core Areas	Significant Natural Sites	**Significant Natural Areas**		Development and site alteration shall not be permitted within the feature 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))
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 Special Management Areas or its 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 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 its 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 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

*** **ESAs** are not specifically a category from the Provincial Policy Statement – actually captures a range of features types – but carried over from older natural heritage assessments completed by the conservation authorities at a landscape scale.

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/
Edible Trees	Tree Canada	Community	Non-profit community	Tree Canada will consider projects that: increase equitable access to healthy food, empower	Grant (values vary)	http://treecanada.ca/en/p

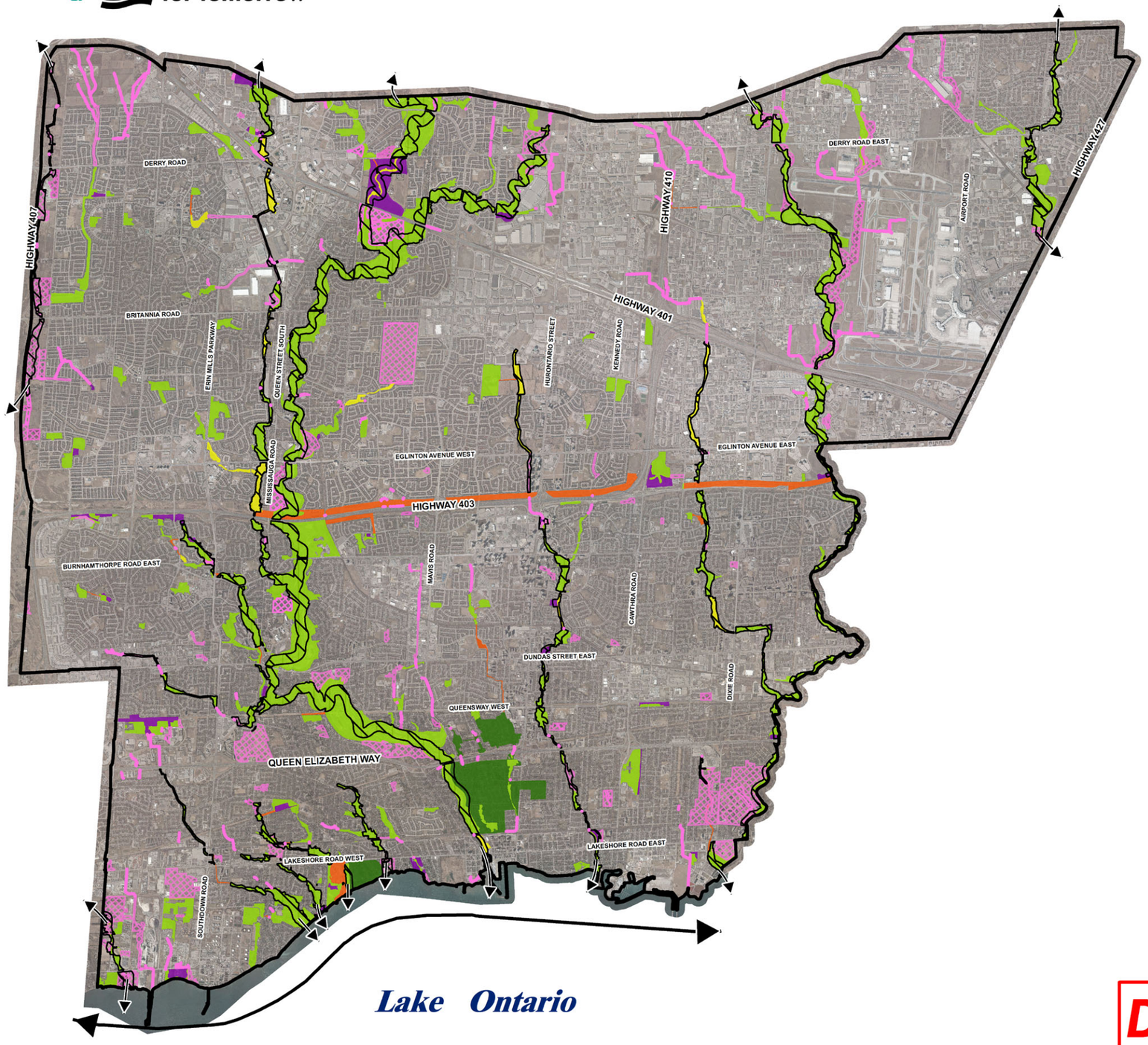
Program Name	Program Sponsor(s)	Target Group(s)	Required Lead for Application	Brief Program Description	Funding / Incentive(s) Offered	Contact / More Information
			group	neighbours to share in the harvest and care of city-grown food resources, provide access to the trees and their fruit, include creative plans for the produce grown, protect and preserves the Canadian environment, and assist residents in understanding and participating in environmental activities in local communities.		rograms/
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.your**leaf**.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)



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.

Draft

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Meters

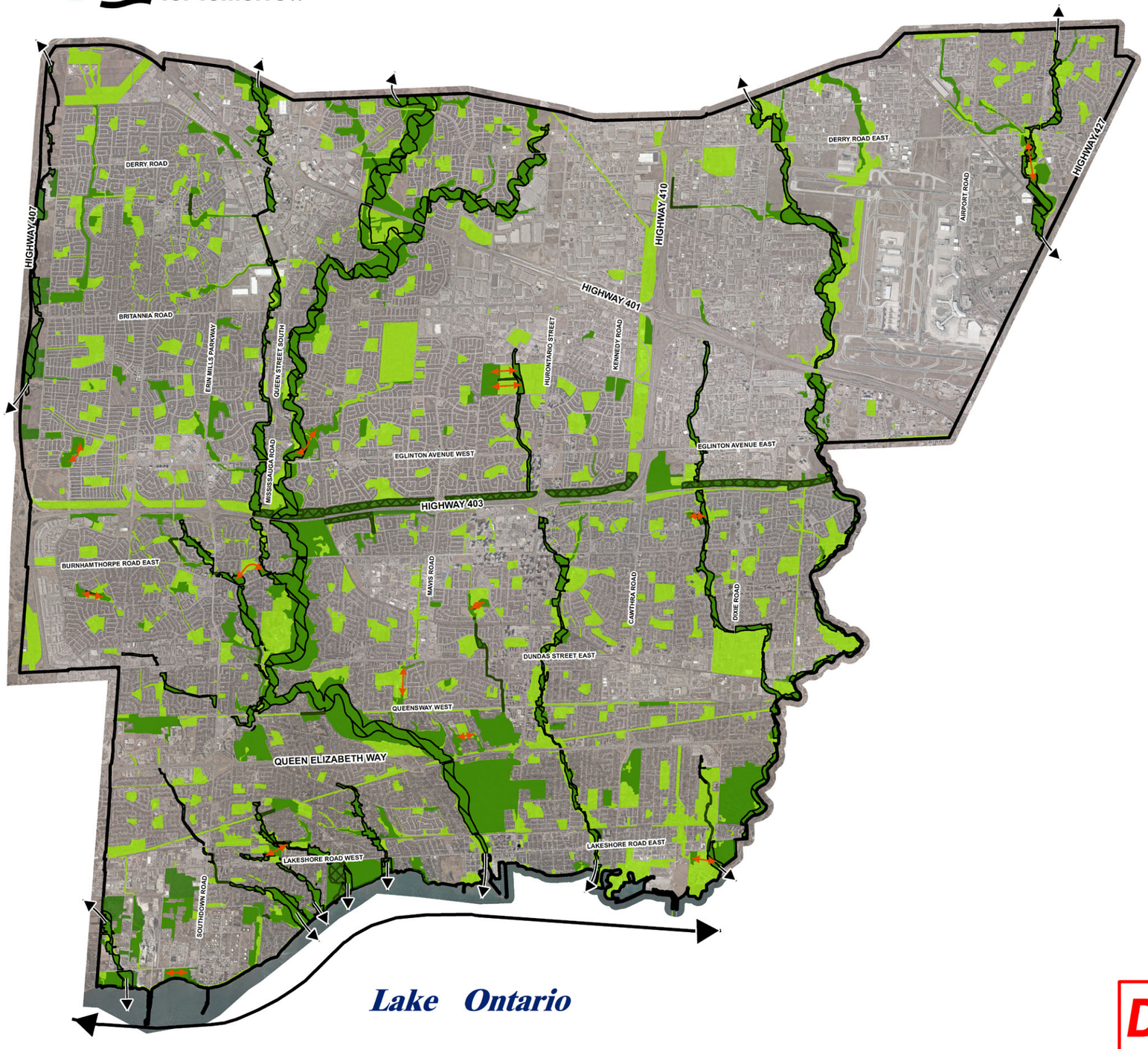
October 25, 2013

Natural Heritage & Urban Forest Strategy

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Map 2: Ecological Connectivity Provided by the Green System



Draft

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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Meters

October 18, 2013

PARKSANDFORESTRY

Urban Forest Management Plan

Final Draft

November 2013



Natural Heritage & Urban Forest Strategy

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Appendix 2

URBAN FOREST MANAGEMENT PLAN CONSULTING TEAM
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CITY LEADERSHIP TEAM

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

CITY STEERING COMMITTEE

John Calvert, Lincoln Kan, Gavin Longmuir, David Marcucci, Brenda Osborne, and Laura Piette (Project Sponsor), as well as previous Steering Committee members who participated in the process: Stu Taylor and Andy Wickens.

CITY COUNCIL

Mayor Hazel McCallion; Councillors Jim Tovey (Ward 1), Pat Mullin (Ward 2), Chris Fonseca (Ward 3), Frank Dale (Ward 4), Bonnie Crombie (Ward 5), Ron Starr (Ward 6), Nando Iannicca (Ward 7), Katie Mahoney (Ward 8), Pat Saito (Ward 9), Sue McFadden (Ward 10) and George Carlson (Ward 11).

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Previous Core Working Team members who participated in the process: Kim Barrett (Halton Conservation), Brock Criger (Region of Peel) and Mark Head (Region of Peel).

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Toronto Region Conservation: David Burnett, Meaghan Eastwood and Adam Miller.

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Conservation Authorities: Meaghan Eastwood, Lionel Normand, Yvette Roy and former member Paul Tripodo.

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STAKEHOLDERS

We would also like to thank the many individuals and organizations who attended workshops and provided input to the development of the UFMP through the NH&UFS process including but not limited to the following:

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 the NH&UFS under separate cover.

Special thanks are extended to Peel Region for providing project-specific technical support related to urban forest cover analyses.

EXECUTIVE SUMMARY

Value of the Urban Forest and Natural Areas

Mississauga's Urban Forest is fundamental to the City's environmental, social and economic well-being. The City's estimated 2.1 million trees provide millions of dollars' worth of environmental services such as pollution filtration and carbon storage annually, as well as many other ecosystem services.

Ecosystem Service	Estimated Amount (Dollar Value)*
Carbon Sequestration	7,400 tonnes annually ($220,000 estimated value)
Carbon Storage	203,000 tonnes ($5.8 million estimated value)
Air Pollution Removal	292 tonnes annually ($4.8 million estimated value)
Energy Consumption Reduction	79,000 MBTUS and 7,300 MWH annually ($1.2 million estimated value)

* estimates from the *City of Mississauga Urban Forest Study* (2011)

Additional valuable ecosystem services that the Urban Forest and Natural Heritage System in Mississauga provide but are harder to measure include:

- reducing exposure to ultraviolet radiation and extreme heat by providing shade and cooling
- encouraging active living
- providing social settings that tend to reduce incidences of crime
- supporting human health by reducing exposure to certain environmental risks, such as pollutants, and creating environments supportive of outdoors activities and recreation
- reducing mental fatigue by providing relaxing places and views
- building stronger communities by facilitating social interactions
- increasing the safety of community streets by calming traffic flow
- increasing the value of nearby homes, and
- increasing the attractiveness of commercial areas.

Rationale for an Urban Forest Management Plan (UFMP)

The development and implementation of an UFMP in Mississauga is a timely response to the challenges facing the City's Urban Forest and Natural Heritage System as the city moves into a phase of infill and intensification-based growth.



The pressures of redevelopment and intensification on existing trees and potential tree habitat are compounded by other environmental threats such as climate change-induced drought stress, and invasive pests and pathogens. However, effectively managing these challenges also provides opportunities for improving the sustainability of the Urban Forest and Natural Heritage System, which in turn creates a healthier community.

Key opportunities, as identified through this UFMP, include:

- pursuing proactive tree health and risk management on public lands and encouraging (and, where possible, supporting) it on private lands[1]
- working with planners, engineers and architects to find planning and design solutions that can accommodate long-lived, and where possible, large-statured trees
- ensuring that some type of compensation is provided for trees that must be removed and that opportunities for naturalization are not overlooked

[1] One of the opportunities arising out of the invasion of emerald ash borer is the potential to replace diseased ash with a greater diversity of native and non-invasive species, and ensure they are provided with adequate soil volume and quality.

- ensuring that trees are given adequate above and below-ground space, soil volume and soil quality by introducing and enforcing minimum requirements, as well as working with other disciplines and partners to find creative ways to give trees space while still meeting other requirements
- managing highly invasive plant species, as well as tree pests and diseases
- planting a diversity of tree species, including those better adapted to warmer and drier conditions anticipated under climate change
- facilitating a paradigm shift towards understanding and managing the Urban Forest and Natural Heritage System as shared community assets and vital components of the city's infrastructure through an active promotional campaign and an expanded stewardship program targeted to City staff, external stakeholders and the community, and
- building on existing partnerships and forming new ones to access resources and funding outside the City's purview.

Relationship between the UFMP and the NH&UFS

The high level of overlap and interconnectedness between natural heritage and urban forest assets has been recognized through the inclusion of both within a joint strategy: the Natural Heritage & Urban Forest Strategy (NH&UFS), which was developed in tandem with this Urban Forest Management Plan (UFMP). The two stand-alone reports can generally be distinguished as follows:

- Natural Heritage & Urban Forest Strategy (NH&UFS): the overarching document for both natural heritage and the urban forest in Mississauga providing strategies related to planning, management, engagement and tracking, with an overall emphasis on strategic planning direction and implementation
- Urban Forest Management Plan (UFMP): a plan that focuses on the operational, technical and tactical aspects required to implement the broader strategies related to the Urban Forest as well as the Natural Heritage System, with an emphasis on management and stewardship

While the NH&UFS and UFMP are stand-alone documents, the NH&UFS should be read in conjunction with this UFMP for context. As a result of their interconnections and shared values, **a vision, guiding principles, and objectives were developed for the NH&UFS project that is shared with the UFMP**, as follows:



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 at Various Scales
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

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.

Plan (and Strategy) Monitoring and Review

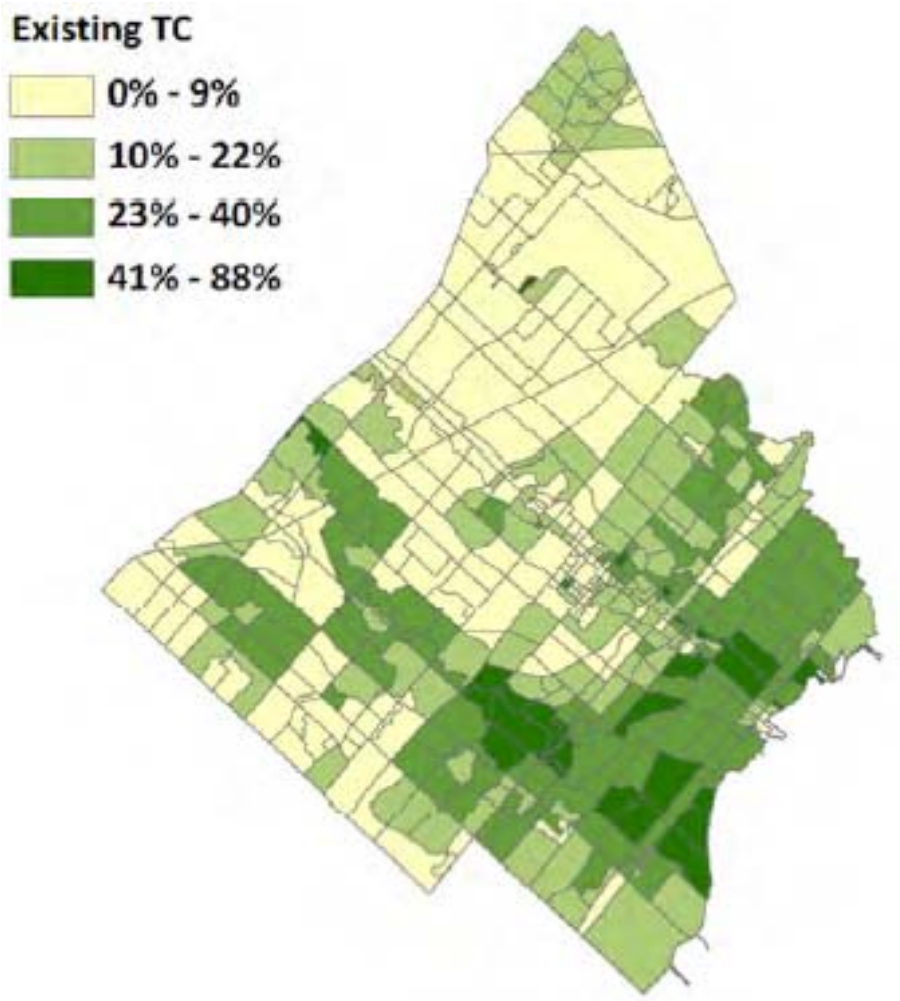
The overall timeframe for this UFMP (and the umbrella NH&UFS) is a 20-year horizon (i.e., 2014 to 2033), and the targets and Actions have been developed in the context of this timeline. Targets for the Urban Forest and Natural Heritage System are identified, and explained, in the NH&UFS.

The recommended review and monitoring for Mississauga's Urban Forest (as per NH&UFS Strategy #25, and supporting UFMP Actions #1 and #2) should consist of:

1. a review and update of the monitoring framework for the Natural Heritage System and the Urban Forest (as provided in Appendix A of the UFMP)
2. a review of the status, timing and anticipated budgetary requirements of each NH&UFS Strategy and supporting UFMP Action (as identified in the Implementation Guides under separate cover)), and
3. a summary of this information in a simplified, stand-alone format for release to City staff in all departments, Council and the community at least once every four years.

Notably, some of the more resource-intensive criteria (e.g., such as the collection of plot-based data) should not be re-assessed every four years, but rather should be re-examined every eight to 12 years.





Existing tree canopy cover (TC) by small geographic units (from *City of Mississauga Urban Forest Study*, 2011)

Recommended Actions

The following recommended actions have been developed with consideration of existing conditions and available resources, relevant best practices and precedents from the scientific and technical literature and other jurisdictions, recommendations from the studies completed by the Peel Urban Forest Working Group, and input from broad consultations with City staff and a range of stakeholders and representatives of the community.

The following 30 Actions have also been developed to provide more detailed technical, operational and/or tactical guidance regarding the implementation of a number of the Strategies identified within the broader Natural Heritage & Urban Forest Strategy (NH&UFS). The Strategies from the NH&UFS that relate to the UFMP Actions described in this Plan are identified below. Although each Action can be understood as part of this Plan, they are best understood within the broader context of the NH&UFS as well.

While the ultimate goal of the City's strategic urban forest management planning is to achieve sustainability for its Urban Forest and Natural Heritage System, targets and Actions developed are intentionally practical (i.e., considered achievable based on the existing conditions and analyses) and considered appropriate for the City's resource base. These Actions are also expected to be implemented under the City's leadership, but with the support of a wide range of external partners, as well as supplementary funding where available. These sources of support are identified in the UFMP Implementation Guide (under separate cover).

It has been recognized throughout the development of this Plan, and the broader NH&UFS, that although there are a number actions the City can take to help achieve Urban Forest and Natural Heritage System objectives in Mississauga, because so much of the City's natural heritage and urban forest assets reside on private lands, it is ultimately the community (including homeowners, tenants, businesses, schools, institutions, etc.) who will determine the extent to which this Plan, and the umbrella NH&UFS, are successful. Although found in the last section of this Plan, actions intended to support education, communication, promotion and partnerships are considered among the most important.

URBAN FOREST PROGRAM ADMINISTRATION

- Action #1: Adopt the monitoring framework developed for Mississauga's Natural Heritage System and Urban Forest *(provides support to NH&UFS Strategy #26)*
- Action #2: Monitor the status of the Natural Heritage System and the Urban Forest with support from the Region, local agencies and other partners *(provides support to NH&UFS Strategy #26)*

- Action #3: Formalize involvement of City Forestry staff in City planning and information sharing related to trees and Natural Areas *(provides support to NH&UFS Strategy #1)*
- Action #4: Develop consistent and improved City-wide tree preservation and planting specifications and guidelines *(provides support to NH&UFS Strategies #14 and #15)*
- Action #5: Update the inventory of City street and park trees, and keep it current *(provides support to NH&UFS Strategy #15)*

TREE AND NATURAL AREA HEALTH AND RISK MANAGEMENT

- Action #6: Optimize street and park tree maintenance cycles *(provides support to NH&UFS Strategy #15)*
- Action #7: Implement a young street and park tree maintenance program *(provides support to NH&UFS Strategy #15)*
- Action #8: Develop and implement a street and park tree risk management protocol *(provides support to NH&UFS Strategy #15)*
- Action #9: Develop a pest management plan for the Urban Forest *(provides support to NH&UFS Strategy #15)*
- Action #10: Undertake targeted invasive plant management in the Natural Heritage System *(provides support to NH&UFS Strategies #11 and #16)*

TREE ESTABLISHMENT, NATURALIZATION AND URBAN FOREST EXPANSION

- Action #11: Develop a targeted Urban Forest expansion plan *(provides support to NH&UFS Strategies #11 and #13)*
- Action #12: Implement a targeted Urban Forest expansion plan *(provides support to NH&UFS Strategies #11 and #13)*
- Action #13: Track and recognize naturalization / stewardship initiatives on public and private lands *(provides support to NH&UFS Strategies #11 and #12)*
- Action #14: Implement and enforce improved tree establishment practices on public and private lands *(provides support to NH&UFS Strategies #15 and #20)*

TREE PROTECTION AND NATURAL AREA MANAGEMENT

- Action #15: Update the Public Tree Protection by-law *(provides support to NH&UFS Strategy #8)*
- Action #16: Update the Erosion Control, Nuisance Weeds and Encroachment by-laws *(provides support to NH&UFS Strategy #8)*
- Action #17: Review the Private Tree Protection By-law *(provides support to NH&UFS Strategy #8)*
- Action #18: Increase effectiveness of tree preservation as part of private projects *(provides support to NH&UFS Strategies #14, #18 and #20)*
- Action #19: Increase effectiveness of tree preservation as part of municipal operations and capital projects *(provides support to NH&UFS Strategies #14, #18 and #20)*
- Action #20: Develop and implement Conservation Management Plans for City-owned Significant Natural Areas *(provides support to NH&UFS Strategy #16)*

PROMOTION, EDUCATION, STEWARDSHIP AND PARTNERSHIPS

- Action #21: Create short video clips on topics and issues related to he Natural Heritage system and Urban Forest *(provides support to NH&UFS Strategies #19 and #22)*
- Action #22: Make the City's tree inventory publicly accessible to support outreach, education and stewardship *(provides support to NH&UFS Strategy #19)*
- Action #23: Improve and maintain awareness about current Natural Heritage System and Urban Forest policies, by-laws and technical guidelines *(provides support to NH&UFS Strategies #1 and #20)*
- Action #24: Continue to support and expand targeted stewardship of local business and utility lands *(provides support to NH&UFS Strategy #21)*
- Action #25: Continue to support and expand targeted engagement of youth and stewardship of school grounds *(provides support to NH&UFS Strategy #21)*
- Action #26: Continue to support and expand targeted engagement of residents and community groups, and stewardship of residential lands *(provides support to NH&UFS Strategy #21)*
- Action #27: Continue to work with various partners to undertake stewardship on public lands *(provides support to NH&UFS Strategy #21)*
- Action #28: Design and operate a City Arboretum / Memorial Forest for the community that provides a place for spiritual connections to nature *(provides support to NH&UFS Strategy #21)*

- Action #29: Partner with local agencies and institutions to pursue shared research and monitoring objectives *(provides support to NH&UFS Strategy #23)*
- Action #30: Build on existing partnerships with the Region of Peel and nearby municipalities to facilitate information sharing and coordinated responses *(provides support to NH&UFS Strategy #23)*

Implementation

A stand alone Implementation Guide for the UFMP has been developed that is designed to facilitate implementation by:

- providing recommended timing for implementation
- identifying City department or division(s) that will lead the implementation
- listing the key implementation components
- identifying which Actions require new City resources for their implementation, and
- indicating which groups or organizations could provide potential partnerships and/or resources and/or funding.

The current new budget identified through this UFMP Implementation Guide is $2,866,970 including two seasonal staff and two students to support expanded stewardship efforts starting in the second four year period (i.e., 2018). The resource requirements are spread across the 20 year period of the Plan as follows:

- 2014 – 2017: $915,000
- 2018 – 2021: $291,710
- 2022 – 2025: $603,420
- 2026 – 2029: $453,420
- 2030 – 2033: $603,420

The primary areas requiring new resources are:

- updating and maintaining the City's street and park tree inventory (the primary tool for ensuring proactive and effective management of the City's treed assets) – projected for 2014 to 2017
- development of a City-wide pest management plan, and implementation of targeted invasive plant management in the City's most valued Natural Areas, and
- expansion of stewardship efforts on lands not under the City's jurisdiction (e.g., schools, commercial and industrial open spaces, residential lots, etc.) in partnership with the Region, local conservation authorities, businesses, academic institutions, community groups, and others.

Although the NH&UFS and UFMP are each stand-alone documents with their own Implementation Guides, effective implementation of this UFMP will require coordination with implementation of the NH&UFS, as well as adequate funding. This allocation of funds should be viewed not so much as an expense, but more as a cost-effective investment into Mississauga's sustainability that will help ensure the physical and mental well-being of the community, while also helping Mississauga mitigate and adapt to climate change.



CONTENTS

1 Introduction 1
1.1 Defining the Urban Forest 2
1.2 Content of the UFMP and Relationship to the NH&UFS 3
1.3 UFMP Structure, Review and Monitoring Framework 3
2 State of Mississauga's Urban Forest 6
3 Valuing Mississauga's Urban Forest 9
3.1 Environmental Services 9
3.2 Social and Health Benefits 10
3.3 Economic Benefits 11
4 Urban Forest and Natural Area Management Challenges and Opportunities 12
4.1 Key Challenges 12
4.2 Key Opportunities 15
5 Setting the Direction 16
5.1 Planning Context and Precedents 16
5.2 Vision, Guiding Principles & Objectives 18
5.3 Targets 19
6 Current Urban Forest Practices in Mississauga 20
6.1 Urban Forest Program Administration 20
6.1.1 Responsibility for the Urban Forest 21
6.1.2 Forestry Resources and Asset Management 23
6.2 Tree and Natural Area Health and Risk Assessment 24
6.2.1 Street Tree Maintenance and Block Pruning 24
6.2.2 Urban Forest Health Management 24
6.2.3 Tree Risk Management 24
6.3 Tree Establishment, Naturalization and Urban Forest Expansion 25
6.3.1 Tree Establishment Programs and Procedures 25
6.3.2 Standards and Specifications 26
6.4 Tree Protection and Natural Area Management 27
6.4.1 Official Plan Policies 27
6.4.2 By-laws 29
6.4.3 Tree Preservation as Part of Private Projects 30
6.4.4 Tree Protection as Part of Public Projects 31
6.5 Promotion, Education, Stewardship & Partnerships 32
6.5.1 Website and Social Media 32
6.5.2 Promotion and Education 33
6.5.3 Stewardship, Partnerships & Funding 34
7 Best Practices & Opportunities for Improvement 36
7.1 Urban Forest Management and Administration 36
7.1.1 Urban Forest Monitoring 36
7.1.2 Tree Inventory 36
7.1.3 Interdepartmental Coordination 37
7.1.4 Specifications, Standards and Guidelines 38
7.2 Tree and Natural Area Health and Risk Assessment 39
7.2.1 Young Tree Pruning 39
7.2.2 Cyclical Pruning 39
7.2.3 Park Tree Maintenance 40
7.2.4 Tree and Woodland Risk Management 40
7.2.5 Invasive Plant Species Management 41

7.3 Tree Establishment and Urban Forest Expansion 42
7.3.1 Tree Species Selection 42
7.3.2 Tree Habitat 43
7.3.3 Tree Establishment and Naturalization Programs 44
7.4 Tree Protection and Natural Area Management 45
7.4.1 Official Plan Policies 45
7.4.2 Tree Preservation By-laws 46
7.4.3 Tree Preservation Through the Planning Process 47
7.4.4 Tree Protection during Municipal Works 48
7.5 Promotion, Education, Stewardship & Partnerships 49
7.5.1 Outreach Using Public Websites and Social Media 49
7.5.2 General and Targeted Marketing 50
7.5.3 Promoting the Value of Natural Areas and their Sensitivities 51
7.5.4 Stakeholder Engagement & Fostering Community Partnerships 51
7.5.5 Building Research Partnerships 52
7.5.6 Funding Opportunities and Incentives 53
8 Recommended Actions 54
8.1 Urban Forest Management and Administration 55
8.2 Tree and Natural area Health and Risk Assessment 58
8.3 Tree Establishment, Naturalization and Urban Forest Expansion 62
8.4 Tree Protection and Natural Area Management 66
8.5 Promotion, Education, Stewardship and Partnerships 71
9 Implementation Guidance 79
10 Glossary of Technical Terms 81

TABLES

Table 1. Examples of grey versus green infrastructure

Table 2. Overview of the environmental services provided by Mississauga's urban

Table 3. *Peel Region Urban Forest Strategy* (2011) guiding principles and strategic objectives

Table 4. Provincial statutes and policies with relevance to urban forest management

FIGURES

Figure 1: Framework for implementation of Mississauga's Urban Forest Management Plan

Figure 2. Land cover estimates in Mississauga

Figure 3. Existing tree canopy cover (TC) by small geographic units

Figure 4. Representation of the diversity of Mississauga's street trees (by stem count)

Figure 5. Land surface temperature, Greater Toronto Area, July 2008, showing summer time "hot spots" in urban areas

Figure 6. Illustration of the proportion of city-owned street trees at risk from emerald ash borer

Figure 7. Illustration of where the City's Urban Forest Management Plan fits in relation to other City guiding documents

Figure 8. The density of canopy cover in a mapped Residential Woodland area (CL7) in dark green hatching along Mississauga's lakeshore

Figure 9. Illustration of the exponential increase in ecosystem services (or benefits) provided by trees as they mature.

APPENDICES

Appendix A. Monitoring framework for assessing Mississauga's Natural Heritage System and Urban Forest.

Appendix B. Summary of how the 27 recommendations from the City of Mississauga Urban Forest Study (2011) have been addressed through this Urban Forest Management Plan and the broader Natural Heritage & Urban Forest Strategy.

Appendix C. Invasive Species Management Plan

Appendix D. Guidance for Natural Area Conservation Plans Prioritization and Implementation

Appendix E. Overview of Shared Stewardship Opportunities

1 INTRODUCTION

Mississauga's urban forest is fundamental to the City's environmental, social and economic health. The City's estimated 2.1 million trees provide valuable ecosystem services such as pollution filtration, flood control, and carbon storage, as well as many other benefits to mental and physical health, and many economic spin-offs.

Mississauga's Urban Forest currently has an overall canopy cover of about 15%. These trees remove an estimated 292 tonnes of ozone from the atmosphere annually, reducing ambient ground level ozone during the day by about 12 parts per billion (ppb).

Data from 2008 indicate that ozone levels in parts of the city remain well above "safe" thresholds set by Health Canada for most of the day (i.e., between 10 am and 8 pm). Increasing the City's Urban Forest cover can effectively reduce the time which ozone levels are above safe levels, and help the community breathe easier.

Toronto Region Conservation (through the Peel Urban Forest Working Group)

However, trees in an urban setting cannot sustain themselves and face many challenges to successful establishment and long-term growth. To be effectively sustained, an urban forest requires planning, management and stewardship that considers the protection, maintenance, replacement and integration of trees a priority. This Urban Forest Management Plan (UFMP), along with the "umbrella" Natural Heritage & Urban Forest Strategy (NH&UFS) document, is intended to provide the strategic and technical guidance required to ensure the sustainability of Mississauga's urban forest.

Investments in the health and longevity of existing trees, and to expand the urban forest will, over time, result in the provision of greater and more widespread urban forest benefits. These benefits will become increasingly important and valuable as Mississauga's population, which is currently more than 740,000, continues to increase.



This UFMP was developed as part of a unique municipal approach of looking at the City's Urban Forest and Natural Heritage System in an integrated way so that opportunities for protecting, enhancing, restoring and expanding both of these assets could be considered together. As a result of this approach, the UFMP takes its direction from the vision, guiding principles, and objectives of the NH&UFS and provides more detailed technical, operational and tactical guidance for many of the Strategies identified in the NH&UFS through the 30 Actions identified in this Plan.

The UFMP Actions are intended to improve the health, sustainability and performance of the urban forest on both private and public lands by being more proactive and innovative about administration, health and risk management, establishment and expansion, protection, engagement and stewardship related to trees and the urban forest as a whole.

This UFMP has been developed:

- based on a comprehensive review of the City's current policies, practices and resources
- by building on the canopy cover data and analyses conducted and provided by the Peel Urban Forest Working Group[2]
- with consideration for the findings and recommendations presented in the *Peel Region Urban Forest Strategy* (2011) and the *City of Mississauga Urban Forest Study* (2011), developed by Toronto Region Conservation with support from the Peel Urban Forest Working Group
- 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[3], and members of the community.

The following key considerations have shaped the development of this UFMP:

- Mississauga is almost entirely built-out, with future development expected to be largely through infill and intensification.
- There will be considerable challenges involved in protecting and maintaining the city's current tree cover under existing and anticipated conditions (as described in Section 2).
- Although the City is responsible for hundreds of thousands of trees on its streets and in its parks and open spaces, more than half of Mississauga's existing urban forest canopy is on private lands, and the majority of the opportunities for planting additional trees are on the landscaped areas of the city's private residential, commercial and industrial lands.
- Mississauga has been gradually building and improving its capacity to implement proactive urban forestry policies, practices and programs over the past two decades. As such, there are a number of innovative policies and successful programs to build on.

This UFMP is intended for use by City staff to guide the planning and implementation of actions to achieve strategic objectives, and to be a resource for City staff and stakeholders to become better informed about the importance of the urban forest, challenges to urban forest health and sustainability, and what can be done to proactively and effectively manage this valuable asset.

1.1 DEFINING THE URBAN FOREST

The 'urban forest' is generally understood to be all the trees in a given urban or urbanizing jurisdiction. However, this UFMP recognizes that other components (such as the above and below-ground growing conditions) must also be considered if management is to result in genuine enhancement and expansion of the urban forest, and related increases in benefits and services. As such, this UFMP adopts the definition of the urban forest from the *Peel Region Urban Forest Strategy* (2011), which defines the urban forest as: ***"a dynamic system that includes all trees, shrubs and understory plants, as well as the soils that sustain them, located on public and private property".***

In accordance with this definition, a successful urban forest management program must consider more than just trees in both strategic initiatives and daily operations. Consequently, this UFMP considers a wide range of topics beyond tree maintenance, such as urban planning, infrastructure development, natural areas connectivity, naturalization, public education, and partnerships, among others.

The Urban Forest as Green Infrastructure

The Urban Forest is a key component of what is called the City's "green infrastructure". A city's "grey" infrastructure is generally understood to be the sewage and water systems, waste management systems, electric power generation and transmission networks, communication networks, transit and transportation corridors, and energy pipelines that provide all the services required for modern day living. However, it is increasingly becoming recognized that trees (as well as untreed open spaces and natural areas) also provide a

[2] The Peel Urban Forest Working Group, formed after the development of the *Peel Region Urban Forest Strategy* (2011), includes representatives from the Region of Peel, City of Mississauga, City of Brampton, Town of Caledon, Credit Valley Conservation and Toronto Region Conservation with expertise in urban forestry.

[3] Stakeholders consulted as part of the joint development of the NH&UFS and the UFMP 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, and arboriculture firms. Summaries of input received through these consultations are provided in the NH&UFS (Appendices A and B).

number of essential and highly desirable services and benefits that facilitate modern life, particularly in urban areas. These components have been labelled "green infrastructure" to highlight their functional value in a way that is comparable to the built "grey infrastructure". Specific examples are illustrated in **Table 1**.

Table 1. Examples of grey versus green infrastructure

Grey Infrastructure	Green Infrastructure
• Roads, highways and parking lots • Storm and sanitary sewer lines • Public utilities (e.g., hydroelectric lines and stations, natural gas lines, water pipes and filtration plants)	• Trees, shrubs and soil • Rain gardens and naturalized swales • Wetlands (constructed and natural) • Green roofs and living walls • Engineered soils and permeable pavement

1.2 CONTENT OF THE UFMP AND RELATIONSHIP TO THE NH&UFS

The content of this UFMP is as follows:

- a framework for monitoring both the Natural Heritage System and the Urban Forest (**Section 1.3**)
- an overview of the state of Mississauga's Urban Forest (**Section 2**)
- a summary of the value of Mississauga's Urban Forest (**Section 3**)
- an overview of challenges to Urban Forest sustainability (**Section 4**)
- the vision, guiding principles, objectives and targets for the Plan (**Section 5**)
- a review of Mississauga's current practices and programs (**Section 6**)
- relevant best practices and opportunities for improvement (**Section 7**)
- recommended Actions (and related NH&UFS Strategies) (**Section 8**), and
- implementation guidance (**Section 9**).
- a glossary of key technical terms (**Section 10**).

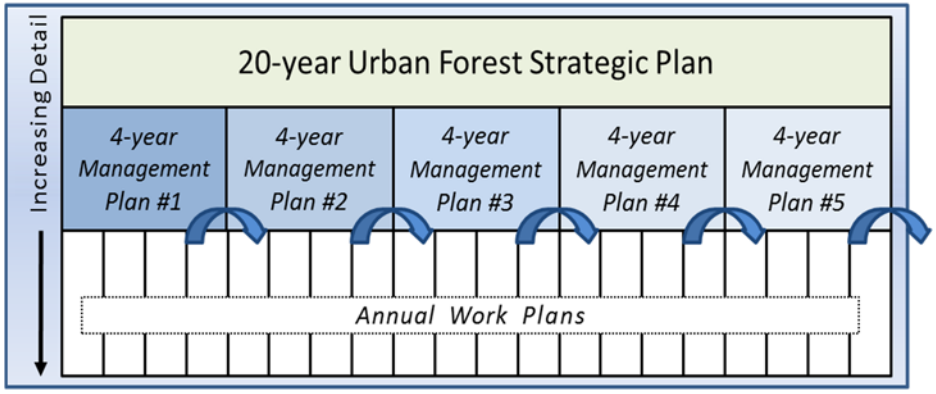
The City's NH&UFS identifies opportunities for protecting, enhancing, restoring and expanding both the Natural Heritage System and Urban Forest together. These opportunities, and strategies for implementing them, are identified in this NH&UFS. However, in order to implement some aspects of the Strategy, the City requires more specific technical, operational and tactical guidance. This guidance as it relates to Urban Forest and Natural Areas management and stewardship is provided in this UFMP.

As a result of this close relationship between the two documents: (a) the NH&UFS and UFMP share the same vision, guiding principles, objectives, and targets, and (b) many of the NH&UFS Strategies are supported by UFMP Actions (as indicated in **Section 8**), which are detailed in this report.

1.3 UFMP STRUCTURE, REVIEW AND MONITORING FRAMEWORK

The overall timeframe for this UFMP is a 20-year horizon (i.e., 2014 to 2033), and the targets and Actions have been developed in this context. The 20-year planning framework for this UFMP is divided into three tiers to support an adaptive management approach, as per **Figure 1**.

Figure 1. Framework for implementation of Mississauga's Urban Forest Management Plan



Tier 1: 20-year Strategic Direction (2014-2033)

- Identifies a long-term vision, guiding principles and strategic objectives
- Sets targets to be achieved in the 20-year period
- Reviews current practices in Mississauga
- Considers best practices from technical and scientific literature
- Identifies opportunities to improve Mississauga's urban forest management practices and programs that are appropriate for the City's context and in line with the long-term vision

Tier 2: Five Four-year Management Plans (2014-2017, 2018-2021, etc.)

- Links guiding principles and long-term objectives with daily practices and on-the-ground operations
- To be implemented by the appropriate departments (i.e., Parks and Forestry, Planning and Building. and Transportation and Works)
- To be tied to recommended budgets and current priorities, but developed with the longer-term vision in mind, as laid out in the UFMP
- To be reviewed and updated at end of every 4th year of implementation and updated in response to objectives met, as well as those yet to be met, and changes in existing conditions

Tier 3: Annual Operating Plan (AOP)

- Provides the applied and specific guidance for day-to-day operations
- Includes operational plans for planting, pruning, removals, inspections, inventory maintenance and public engagement/outreach
- Considers budgets and current priorities, but developed with consideration for the vision and objectives, as outlined in the Four-year Management Plans and the UFMP

This UFMP is the "Tier 1" plan. The City's Forestry Division will take the lead on developing the Tier 2 and Tier 3 plans related to this UFMP. This structure will help ensure that the UFMP is treated as a 'living document' through built-in periodic plan assessment and review cycles, further described below.

The 20 year time frame for this Plan aligns with the 20 year time frame for the broader NH&UFS, and also:

- is considered an appropriate time frame to enable implementation and document substantial changes in urban forest cover and sustainability, but not so long as to lose sight of long-term objectives
- coincides with the 20 year time frame for the One Million Trees Program and with the *Future Directions Master Plan for Parks and Natural Areas* (2009) time frame which extends to 2031, and
- falls within the City's broader 50 year strategic planning horizon .

After the 20 year period for this Plan (and the related NH&UFS), it is anticipated that both the overall Strategy and the UFMP will undergo a comprehensive review and update, and a new NH&UFS and UFMP will be developed for the subsequent 20 years.

Adaptive Management

Natural forested ecosystems are complex and dynamic entities, and urban forests have the added complexity of being heavily influenced by human activities. In this context, it is difficult for urban forest managers to anticipate changes or events, such as ice storms or pest infestations, that they may have to accommodate. Available resources can also change. For this reason, the concept of active adaptive management is firmly embedded in this UFMP (and the broader NH&UFS).

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

Adaptive management is embedded in both the NH&UFS and the UFMP through the following recommendations for monitoring and regular review (as per NH&UFS Strategy #25, and supporting Actions #1 and #2):

- Adopt the monitoring framework developed for the NH&UFS, and the supporting UFMP (see **Appendix A**), and use the criteria and indicators in this framework as a basis for assessing the status of the City's Natural Heritage System and Urban Forest, as well as the status of planning, management and engagement related to these assets, and
- Summarize and report on the state of the City's Natural Heritage System and Urban Forest once every four years In addition, the implementation guidance for the UFMP (as described in **Section 9**) has been developed as a separate document so that it can be revised as needed in response to new information and/or changes in priorities and/or resource availability.

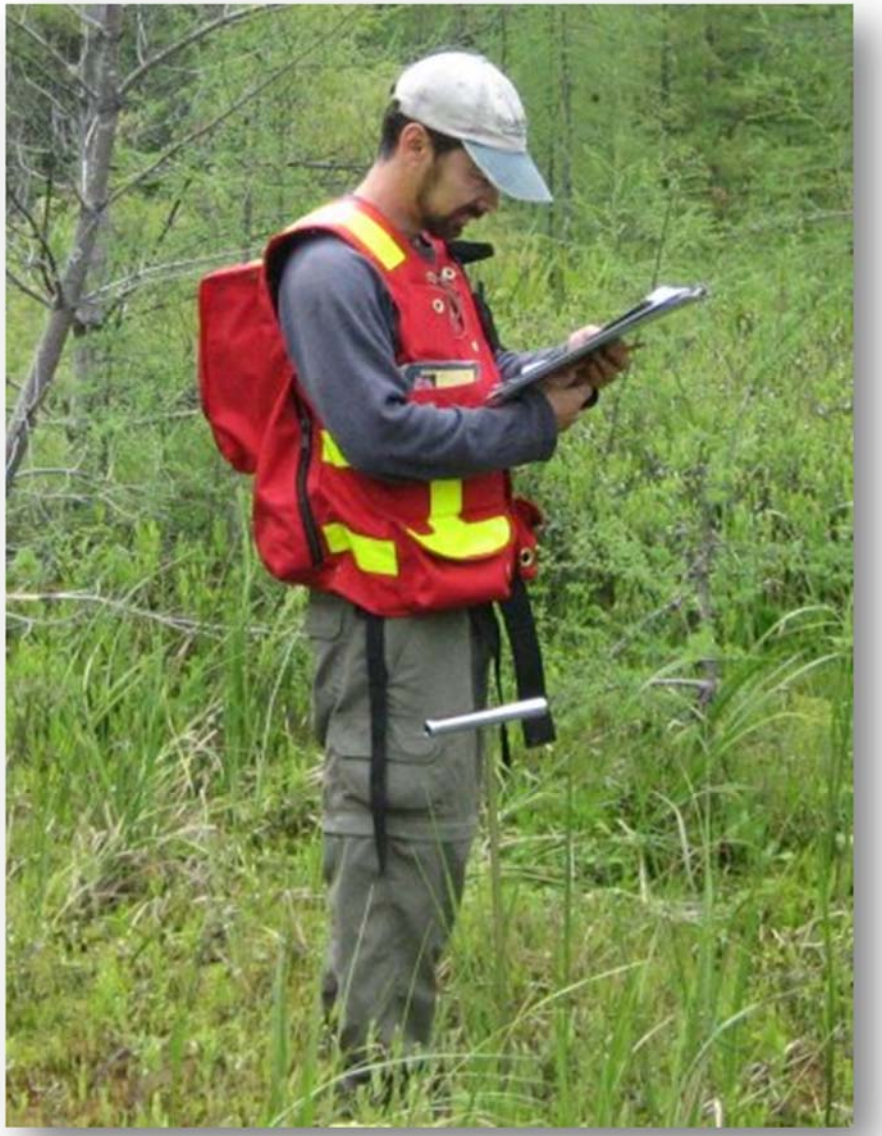
Review and Monitoring Framework

Kenney et al., 2011[4] built on a previous framework (from 1997) to develop a comprehensive suite of 25 criteria and indicators designed to monitor key aspects the urban forest. This monitoring framework fully recognizes the important role of people in urban forest sustainability in that it has criteria related to the (1) state, (2) management, and (3) stewardship of the urban forest. Each criterion can be assessed as "low", "moderate", "good" or "optimal" using technical indicators based on the current science (where the data is available) or measures of success relative to what is possible in a given jurisdiction. This framework has been adapted and expanded, in consultation with the original paper authors, for the NH&UFS (see **Appendix A**) to include criteria and indicators related to the Natural Heritage System, and tailored to incorporate targets that consider Mississauga's current and projected land use context for the next 20 years.

The recommended review and monitoring for Mississauga's Urban Forest (as per NH&UFS Strategy #25, and supporting UFMP Actions #1 and #2) should consist of:

1. **a review and update of the monitoring framework for the Natural Heritage System and the Urban Forest (as provided in Appendix A)**
2. **a review of the status, timing and anticipated budgetary requirements of each NH&UFS Strategy and supporting UFMP Action (as identified in the Implementation Guides under separate cover), and**
3. **a summary of this information in a simplified, stand-alone format for release to City staff in all departments, Council and the community at least once every four years.**

Notably, some of the more resource-intensive criteria (e.g., such as the collection of plot-based data) should not be re-assessed every four years, but rather should be re-examined every eight to 12 years.



[4] 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.

2 STATE OF MISSISSAUGA'S URBAN FOREST

In 2011, Toronto and Region Conservation in partnership with the Region of Peel,, Credit Valley Conservation, and the local area municipalities of Mississauga, Brampton and Caledon, developed the *Peel Region Urban Forest Strategy* as well as more technical urban forest studies for the urban areas within each of the area municipalities (i.e., the entire City of Mississauga, the City of Brampton's Urban System area, and the rural Service Centres of Bolton and Caledon East in the Town of Caledon)[5]. These technical urban forest studies used the United States Department of Agriculture Forest Service's i-Tree Eco field sampling methodology combined with satellite imagery analysis and computer modeling tools to compile data about the Region's urban forest (e.g., approximate tree cover and distribution, tree age size/class distribution, tree species diversity) and estimate the value of some of the services provided by the urban forest (see **Section 3**).

The *Peel Region Urban Forest Strategy* (2011) and associated *Mississauga Urban Forest Study* (2011), along with subsequent studies, have found that:

- there are approximately 2.1 million trees in Mississauga,
- Mississauga's urban forest canopy cover is approximately 15%[6] (see **Figure 2**)
- most of Mississauga's trees are in relatively good health, but small in stature
- the dominant trees in the city are maples 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 the city's canopy cover (about 5%) is found in woodlands in the City's Natural Areas System (hereto referred to in this Plan as the Natural Heritage System), with the remaining canopy cover scattered across institutional, commercial, industrial and other land uses.

[5] These six municipal and agency partners joined to form the Peel Urban Forest Working Group following development of the *Peel Region Urban Forest Strategy* (2011). This group has provided both technical support for and input to this UFMP.

[6] Based on imagery from 2011

Historical Land Use Context

Mississauga's Urban Forest is largely shaped by land use patterns and the history of development across the City's more than 290 square kilometres. Prior to the arrival of Europeans, the lands in and around Mississauga were home to a number of aboriginal tribes such as the Objibway (Anishanabe), who farmed, fished and hunted within the area's diversity of woodlands, wetlands, grasslands and rivers. Starting in the 1800's, a number of European settlements were established (e.g., Clarkson, Cooksville, Dixie, Lorne Park, Malton, Meadowvale, Port Credit, Streetsville and Summerville) and the area was quickly dominated by resource extraction and agricultural land uses. This included logging which resulted in the removal of much of the area's woodlands. The next major transition, which has occurred since the 1950's, was from agriculture to urbanization, with construction of major transit routes (i.e., Highways 401, 403 and – most recently - 407) and a related surge of industrial, commercial and residential development.

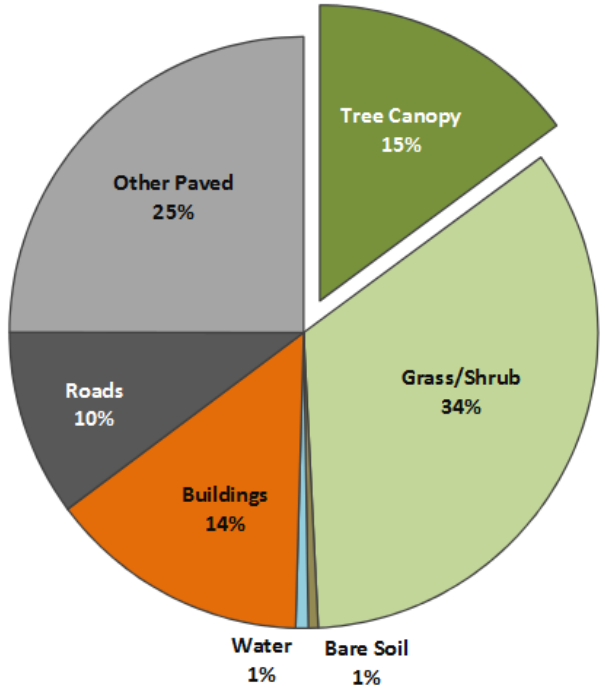


Figure 2. Land cover estimates in Mississauga (from *City of Mississauga Urban Forest Study*, 2011)

Current Land Use Context and Canopy Cover Distribution

Today, trees are found across the city along its right-of-ways and within parks and Natural Areas, as well as residential yards, school grounds, and the landscaped grounds of commercial and industrial lots. These trees are found in either Natural Areas that have regenerated through active or passive management, or in landscaped areas where they have been planted.

From an urban forestry perspective, the city's landscape ranges from older lakeside and riverfront residential communities with relatively high levels of canopy cover (such as Port Credit, Mineola and Clarkson-Lorne Park) to the industrial parks and commercial areas with relatively low levels of urban forest canopy. In more recently developed subdivisions (such as Meadowvale, Lisgar and Malton) trees have been planted in boulevards, yards and parks, but the extent to which these will mature into large, canopied trees remains to be seen. The City's roadways vary from quiet neighbourhood streets to high-speed, high-capacity thoroughfares. Opportunities for tree protection along transit corridors have been limited, particularly along the major corridors, but efforts over the past few decades to try and work with the applicable authorities to integrate trees (and other vegetation) along utility and transportation rights-of-ways (where it does not compromise safety considerations) has resulted in more tree planting and naturalization projects.

Current analyses indicate that Mississauga's Urban Forest canopy cover was approximately 15% in 2011 (*City of Mississauga Urban Forest Study* 2011), with most of this canopy in older residential areas, open spaces and natural areas. The total tree canopy cover is shown in **Figure 2**, and the variability in tree canopy cover in different parts of the city is shown in **Figure 3**.

Like most urban forests, Mississauga's is comprised of trees of a range of species, age/size classes, and health/condition categories. However, development of most of the land base means that natural regenerative processes no longer govern the structure of most of the urban forest. Instead, tree selection and planting by City staff and private property landowners determines what kinds of trees grow within the city, and where. A summary of the diversity, age / structure and condition of Mississauga's urban forest is provided below.

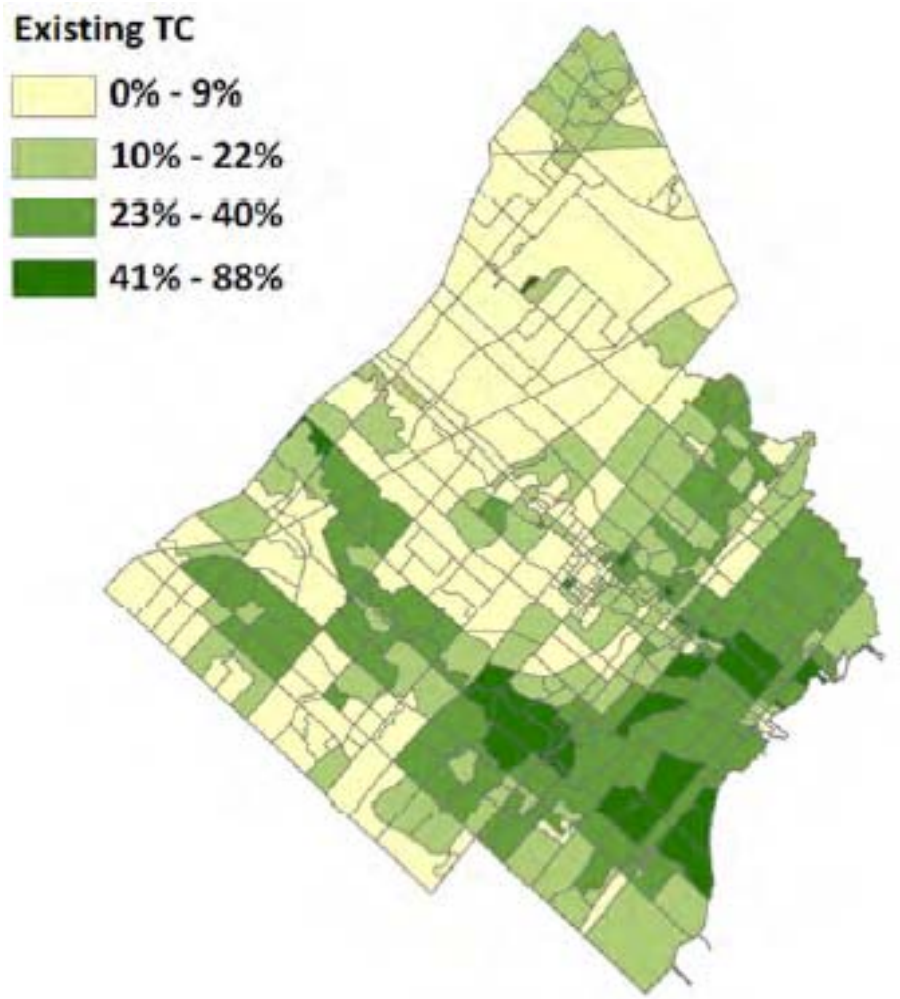


Figure 3. Existing tree canopy cover (TC) by small geographic units (from *City of Mississauga Urban Forest Study*, 2011)

Diversity

Mississauga's Urban Forest Study (2011) found that although there are 234 different tree species and cultivars in Mississauga's street tree population, the overall diversity of the urban forest is relatively low. The top five most common tree species, by leaf area[7], include sugar maple, Norway maple, Manitoba maple, green ash and white ash. Maples together comprise over one-third of tree species across the city, and both Norway and Manitoba maples are considered invasive. This relatively low level of tree species diversity leaves the City vulnerable to threats such as Asian longhorned beetle (ALHB) or emerald ash borer (EAB). EAB, which has already been confirmed as established and spreading in the city, threatens about 10% (more than 27,400), of the City's street trees, and many thousands more in its parks, Natural Areas and on other public and private lands.

Data generated from the City's street tree inventory (completed in 2006) indicates that the diversity of the City's street trees (as illustrated in **Figure 4**) is similarly low, with four species (i.e., Norway maples, green ash, little leaf linden and honey locust) accounting for almost half of all species planted (by stem count) and many of the most dominant species being invasive (i.e., Norway maples account for 22% of the City's street trees).

Age/Size

The majority of Mississauga's trees are relatively small. In 2011 more than 60% of trees in the City were less than 15.3 cm in diameter[8], showing that Mississauga's Urban Forest structure is currently skewed towards trees of a younger age class. The largest trees, such as red and white oaks, are typically found in older neighbourhoods and Natural Areas. This reflects the relatively recent development of many of the City's residential areas. As a result, the numerous ecosystem services (see **Section 3**) provided by large-stature, mature trees are not currently equally available to all communities. This is illustrated in the existing canopy cover by Small Geographic Unit (SGU), shown in **Figure 3**.

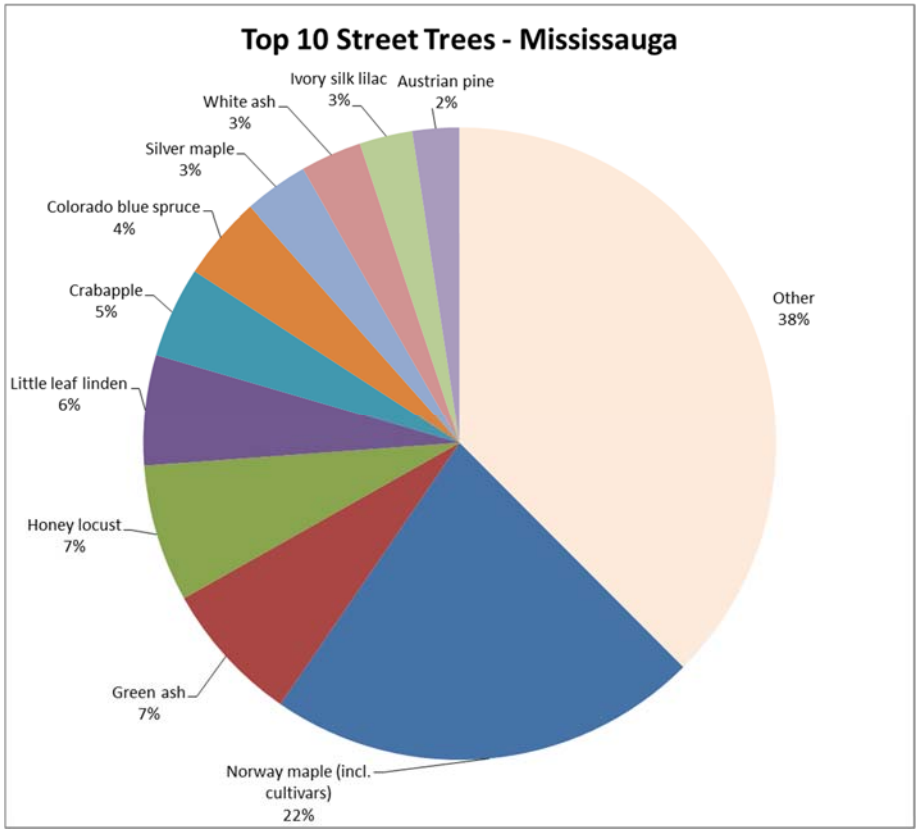


Figure 4. Representation of the diversity of Mississauga's street trees (by stem count)

Condition

Most of Mississauga's trees are estimated to be in good to excellent condition (*Mississauga's Urban Forest Study* 2011). Similarly, street tree inventory data from 2006 show that 73% of the City's street trees were in good condition, and only 5% were in poor condition. This is a positive indicator but also reflects the relatively young age and small stature of most trees in the city. It is likely that as trees age and younger trees in newer developments reach the limits imposed by their difficult growing sites, tree health and condition across the city will decline and more effort to maintain and improve tree condition will be needed.

[7] The abundance of trees can be measured in several ways, but the two most commonly used are by stem (i.e., by individual tree) or by leaf area (i.e., the approximate amount of area occupied by a given tree's leaves). Leaf area can be useful because it reflects the volume of a given species as opposed to simply the number of specimens.

[8] Tree diameter is typically measured as "diameter at breast height" (DBH), which is translated as 1.3 m to 1.4 m above the ground.

3 VALUING MISSISSAUGA'S URBAN FOREST

The ecosystem services[9] provided by trees and green spaces in urban areas are well-documented in the scientific and technical literature[10], and are more broadly described in Section 4 of Mississauga's NH&UFS. The fundamental message from more than a decade of research is that trees in cities are more than just something nice to look at; they are critical assets (just like roads, buildings, and water lines) that provide a wide range of services that make cities healthy and vibrant places to live. While the air quality and cooling benefits of trees are well-established, there is also mounting evidence that trees (both within and outside of natural areas) directly improve human physical and mental health. This information has not been lost on schools where "outdoor classrooms" and wilderness courses are becoming a more mainstream component of the curriculum.

The Urban Forest in Mississauga provides a wide range of environmental, social and health, and economic benefits that accrue to all those who live and work in the city, and beyond. Trees and shrubs not only clean the air and water, they also moderate local climate fluctuations, reduce energy consumption in homes and buildings, store atmospheric carbon (which contributes to climate change), provide shade, control stormwater runoff, and provide habitat for local and migrating wildlife. Trees and natural areas in neighbourhoods also contribute to increased property values, sustain human mental and physical health, and support safer communities. This section of the UFMP presents an overview of these environmental services and benefits.

[9] "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 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".

[10] A comprehensive listing and summary of the published scientific and technical literature on this subject can be viewed at websites such as the USDA Forest Services' "Green Cities" site at www.depts.washington.edu/hhwb/

3.1 ENVIRONMENTAL SERVICES

Table 2. Overview of the environmental services provided by Mississauga's urban forest

Environmental Service	Estimated Amount (Dollar Value)*
Carbon Sequestration	7,400 tonnes annually ($220,000 estimated value)
Carbon Storage	203,000 tonnes ($5.8 million estimated value)
Air Pollution Removal	292 tonnes annually ($4.8 million estimated value)
Energy Consumption Reduction	79,000 MBTUS and 7,300 MWH annually ($1.2 million estimated value)

* estimates from the *City of Mississauga Urban Forest Study* (2011)

Recent assessments (*City of Mississauga Urban Forest Study* 2011) estimate that the city's urban forest has a basic replacement value[11] of $1.4 billion, and provides more than $6 million worth of environmental services every year, as well as many other benefits that are equally (or more) valuable but cannot be as readily quantified. These include:

- improving stream water quality (e.g., by reducing surface runoff rates and cooling water temperatures)
- reducing high urban air temperatures in the summer (through shading and evapotranspiration) (see **Figure 5**)
- reducing energy usage by shading buildings and vehicles in the summer and buffering the effects of cold winds in the winter
- conserving soil resources by stabilizing slopes and intercepting water with root networks, and
- providing habitat for urban wildlife such as mammals, birds, as well as aquatic species (e.g., by providing riparian cover).

[11] The basic "replacement value" (also known as the basic structural value) is the estimated cost of simply replacing every tree in the city with young nursery tree stock.

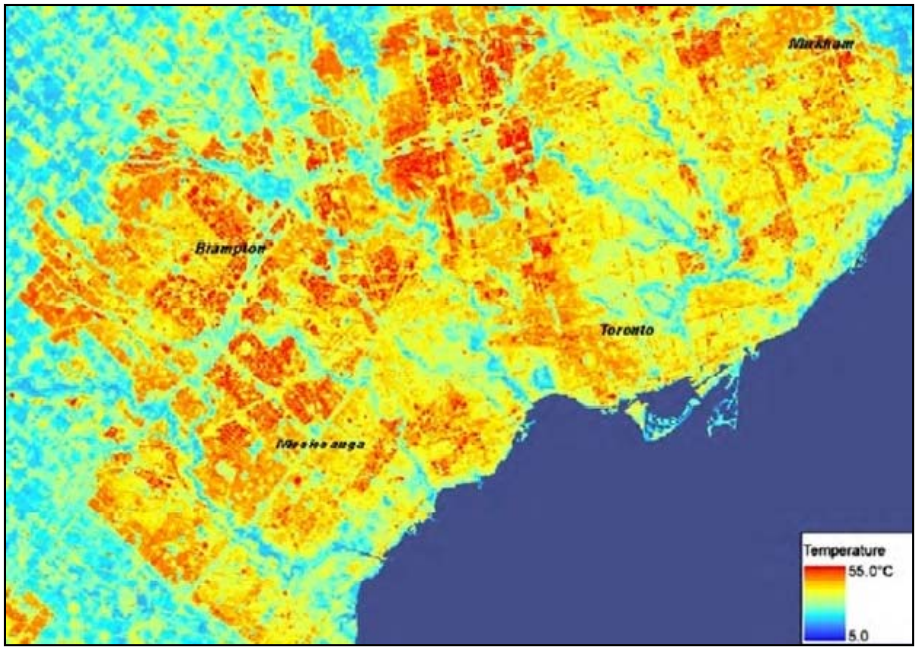


Figure 5. Land surface temperature, Greater Toronto Area, July 2008, showing summer time "hot spots" in urban areas (from *City of Mississauga Urban Forest Study*, 2011)

Climate Change Adaptation and Mitigation

Among the most important environmental services provided by a healthy urban forest are climate change adaptation and mitigation[12]. By moderating local temperatures through shading and evapotranspiration, removing pollution from the air, and moderating storm water flows, Mississauga's trees help the community adapt and be more resilient to climate change. Trees also sequester and store carbon, thereby reducing the concentrations of this greenhouse gas in the atmosphere, and potentially helping to mitigate the impacts of climate change.

[12] Climate change "adaptation" refers to adjustments in natural or human systems made in response to actual or expected climate change effects; "mitigation" are initiatives and measures taken to reduce the vulnerability of natural or human systems to actual or expected climate change effects.

3.2 SOCIAL AND HEALTH BENEFITS

Trees provide important community and human health benefits, particularly in urban areas where population densities are greater. These benefits include:

- reducing exposure to ultraviolet radiation and extreme heat by providing shade and cooling
- encouraging active living
- providing social settings that tend to reduce incidences of crime
- supporting human health by reducing exposure to certain environmental risks, such as pollutants, and creating environments supportive of outdoors activities and recreation
- reducing mental fatigue by providing relaxing places and views
- building stronger communities by facilitating social interactions, and
- increasing the safety of community streets by calming traffic flow.

Studies have shown that exposure to treed and natural areas can improve recovery after surgery, reduce stress and improve learning and creativity. Reductions in property crimes in residential areas with street trees and vegetation, and 5% to 20% decreases in motor vehicle accidents on roads with trees on the roadsides, have also been documented. Many of these community and health benefits are difficult to quantify in dollar values, but contribute to making Mississauga a liveable community.



3.3 ECONOMIC BENEFITS

Although trees in cities are not generally grown for their timber value, or for generation of products that can be bought and sold, trees in urban forests are good for the local economy. Studies have demonstrated that:

- The presence of large trees in yards and streetscapes can add between 3% and 15% to the value of homes, even if the trees are on neighbouring properties
- Homes on wooded lots typically sell faster than comparable untreed properties, and
- Shoppers express a willingness to pay, on average, between 9% and 12% more for goods and services in well-treed business districts, and are also willing to travel longer distances to such areas.

Recent movements for re-introducing agriculture into urban environments also present opportunities for considering the potential value of tangible goods produced by some trees such as edible fruits and nuts, as well as maple syrup. In addition, at the end of their life spans, urban trees can become valuable and highly-sought after wood products, or be used as high-quality mulch.

Trees and natural areas are also considered assets in terms of attracting visitors and supporting local tourism.



4 URBAN FOREST AND NATURAL AREA MANAGEMENT CHALLENGES AND OPPORTUNITIES

The development and implementation of an UFMP in Mississauga is a timely response to the challenges facing the City's Urban Forest and Natural Heritage System as the city moves into a phase of infill and intensification-based growth. The pressures of redevelopment and intensification on existing trees and potential tree habitat are compounded by other environmental threats such as climate change-induced drought stress, and invasive pests and pathogens. However, effectively managing these challenges also provides opportunities for improving the Urban Forest's sustainability, which in turn creates a healthier community.

4.1 KEY CHALLENGES

Big picture challenges in Mississauga related to the Natural Heritage System and Urban Forest (as identified in the NH&UFS) include:

- instilling a mind-set of the "total landscape as a life-support system"
- trying to maintain and enhance ecological connectivity
- reconciling Natural Heritage System and Urban Forest objectives with the need to accommodate continued growth
- building resilience to climate change and related stressors
- getting more support from higher levels of government, and getting the entire community to become more fully engaged in stewardship, and
- recognizing and accepting the need for sustained management of the Natural Heritage System and Urban Forest.

More specific management, operational and tactical challenges faced by Mississauga's Urban Forest and Natural Heritage System are described in more detail below, and include:

- invasive species, pests and pathogens
- ongoing development and redevelopment pressures
- conflicts between trees and "grey" infrastructure,
- the impacts of climate change and related stressors
- difficult growing conditions in urban landscapes
- fragmented ownership of the urban forest, and
- limited community awareness and stewardship.

In addition, these challenges must be addressed within the limits of the City's current resources, supplemented by resources that may be available through partnerships within the community and other supporting partners, as well as external funding where possible.



Invasive Species, Pests and Pathogens

Trees in urban areas tend to be more susceptible to the effects of invasive species, pests and pathogens than trees in natural settings because they are already stressed by being in sub-optimal habitats. Across North America, urban forests have been affected by a number of invaders. In the past, Dutch elm disease wrought widespread damage to urban elm tree populations; today, emerald ash borer (EAB) threatens to destroy all of Mississauga's ash (*Fraxinus*) trees, representing a potential loss of $208 million in structural value and 16% of the Urban Forest's leaf area. About 10% of the City's street trees (more than 23,000 ash trees) are at risk (**Figure 6**), in addition to thousands of ash in public and private Natural Areas, parks, yards and open spaces. EAB is already ravaging Mississauga's urban forest, and the Active Management Plan response will cost an estimated $51 million over the next nine to ten years[13]. This wide-scale pest infestation may affect the City's ability to provide core urban forestry services for some time, as available resources will need to be mobilized to address EAB-related tree mortality, treatments and other immediate management needs.

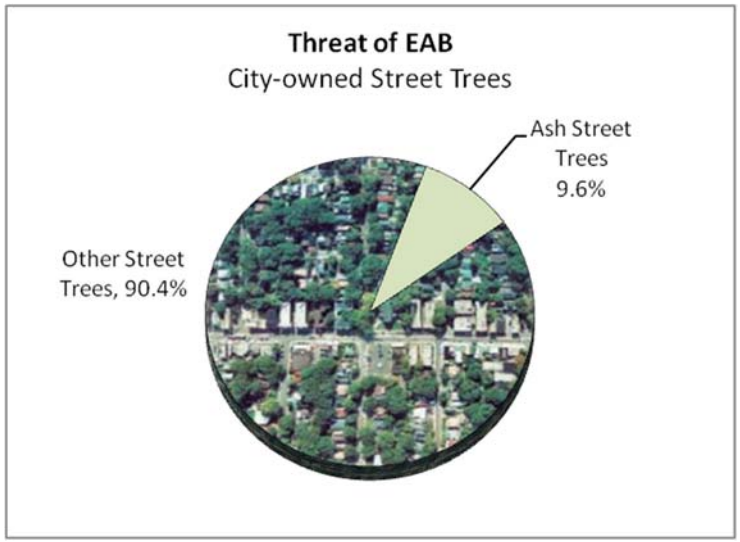


Figure 6. Illustration of the proportion of city-owned street trees at risk from emerald ash borer (based on the street tree inventory data from 2006)

[13] The *City of Mississauga Emerald Ash Borer Management* Plan (2012) that was recently adopted by Council provides details about the components and costs of an Active Management Plan.

Development Pressures

Mississauga's population is forecast to grow by more than 10% over the next 20 years. New residents bring diversity, ideas and opportunities, but also increase demand for housing and municipal services, including roads, sewers, parks and Natural Areas. Intensification and redevelopment will make preservation of existing trees and integration of new trees into developed landscapes more challenging, and will also increase the pressure on remaining Natural Areas and parks.

Tree and Infrastructure Conflicts

Trees occupy space both above and below ground, and must therefore compete with a number of "grey" infrastructure components such as electric and gas utilities, storm and sanitary sewers, water services, roadways and sidewalks, signs, and parking lots. In a highly urbanized setting like Mississauga, trees and Natural Areas also compete for space with buildings. Finding creative solutions so that trees (i.e., "green" infrastructure) and "grey" infrastructure can effectively co-exist presents both a challenge and an opportunity to collaborate and innovate.

Climate Change

Climate change is already thought to have increased average annual temperatures in southern Ontario by 0.5°C over the past two decades[14]. Furthermore, the incidence and duration of extreme weather events (e.g., wind and ice storms, intense rainfall) and drought stress is expected to increase in the coming years, making the Urban Forest more vulnerable to pests, pathogens, invasive species, physical damage and general decline. In urbanized communities such as Mississauga, these effects are likely to be compounded by the extent of impervious and unvegetated surfaces. However, this challenge also presents an opportunity to embrace proactive urban forest management practices, which can make both the city's trees and the city as a whole more resilient to climate change[15].

[14] See http://www.ene.gov.on.ca/stdprodconsume/groups/lr/@ene/@resources/documents/resource/stdprod_085423.pdf

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



Difficult Growing Conditions

Most trees are naturally adapted to growing in forest conditions. Growing conditions in urban areas are markedly different, and are typically characterized by a more exposed environment, degraded and compacted soils, altered moisture regimes, and substantially reduced soil biological activity to support tree growth. Another stressor, particularly for street trees, is being subjected to road salts and other de-icing agents in the winter.

When trees are an afterthought in planning, insufficient consideration is given to providing suitable growing conditions, which causes greater susceptibility to drought and/or nutrient stress, pests and pathogens. In recent years, strides have been made in Mississauga to improve below-ground growing conditions for trees; the City must continue to manage salt use as well as a legacy of difficult growing conditions, and prevent such conditions from recurring in the future.

Tree Preservation on Private Property

As in most communities in southern Ontario, much of the City's Urban Forest is on privately-owned lands, as are many of the opportunities for urban forest planting and enhancement. Although the City has a Private Tree Protection by-law to help regulate tree removal on private lands, this in and of itself does not ensure all opportunities for tree protection and replanting are pursued. Official Plan policies that are supportive of the Urban Forest, and related zoning provisions, can help ensure that further opportunities for tree protection and replanting are explored through the planning process. Even where there is existing zoning in place that supports some type of development (as in many parts of Mississauga), the type or extent of development may be modified to work around existing trees and/or incorporate additional tree plantings, where policies support it,

The City is also continually working to acquire wooded (and other) natural areas as opportunities arise. However, the comprehensive care and stewardship of the urban forest on private lands can only be achieved through widespread recognition of the value that trees bring to the community, and a willingness to help sustain the urban forest.

Limited Community Awareness and Engagement

Available evidence indicates that while Mississauga's residents generally seem to support having trees in their yards and their neighbourhoods, there is less support for regulatory mechanisms regarding tree protection, and a limited appreciation for the full value of trees in urban areas[16]. Forestry Division staff have indicated that while members from various sectors of the community regularly participate in stewardship activities, the level and extent of engagement could be a lot broader. Because most of the City's Urban Forest is on private lands, it is imperative for all residents and private landowners to fully understand the value of maintaining and expanding the Urban Forest, and to contribute to its sustainability through tree preservation, tree planting and naturalization, and stewardship on their lands.

[16] T. Conway and T. Shakeel. 2012. Trees and residents: An exploration of residents' role in growing Mississauga's urban forest. Paper for the Department of Geography, University of Toronto, Mississauga, 13 p.

4.2 KEY OPPORTUNITIES

Implementation of the Actions recommended in this UFMP (see **Section 8**) will benefit the City's Urban Forest through good management, improved operational practices, and increased engagement and stewardship. Opportunities related to the key challenges outlined above include:

- INVASIVE SPECIES, PESTS AND PATHOGENS: Pursuing proactive tree health and risk management on public lands (e.g., implementation of the City's emerald ash borer strategy), and encouraging (and, where possible, supporting) it on private lands[17]
- DEVELOPMENT PRESSURES: Ensuring opportunities for Urban Forest canopy expansion are identified in areas that are not expected to accommodate extensive intensification, and that some type of compensation for trees removed where required is provided
- TREE AND INFRASTRUCTURE CONFLICTS: Working with planners, engineers and architects to find planning and design solutions that can accommodate long-lived, and where possible, large-statured trees
- CLIMATE CHANGE: Managing the Urban Forest and Natural Heritage System in an integrated way to help the community mitigate stressors associated with climate change (see below)
- DIFFICULT GROWING CONDITIONS: Ensuring that trees are given adequate above and below-ground space, soil volume and soil quality by introducing and enforcing minimum requirements, as well as working with other disciplines and partners to find creative ways to give trees space while still meeting other requirements (e.g., servicing, safety, etc.)
- TREE PRESERVATION ON PRIVATE PROPERTY: Facilitating a paradigm shift towards understanding and managing the Urban Forest and Natural Heritage System as shared community assets and vital components of the city's infrastructure through an active promotional campaign and an expanded stewardship program targeted to City staff, external stakeholders and the community, and
- LIMITED COMMUNITY AWARENESS AND ENGAGEMENT: Leveraging social media, and building on existing partnerships and forming new ones to access resources and funding outside the City's purview.

[17] One of the opportunities arising out of the invasion of EAB is the potential to replace diseased ash with a greater diversity of native and non-invasive species, and ensure they are provided with adequate soil volume and quality.



Opportunities Associated with Climate Change

Climate change presents one of the most pressing challenges for urban trees, some of which already suffer from non-climatic stressors such as competition for resources, soil compaction, drought, pests and diseases. Fortunately, strategies to reduce the effects of climate change on the Urban Forest are well-aligned with activities that contribute to overall urban forest sustainability, as follows:

- minimizing the further expansion of non-climate stressors
- managing highly invasive plant species, as well as tree pests and diseases
- planting a diversity of tree species, including those better adapted to warmer and drier conditions (e.g., Carolinian zone species)
- developing and implementing an extreme weather response strategy,
- planting trees strategically around residences and other two or three storey buildings to reduce heat loss in the winter and cooling needs in the summer, and
- protecting and enhancing Natural Heritage System connectivity to facilitate native species movement and adaptation.

Urban forest management is a resource-intensive undertaking. The wide range of urban forest-related issues in Mississauga – from routine tree maintenance, to invasive species management, to development plan review and site inspection - requires adequate staffing, appropriate training, and adequate resources. As in all municipalities, the City will be challenged to achieve levels of service for various management activities that meet planned or optimal levels. Therefore, it is critical that this UFMP be broadly embraced and used by City staff, stakeholders, and the community alike.

5 SETTING THE DIRECTION



Figure 7. Illustration of where the City's Urban Forest Management Plan fits in relation to other City guiding documents

5.1 PLANNING CONTEXT AND PRECEDENTS

There are a number of city-wide planning documents that provide context and guidance for this UFMP, as illustrated in **Figure 7**. The relevant components from each of these, and higher level planning documents, are summarized in Section 5 of the NH&UFS. Additional guidance related specifically to the Urban Forest from each of these documents is provided below.

Strategic Plan (2009)

The City's *Strategic Plan* identifies five pillars for change with the pillar most relevant to this UFMP being the "living green" pillar. The "connect" pillar also has some relevance in so far as trees are a cornerstone of complete communities, and of complete active transportation links and streetscapes.

Specific strategic actions under the "green" pillar related directly to this plan include:

- Plant one million trees in Mississauga (Action 4)[18]
- Implement a city boulevard beautification program to foster civic pride and raise environmental awareness (Action 5)
- Create an educational program that promotes "living green" (Action 10)

Although Action 7 "Implement an incentive/loan program for energy improvements" does not specifically mention trees, this program could include a subsidy for tree planting in view of the energy conservation benefits provided by trees[19]. In addition, although Action 24 "Make streets safer" (under the "connect" pillar) does not mention trees, it has been documented that treed streets can be safer than those without trees (see **Section 3.1**).

Official Plan (2011)

The City's recently adopted *Official Plan* recognizes the city is entering a new stage in its evolution, "one of intensification and urbanization" and also recognizes the importance of creating an environment where "where people, businesses and the natural environment thrive". Section 6 "Value the Environment" includes a framework for the City's Green System, which includes a wide range of treed areas on both public and private lands, and a specific set of policies for the Urban Forest that include direction for tree protection, tree planting, and urban forest education, stewardship and partnerships (see **Section 6.4**).

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

The Future Direction Master Plan looks at the City's parks and Natural Areas in an integrated, holistic manner, 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. Many of the 61 recommendations found in the document relate to trees and woodlands, however recommendation 60 - *"Allocate dedicated and sustained funds towards the adequate long term maintenance required to sustain a healthy urban forest."* - relates directly to this UFMP.

[18] Notably the One Million Trees Program was launched in April 2013.

[19] The *City of Mississauga Urban Forest Study* (2011) cites research indicating trees of at least 6 m tall and within 20 m of one or two-storey building confer measurable savings in cooling costs in the summer (from shade) and heating in the winter (by buffering winds).

Living Green Master Plan (LGMP) (2012)



The recently completed LGMP provides guidance related to City policies and programs so that the environmental objectives of the Strategic Plan are met. The 49 actions identified in the LGMP are intended to be met by 2021. In addition, the LGMP includes "tree canopy intensity" and "Natural Heritage system coverage" as two of its 18 performance monitoring indicators. These indicators have been adopted and developed through this UFMP (see **Appendix A**).

Natural Heritage & Urban Forest Strategy (NH&UFS)

In Mississauga, the high degree of overlap and interconnectedness between the Natural Heritage System and the Urban Forest has been recognized through the inclusion of both within a joint strategy. The NH&UFS, which has been developed in tandem with this UFMP, recognizes that the Urban Forest includes all treed Natural Areas, as well as trees outside those Natural Areas throughout the city, and that the Natural Heritage System and Urban Forest needs are therefore most effectively addressed with an integrated approach.

Other Key Sources of Information and Guidance

The two other key sources of information and guidance for the UFMP (as described in **Section 2** and **Section 6.1.1**) are the *Peel Region Urban Forest Strategy* (2011) and *City of Mississauga Urban Forest Study* (2011), developed by Toronto Region Conservation with support from the Region of Peel, Area Municipalities (Mississauga, Brampton and Caledon), and Credit Valley Conservation.

The *Peel Region Urban Forest Strategy* (2011) outlines six guiding principles and eight strategic goals (see **Table 3**) to facilitate a coordinated and consistent approach to sustainable urban forest management across the Region. These principles are echoed in Mississauga's principles for this study, while the objectives provide some higher level support and resources to facilitate implementation of Mississauga's objectives (see **Section 5.2**).

The *City of Mississauga Urban Forest Study* (2011) provides 27 recommendations to help Mississauga move forward with its urban forest program and practices. A summary of how each of these has been addressed through this study is provided in **Appendix B**.

Table 3. *Peel Region Urban Forest Strategy* (2011) guiding principles and strategic objectives

Guiding Principles
1. A sustainable urban forest promotes quality of life, human health and longevity
2. Residents of Peel Region are the most important and influential stewards of the urban forest
3. All residents should have the opportunity and means to benefit equally from the ecosystem services provided by the urban forest
4. Improved communication and coordinated action will result in a more informed, streamlined, and effective approach to urban forest management
5. The urban forest, as natural infrastructure, requires long-term, stable funding
6. Municipal Governments should lead by example

Strategic Objectives
1. Facilitate partnerships and coordinate action across Peel Region
2. Develop urban forest targets
3. Develop and implement urban forest management plans
4. Create a comprehensive urban forest policy framework
5. Gain formal support from upper levels of government for sustainable management of the urban forest as natural infrastructure
6. Implement effective monitoring and research programs
7. Secure long-term funding for urban forest management
8. Provide comprehensive training, education, and support for residents and members of the public and private sector

5.2 VISION, GUIDING PRINCIPLES & OBJECTIVES

As discussed above, a vision, guiding principles, and objectives were developed for the NH&UFS, which is the umbrella Strategy for the UFMP. These are provided in both documents so that each document can be read and understood independently (with cross-references as appropriate). However, the NH&UFS should also be read in order to develop an understanding of the broader study context and how the vision and objectives are intended to be achieved.

Vision for the Natural Heritage & Urban Forest Strategy (NH&UFS)

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 for the Natural Heritage & Urban Forest Strategy (NH&UFS)

The following are recommended guiding principles for the long-term protection, enhancement, restoration and expansion of the City's Natural Heritage System (NHS) and Urban Forest within the broader Green System.

13. Act Now
14. First Protect - then Enhance, Restore and Expand
15. Maximize Native Biodiversity
16. Recognize and Build On Past and Current Successes
17. Learn From Our Past and From Others
18. View the Natural Heritage System and Urban Forest as part of the City's broader Green System
19. Understand the Value of the City's Green System and the Essential Ecological Services it Provides
20. Make Stewardship on Public and Private Lands Part of Daily Living
21. Integrate Climate Change Considerations in Natural Heritage and Urban Forest Planning
22. Protect, Enhance, Restore, and Improve Natural Connections at Various Scales
23. Track the State of the Natural Heritage System and Urban Forest, and Practice Adaptive Management
24. Recognize Natural Areas and the Urban Forest as Critical Components of the City's Infrastructure

Objectives for the Natural Heritage & Urban Forest Strategy (NH&UFS)

These objectives are intended to provide guidance for the long-term implementation and evaluation of the Actions identified in the UFMP (as well as the NH&UFS), and for meeting the established targets (see **Section 5.3**). Measures for evaluating the objectives are provided through the Monitoring Framework (see **Appendix A**).

The UFMP and NH&UFS both include 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.

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.

5.3 TARGETS

There are many ways to measure the success of an urban forest management program and to gauge urban forest sustainability. Quantitative targets are one way to assess the state of the urban forest, and when considered in conjunction with a broader range of criteria and indicators (as provided in the Monitoring Framework in **Appendix A**) can provide a fairly comprehensive assessment of the state of urban forests sustainability in a municipality. Notably, because of the integrated approach taken through the NH&UFS, both the targets and the Monitoring Framework address both the City's Natural Heritage System and its Urban Forest. The six targets developed for Mississauga's Natural Heritage System (NHS) and Urban Forest (UF) are as follows:

1. NHS Size: 12% to 14% of the City
2. NHS Connectivity: (a) 75% of the watercourses have vegetation for at least 30 m on either side, and (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 substantially improved using 2013 as a baseline, and (b) Conservation Management Plans are developed and in effect for all high priority publicly-owned Significant Natural Areas
4. UF Canopy Cover: 15% to 20%
5. . UF Quality (of City 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, and (c) non-native and invasive tree species represent less than 8% of the street and park tree population
6. UF Canopy Distribution: Canopy cover meets or exceeds the total UF cover in 50% to 75% or more of the neighbourhoods and/or land uses identified as high priority for reforestation

These targets have been developed based on: consideration for other relevant studies, an understanding of the extent and condition of the current Urban Forest and that Mississauga is an urbanized jurisdiction that will continue to experience population growth and intensification, recognition of the value of the ecosystem services provided by the Urban Forest, and input from various consultations.

Discussion of the rationale behind each of these targets is provided in Section 7 of the NH&UFS.

6 CURRENT URBAN FOREST PRACTICES IN MISSISSAUGA

The City of Mississauga is further ahead than many municipalities in terms of its urban forest management program. The Parks and Forestry Division's staff are involved in many aspects of administration, maintenance, management and restoration of both the Natural Heritage System and the Urban Forest, particularly on public lands. The City also has a number of regulations and policies intended to help protect trees and Natural Areas, and several successful stewardship programs to engage the community in naturalization, tree planting and follow-up care of trees and natural spaces. However, Mississauga's Urban Forest and Natural Heritage System face many challenges to their sustainability (see **Section 4**), and a critical review of current practices, provides a good basis for the identification of best practices and opportunities (see **Section 7**).

This section of the UFMP provides an overview of the City's current urban forest management administration, policies, practices and programs directed to both public and private lands.

Current approaches to planning and operations activities related to the five key topic areas considered in this UFMP are reviewed, highlighting the role of the Parks and Forestry Division, and other stakeholders, in maintaining Mississauga's Urban Forest. Topic areas, each presented in more detail in this section, include:

- **Urban forest management and administration (Section 6.1):** examines the administrative structure of the urban forestry program, considers resource allocation related to forestry, and reviews overall approaches to urban forest asset management
- **Tree health and risk management (Section 6.2):** reviews the implementation of urban forest health, maintenance and risk management activities
- **Tree establishment and urban forest expansion (Section 6.3):** reviews tree establishment practices and programs
- **Urban forest protection and preservation (Section 6.4):** examines relevant legislation, policies and guidelines, and
- **Promotion, education, stewardship and partnerships (Section 6.5):** focuses on current approaches being used to increase engagement and stewardship related to the Urban Forest and Natural Heritage System on public and private lands.

6.1 URBAN FOREST PROGRAM ADMINISTRATION

This section of the plan provides an overview of:

- the roles of different jurisdictional levels for the urban forest as they relate to Mississauga
- Mississauga's Parks and Forestry Division's administrative structure, organization and processes, and
- management of the City's Urban Forest and Natural Heritage System assets.



6.1.1 RESPONSIBILITY FOR THE URBAN FOREST

Federal Government

The involvement of the federal government in urban forest management has, to date, been limited and indirect. The primary source of support has been through the Canadian Food Inspection Agency (CFIA) and Canadian Forest Service efforts to monitor and control the spread of invasive insect pests, the most important of which include (ALHB, *Anoplophora glabripennis*) and (EAB, *Agrilus planipennis*).

Provincial Government

Similar to the federal government, the government of Ontario has not gotten involved in urban forest management. However, a wide range of provincial legislation directly and indirectly affects the ability of municipalities to regulate their urban forest resources. **Table 4** provides a list of relevant provincial statutes and policies which directly relate to urban forest management.

Other provincial documents that include support for local urban forest initiatives include:

- *Grow Green: Ontario's Climate Change Action Plan* (2007), which sets a planting target of 50 million new trees in Southern Ontario by 2020, and provides funding for volunteer-driven tree planting projects
- *Ontario Invasive Species Strategic Plan* (2012) which identifies some strategies the various partners can use to help fight invasive species, and
- *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, including woodlands, in the Province.

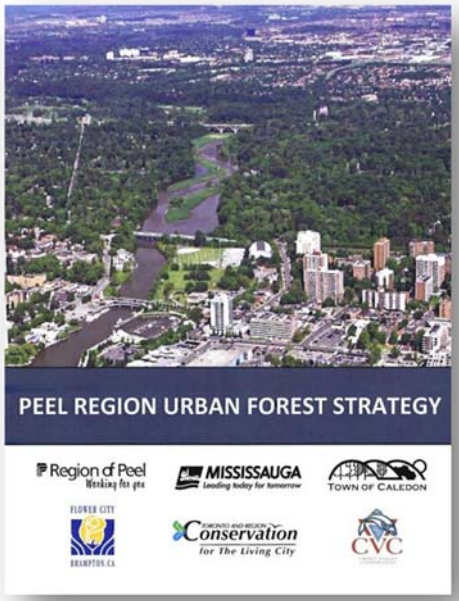
Table 4. Provincial statutes and policies with relevance to urban forest management

Statute or Policy	Relevance
Planning Act, 1990	Establishes the framework for municipal planning in the province. Empowers municipalities to develop official plans and regulate development, including requiring landscaping with trees and shrubs.
Ontario Heritage Act, 1990	Allows for the designation of heritage properties and/or landscapes in the Province, including trees on such lands that may have heritage value.
Forestry Act, 1990	Provides a legal definition for "woodlands" and "good forestry practices", as well as certain provisions pertaining to boundary/shared trees.
Conservation Authorities Act, 1990	Establishes conservation authorities as watershed-based authorities with various responsibilities, including regulation of lands adjacent to watercourses, wetlands and shorelines.
Municipal Act, 2001	Establishes municipal powers. Sec. 223.2 allows any municipality greater than 10,000 people to regulate the injury or destruction of trees, while Sec 135-146 provides the legal framework for municipal tree and site alteration by-laws.
Places to Grow Act, 2005	Enables Province to designate population growth areas, requiring certain jurisdictions to meet established growth targets by certain dates.
Provincial Policy Statement, 2005	Provides guidance for land use planning, protection for significant woodlands.
Greenbelt Act, 2005	The *Greenbelt Act* and the supporting Greenbelt Plan were recently amended to provide an additional designation of Urban River Valleys to the Natural Heritage System. This designation is intended to include publicly owned lands located in the urban river valleys extending south from the Greenbelt Plan. The lands within the Greenbelt Urban River Valleys are to be governed by the applicable municipal Official Plan policies provided they have regard for the objectives of the Greenbelt Plan.

Region of Peel

Mississauga is a lower-tier municipality within the Regionof Peel, along with the other Area Municipalities of Brampton and Caledon. The updated Regional *Official Plan* recognizes the importance of maintaining the Region's Greenlands System, and includes policies that support a range of studies and plans for different components of its natural heritage system. Official Plan Amendment 21B, adopted in 2010, directs the Region to "*...work jointly with the agencies and Area Municipalities to develop urban forest strategies and to encourage and support programs and initiatives that maintain and enhance the urban forest canopy*".

The Region, in collaboration with its Area Municipalities, Credit Valley Conservation and the Toronto and Region Conservation, undertook the development of the *Peel Region Urban Forest Strategy (2011)*. One outcome of this Strategy has been the establishment of an interagency Urban Forest Working Group, which includes members from the Region, Area Municipalities and local conservation authorities, who meet on a semi-regular basis to work towards implementing the strategy's action items.



The *Peel Climate Change Strategy* (2011) is the strategic framework of the Region of Peel, area municipalities (i.e., Mississauga, Brampton and Caledon) and conservation authorities. The strategy contains 38 actions that will help Peel Region to mitigate the impacts of and adapt to climate change. It recognizes the importance of the urban forest in both these endeavours. The strategy directs regional partners (Area Municipalities and Conservation Authorities) to, on an ongoing basis, "*undertake specific initiatives, such as implementing best practices related to urban forestry, which are intended to maintain and restore natural habitats, trees and naturalized spaces within the urban system*". The Region provides support to its partners in this regard.

City of Mississauga

The City of Mississauga bears the primary responsibility for the planning and implementation of urban forest management within the City. The City's urban forest planning and operations activities focus on:

- establishment and maintenance of trees on public lands
- tree removal and tree planting on private property as part of development projects
- the development and enforcement of regulations related to privately-owned trees
- encroachments from private lands into adjacent public Natural Areas, and
- activities related to the maintenance and restoration of the City's Natural Areas and parks.

Urban forest management and maintenance is largely administered by the Forestry Section of the Parks and Forestry Division within the Community Services Department. Forestry staff are responsible for the maintenance of over 240,000 street trees, as well as trees in parks and City-owned Natural Areas.

Most other departments are also directly or indirectly involved in planning and operations which may affect existing trees and/or opportunities for future growth of the urban forest, although some to a lesser degree. The key departments whose work includes decisions affecting planning, operations, outreach and stewardship related to tree preservation and/or planting issues on a regular basis include:

- Community Services Department
  - Environment Division
  - Parks and Forestry Division
    - Park Planning
    - Park Development
    - Parks Operations
    - Forestry
- Planning and Building Department
  - Policy Planning Division
  - Development and Design Division
  - Building Division
- Transportation and Works Department
  - Transportation and Infrastructure Division
  - Development Engineering Division
  - Engineering and Works Division
    - Development Construction Division
- Corporate Services Department
  - Office of the City Clerk (including Committee of Adjustment)
  - Realty Services

Landscape Architects, Landscape Technologists, Site Plan Technologists, and Land Use Planners in Community Services, Planning and Building, and Transportation and Works regularly undertake review of tree preservation and/or planting plans, as well as site inspections. Staff in the Parks and Forestry Division play a role in most tree-related decisions on municipal and private projects, but are not always involved at the outset of the process, and may not be involved in situations where only one or two trees are being removed, or where no trees are being removed but opportunities for planting exist.

While the Parks and Forestry Division is the primary group charged with the management and administration of Mississauga's urban forest, responsibility for this vital asset extends to various staff in other City departments and divisions. Consequently, sustainable urban forest management can only occur if all departments work together to achieve the common vision, objectives and targets established through the NH&UFS (see **Section 5**).

6.1.2 FORESTRY RESOURCES AND ASSET MANAGEMENT

The Forestry Section currently has staff with forestry, arboriculture, ecology and other relevant areas of expertise under the direction of the section Manager that are divided among five key tasks: contract administration, protection and preservation, inspections, City tree maintenance, and woodland/natural area services (including community planting and stewardship).

Mississauga currently has an inventory of about 243,000 city-owned street trees. The intention is to expand this inventory to include trees in City parks plus hundreds of thousands more added through the One Million Trees program (launched April 2013). Some Region of Peel trees are also included in the inventory, as the City maintains the trees on some Regional roads as well. The inventory is GIS-based, but contains a limited amount of information about each tree. Attributes include a unique identification number, municipal address of property closest to street tree, forestry management zone, overall condition rating, diameter (in cm), service status (Operations or Warranty), and location coordinates.

The Parks and Forestry Division uses asset management software to receive service requests and develop work orders for planning operations such as tree pruning or planting. In its 2013 business plan, the Parks and Forestry Division put forward a budget request to enable the Forestry Section to transition towards a more comprehensive asset management system, including in-field solutions such as mobile computers, wireless access and mobile printers. This will increase staff productivity by enabling real-time or automated information updating, work order generation, and other tasks currently done manually in-office, and should result in improved timing of service delivery.



6.2 TREE AND NATURAL AREA HEALTH AND RISK ASSESSMENT

6.2.1 STREET TREE MAINTENANCE AND BLOCK PRUNING

Street Tree Elevation Program

Mississauga's Forestry Section staff regularly undertake street tree pruning across the City through the Street Tree Elevation Program. The program focuses on providing the minimum required clearances between tree branches, roads and sidewalks, and typically begins when trees are between 10 and 20 years of age. The program is intended to operate on an 8-year cycle, meaning that most trees along City streets should be pruned once every 8 years. This length of cycle is generally considered adequate to balance maintenance costs and the benefits provided by proper pruning.

Young Tree Training

Currently, the City prunes some young trees, typically three to four years following planting. However, the young tree pruning program is not formalized, not all young trees are pruned, and pruned trees may not be revisited again until they are incorporated into the Street Tree Elevation Program, which may be long enough after the initial pruning that significant structural problems may develop.

6.2.2 URBAN FOREST HEALTH MANAGEMENT

Urban forest health management primarily involves using a range of management practices to monitor and mitigate the effects of tree pests, diseases, and invasive plant species (in Natural Areas).

Pest and Disease Management

As in most jurisdictions, Mississauga's approach to pest and disease management is a combination of proactive (e.g., site inspections, monitoring, tree pruning) and reactive (e.g., tree removal, pesticide treatment) measures. As part of their duties, the City's Parks and Forestry Division Inspectors monitor City-owned street and park trees for signs of invasive pests or pathogens. Forestry Section staff monitor for invasive plants in Natural Areas as resources permit. In recent decades, the City has committed to implementing an Integrated Pest Management (IPM)-based approach to pest and disease management. This holistic approach balances cultural and biological approaches (such as maintaining tree health) with methods to reduce pest or disease populations, while reducing the use of chemical pesticides.

Emerald Ash Borer (EAB)

The recent emergence of EAB places an estimated 16% of the City's urban forest in significant danger. This invasive beetle causes near-complete mortality of ash trees wherever they occur if they are not treated with a stem-injectable pesticide. The borer is established across the entire City, and widespread ash mortality is already beginning. In response, the City has begun implementation of an EAB Management Plan scheduled over the next nine to 10 years that will see approximately 20,000 trees treated, and will help fund the costly removal of dead and potentially hazardous trees and their replacement. The cost of the EAB Management Plan is an estimated $51 million over the plan horizon, and may vary depending on the rate and extent of tree mortality. The Plan is funded in part by a Special Purpose tax levy.

Natural Areas Invasive Species Management

Invasive plant species, such as dog-strangling vine, buckthorn, and garlic mustard, are a significant threat to the ecological integrity and health of the City's Natural Areas. The City's approach to managing invasive species has, to date, been relatively limited and focused on intensive management of individual infestations, rather than broader strategic efforts. Stewardship events involving the community are occasionally undertaken in public Natural Areas and invasive species removals are often required by the conservation authorities as part of development approvals on regulated private Natural Areas. In addition, the conservation authorities have extensive resources related to the identification and management of invasive species on their websites, and support this work in Mississauga, and elsewhere in the watershed.

6.2.3 TREE RISK MANAGEMENT

Street Tree Risk Management

Currently, street tree risk management is undertaken through a combination of proactive and reactive methods. Risk reduction on City trees through methods such as deadwood and structural pruning is undertaken during the course of the operations undertaken by the Forestry Section. The City's Forestry Inspectors also respond to resident requests for tree risk assessment and, where appropriate, create work orders through the City's asset management system. Some Forestry staff have received training in both basic and advanced methods of tree risk assessment in order to improve the City's ability to practice more conservation-based tree risk management, where appropriate.

Woodland Tree Risk Management

The City does not currently have a formalized program for tree risk inspection or mitigation in the 152 public woodlands or other Natural Areas it manages. In some woodlands, where risk is a known issue, there has been some mitigation work (e.g., selective tree removal) and woodlands in Riverwood Park have some tree risk inspection done by volunteers.



6.3 TREE ESTABLISHMENT, NATURALIZATION AND URBAN FOREST EXPANSION

Direct management is necessary to ensure the expansion of the urban forest. This is in large part due to the fact that trees in predominantly urban settings often cannot regenerate naturally; seeding and vegetative growth account for only a small part of urban forest regeneration. In addition, there are stressors and threats specifically related to the urban context (e.g., encroachment, vandalism) that require active management.

6.3.1 TREE ESTABLISHMENT PROGRAMS AND PROCEDURES

A key component of Mississauga's urban forest program is the establishment and expansion of the urban forest, primarily through tree planting. Trees in Mississauga are generally planted under City programs by municipal staff and contractors, or by private property landowners, as well as with some volunteer support on public and private lands.



Street Tree Planting Program

The City plants caliper-size trees as replacements for removed trees or to fill available planting sites on the public portions of streetscapes. City residents can submit requests for tree planting, which are addressed in a similar manner as other work order requests.

Commemorative Tree Program

The City maintains a Commemorative Tree Program whereby residents can donate a commemorative tree for a set fee. Forestry staff work with the contributor to determine an appropriate species and location. Commemorative plaques may also be installed for an additional fee.

Planting in New Developments and Redevelopments

The City assumes responsibility for street trees planted on public rights-of-way as part of new development, redevelopment, and other dwelling projects, under agreement with the developer, after the plantings are completed and the warranty period (usually two years) has passed. Costs for tree planting are usually incorporated into the closing purchase price of new residences, and securities for estimated landscape costs are provided by the developer.

Trees are typically planted after homes have been built, roadways have been paved, and other streetscape elements have been completed. While this may delay the provision of trees in a new neighbourhood, it is consistent with best practices as it greatly reduces the likelihood of tree damage and enables better maintenance. Typically, one tree is planted per 10 m, except where trees need to be excluded to avoid infrastructure conflicts.

One Million Trees Mississauga

One Million Trees Mississauga, a program to plant one million trees on public and private lands throughout the city over the next 20 years, started in 2012 and had its official launch in April 2013. The program is an action item from the City's *Living Green Master Plan* (2012) and *Strategic Plan* (2009). Trees will be planted by City staff on public lands, and support will be given to individual volunteers, community groups, organizations and businesses to plant trees across the City. The program will track plantings conducted through various activities on public and private lands, including tree establishment through site plan and subdivision development, and plantings on private residential lots (where the land owners choose to report it) through the program's website.

Naturalization and Urban Forest Expansion

The City facilitates a number of community tree planting, naturalization and stewardship programs in the spring, summer and fall. These activities are often conducted in conjunction with Credit Valley Conservation, the Toronto Region Conservation, non-profit organization (e.g., Evergreen) and/or local business events. Every year thousands of small-stock native trees and shrubs are planted through such programs, and in 2012 nearly 30,000 trees and shrubs were planted.



6.3.2 STANDARDS AND SPECIFICATIONS

Planting standards and technical specifications can help ensure the consistent application of proper tree planting techniques, including site preparation, species selection, tree installation and post-planting maintenance.

Technical Requirements

Several standards and specifications help guide the tree establishment process in Mississauga. Guiding documents which outline aspects of tree planting standards and specifications include:

- *Site Plan Application: Process Guidelines* (Planning and Building Department, 2012)
- *Development Requirements Manual, Subdivision Requirements, Section 1: General Requirements for Servicing Subdivisions* (Transportation and Works Department, 2009)
- *Community Services Subdivision Requirements Manual* (Community Services Department, last rev. 2006, currently under review)
- *Green Development Standards* (Planning and Building Department, 2010)

Mississauga's tree planting specifications outline the City's requirements for aspects of tree establishment, including planting stock selection (species, size, quality, etc.), tree spacing, soil quality and volumes, and establishment methods. The primary guiding document which outlines these specifications is the *Community Services Subdivision Requirements Manual,* and its associated detail drawings and specifications. Section 02950 – Planting, was last revised in 2002 and is the primary specification used by the City to guide planting on municipal rights-of-way in new developments. Many of the provisions of this specification are in accordance with recognized best practices, but some require updating or modification to promote improved tree health and successful urban forest establishment. Most notably, minimum soil volume requirements should be included and should reflect the City's *Green Development Standards* (2010), and specifications for soil quality and texture should be revised to better reflect the scientific and technical understanding of urban tree soils and tree requirements.

Currently, the City maintains two different sets of tree protection fencing/hoarding standard detail drawings and one set of written specifications. Standard drawing No. 02950-8 was published in 2002 by the Community

Services department and is contained within the *Community Services Subdivision Requirements Manual* (currently under review). It provides details for installation of 'farm fence' tree protection fencing, along with standard notes, and is supported by Specification No. 02104 – Site Protection.

Tree Species Selection

The City's Parks and Forestry Division currently has a list of acceptable or appropriate tree species. Typically, species selection for development plans on private property is reviewed by the Landscape Architects or Site Plan Technologists in the Development and Design Division of the Planning and Building Department, while Forestry staff typically review species selection for trees proposed on public lands through the planning process. Notably, Credit Valley Conservation has a comprehensive Plant Selection Guideline that includes desirable and undesirable species suitable for the watershed, particularly for naturalization projects.

Commonly-planted street tree species include varieties of maple, linden, elm, oak, hackberry, Kentucky coffee tree, honey locust, ivory silk lilac, and some species of conifers. Species selection for parks and naturalization projects tend to be more exclusively focused on native species, and more diverse.

Due to limited soil volumes and the difficult growing sites across the City (and particularly in boulevards), the available palette of suitable hardy tree species is limited. As a consequence, opportunities for increasing species diversity are reduced, and an increased amount of resources must be dedicated to sustaining planted trees.

Mississauga Green Development Standards

In 2010, the City published its first *Green Development Standards* as part of its Green Development Strategy. The Standards address several aspects of sustainable development, including storm water management, green roofs, bird strike prevention and incorporation of new trees into development sites. These standards support the implementation of known best practices, including the provision of 30 m^3 of soil per individual tree in hardscape areas, or 15 m^3 per tree when open soil areas are shared among more than one tree. These standards also recognize the importance of planting large-stature shade trees at an appropriate spacing (6 to 8 m) to enable the development of large canopies along frontages and pedestrian areas. Currently, implementation of the Green Development Standards is encouraged.



6.4 TREE PROTECTION AND NATURAL AREA MANAGEMENT

The City's approach to tree protection and urban forest preservation is fairly comprehensive in terms of introducing and revising policies, by-laws, standards and specifications that support protection of trees and require replacement for healthy trees that need to be removed. A summary of the current policies, by-laws and specifications is provided below.

6.4.1 OFFICIAL PLAN POLICIES

Mississauga is one of the few municipalities with a specific section dedicated to urban forest policies in its Official Plan. The policies (found in Section 6.4 of the *Official Plan*, 2011), provide support for a range of tools to protect and plant trees, while also providing flexibility to accommodate appropriate development. The policies encourage tree protection and planting on public and private lands, and provide specific direction for:

- developing a strategic planting program that targets different parts of the City

- implementing a strategic maintenance program for trees on public land
- ensuring development and site alteration will have "no negative impact" on the urban forest
- planting the right tree in the right place, with enough soil to sustain it
- implementing and complying with tree by-laws
- promoting greater awareness and stewardship, both internally and externally; and
- building strategic partnerships for promotion and implementation.

Some of this policy direction carries over into policies for desirable urban form and neighbourhoods where consideration for and integration of trees is recognized as important, particularly in those neighbourhoods with Residential Woodlands.

The Natural Environment section of the Official Plan (Section 6) presents a framework for a City-wide Green System. Although this system does not explicitly include the urban forest, it incorporates treed natural areas, Residential Woodlands, and Parks and Open Spaces, which include many natural and manicured treed areas.

Residential Woodlands (as shown in **Figure 8**) are residential areas, primarily on private property, identified as having relatively high levels of canopy cover and mapped[20] as part of the City's Green System. The Residential Woodlands overlay is a unique policy tool that identifies areas where tree preservation and replacement are particularly important because of the relatively high levels of canopy cover and the ecological value[21] of some of these areas. The Residential Woodlands policies encourage protection and enhancement of the urban forest in these areas, and some Special Policy Areas require it (e.g., parts of Cooksville).

In some cases these policies have been used successfully as tools to prevent significant expansion of existing residential developments into treed areas, and treed areas identified for protection through the redevelopment process have been zoned as Greenbelt to allow for natural regeneration, effectively protecting them from future re-development or expansion proposals.

More details on the City's Natural Areas System policies, which include significant woodlands, valleylands and wetlands, are provided in Section 5 and Section 9.1 of the NH&UFS.

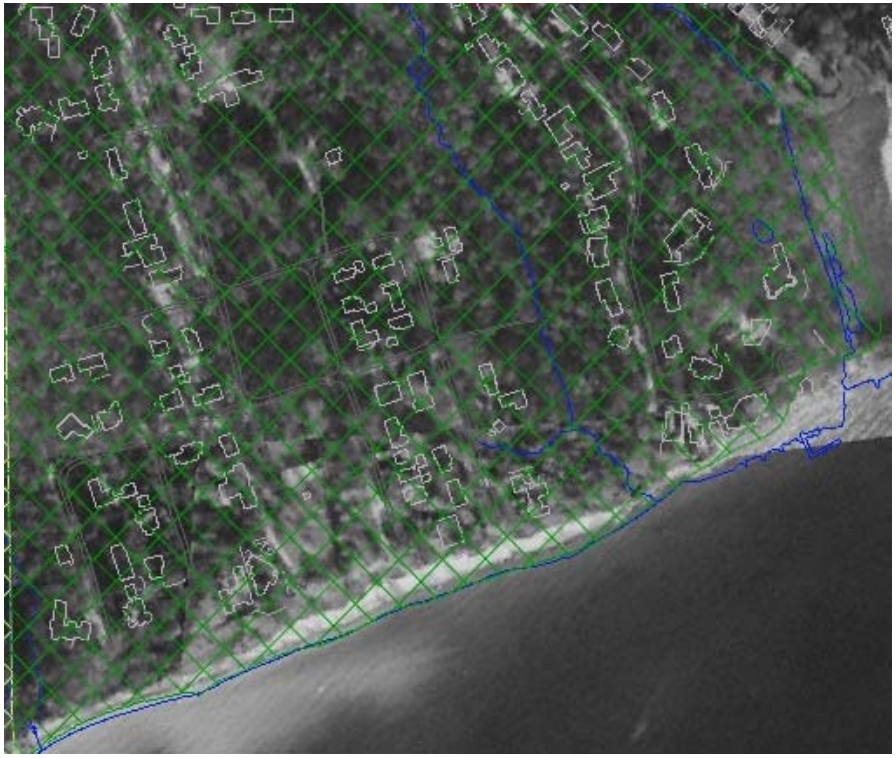


Figure 8. The density of canopy cover in a mapped Residential Woodland area (CL7) in dark green hatching along Mississauga's lakeshore

[20] The Residential Woodlands mapping in the City's current Official Plan has been carried forward from the previous Official Plan, and is based on data and analyses from the late 1980s.

[21] Examples of ecological value provided by some of these residential woodlands include stopover habitat for migratory birds in the spring and fall, and habitat for resident urban-adapted wildlife.

6.4.2 BY-LAWS

Any municipality with a population over 10,000 residents is empowered to enact legislation to regulate the injury and destruction of trees on public or private lands under the authority of the provincial *Municipal Act* (2001). Tree protection by-laws are primarily enacted to regulate the injury or destruction of trees outside of the development process. Mississauga has enacted three by-laws specifically addressing these issues, and several others that also support urban forest objectives. However, development proponents are typically required to adhere to Mississauga's tree protection by-laws under both subdivision planning and Site Plan Control processes.

Private Tree Protection By-law

The City's first private Tree Permit by-law (0624-2001) was approved December 2001. This by-law was amended in December 2005 (474-05) and was recently revised again, and passed by Council in 2012. The 2012 amendment, which changed the by-law name to the Private Tree Protection by-law (0254-2012), has been in effect since March 1, 2013.



The Private Tree Protection by-law has always regulated the injury or destruction (removal) of trees on private property in the City. Key changes in the recent amendment making the by-law more restrictive include:

- regulation of three or more trees with diameters greater than 15 cm per calendar year (as opposed to five)
- requirements for one or two replacement trees to be planted for each healthy tree removed (depending on the diameter of the one removed) or that a contribution be made to the Corporate Replacement Tree Planting Fund equivalent to the replacement costs, and
- increases in the penalties for by-law infraction to the maximum allowable under the *Municipal Act*.

Street Tree By-law

By-law 91-75 regulates injury and destruction of trees located in City-owned rights-of-way and other publicly owned lands. This older by-law is currently being revised by City staff to bring it into accordance with the current legislative framework and practices, and should be completed shortly. This by-law will improve the City's ability to prevent and/ or stop works which may result in the injury or removal of City-owned trees, and fine parties responsible for such damages.

Encroachment By-law

The Encroachment By-law (57-04), enacted in 2004 and last amended in 2011, is intended to prohibit any type of encroachment on to City lands unless specifically approved by the City or other public landowners (e.g., the Conservation Authorities). This by-law has been used effectively to prevent and require removal of any structures or changes in land use that extend from private property into adjacent City-owned natural areas, most of which are wooded. Over the past nine years, since by-law enactment, approximately 3.44 hectares (8.2 acres) have been effectively reclaimed.

Other Relevant By-laws

In addition to these "tree-specific" by-laws, the City has enacted a Parks By-law (186-05) and an Erosion and Sediment Control By-law (512-91). . The Parks By-law prohibits persons from engaging *"in any activity that may cause injury or damage to any… tree"* and from planting, pruning, climbing, removing, damaging or defacing any trees in City parks.

The City's Erosion and Sediment Control By-law, which is currently being updated, regulates the removal or placement of topsoil from any lands (public or private) throughout the city without a permit. It currently exempts removal from lots 1 ha and less in area, except for removal within 30 m of water bodies, which requires a permit in all cases. As part of the permitting process, applicants must provide the location and type of vegetative cover in the area to be affected. This by-law is not currently being used as a tool to support urban forestry or natural area objectives.

6.4.3 TREE PRESERVATION AS PART OF PRIVATE PROJECTS

Tree Preservation through Subdivision Development

The subdivision development process is coordinated by staff from the Planning and Building, Community Services and Transportation and Works departments. The *Community Services Subdivision Requirements Manual* (last revised in 2006, currently under review) outlines requirements for site-wide and individual lot/block preservation plans, including tree and site information, standard notes, and tree hoarding. In accordance with the manual, woodland management plans may also be required.

Various City staff are involved in overseeing tree preservation, depending on the location of the tree(s). Landscape Architects in the Planning and Building Department oversee tree preservation on private property; Landscape Architects in the Community Services Department oversee tree preservation on public property and lands to be dedicated to the City, and Certified Arborists from Forestry provide site-specific expertise on request from other staff.

The *Manual* is currently being revised to ensure its continued utility as a guiding document for infill and intensification projects, as the number of subdivision developments declines.



Tree Preservation under Site Plan Control

Site Plan Control is intended to ensure development conforms to the policies of the City's Official Plan, including those relating to the environment. Site Plan Control applies to several different categories of lands, including certain residential areas of the City. Through this process, development proponents must submit detailed Site Plan Applications, outlining various aspects of the proposed development for review by City staff, other regulatory bodies and potentially affected stakeholders. Unlike the subdivision planning process, Site Plan Control is primarily administered by one City department - Planning and Building, with support from Landscape Architects and Planners in Park Planning where the proposals are adjacent to City-owned lands. Other departments may also provide comment, if required, through participation in the Development Application Review Committee (DARC), and Certified Arborists in the Forestry Section are sometimes called in for additional technical support.

The City's *Site Plan Applications: Process Guidelines* manual is the primary guiding document for this form of development planning (specifically under Site Plan Control By-law 0293-2006). Key requirements for tree preservation planning under Site Plan Control include a tree survey plan (including mapping and identification of trees >15 cm DBH), general site information, and tree protection hoarding (if applicable to the site). There is no formal requirement for a written arborist report, although these are often requested as part of the Site Plan Application. The City's *Design Guidelines and Site Plan Requirements: New Dwellings, Replacement Housing and Additions* manual (May 2010) also provides guidance for tree protection during development specifically tailored to infill situations.

The City is able to request and hold financial securities against tree protection, in addition to several other elements of development. Securities against tree protection are typically released within one growing season following completion of all site works, and are only held longer if hoarding is not in place during construction works or if damage to trees due to construction practices is observed.

Tree Preservation outside Development Control

Certain types of site development are subject to municipal zoning regulations or provincial statutes rather than development controls. This includes many forms of construction outside of Site Plan Control areas (which still require Building Permits), or relatively minor works such as swimming pool installations.

Mechanisms for exploring tree preservation or replacement in these situations are limited to the City's tree protection by-laws (where they apply) and the *Tree Injury or Destruction Questionnaire and Declaration* form associated with the Building Permit process. It is a challenge to ensure that these forms are always filled out accurately, and that opportunities for tree preservation / replacement are explored with the proponents because of the provincial legislation which mandates short timelines for Building Permit issuance following submission of an application.

Tree preservation issues are also sometimes considered through the Committee of Adjustment process, where development applications requesting variances from zoning by-laws are reviewed by community members and City staff. The Development and Design division reviews and comments on applications, and may consult with Forestry staff, but because Committee of Adjustment review is a largely precedent-based, "applicant-driven" process, tree protection usually only becomes an issue if public pressure is brought to bear on the review process.



6.4.4 TREE PROTECTION AS PART OF PUBLIC PROJECTS

Existing trees, particularly those owned by the City, can be impacted during the course of public projects ranging from common maintenance operations such as sidewalk panel repair, to major capital projects such as road widening. While the relevant public agency (e.g., City, Region or Province depending on the type of project) generally makes efforts to ensure that trees are not adversely affected, tree protection during municipal works may be overlooked or not fully implemented as a result of gaps in the process, including:

- the lack of involvement by staff focused on tree preservation and/or replacement at the outset of the process (i.e., when the designs are being developed)
- the absence of City-wide standard engineering specifications or detailed drawings for tree protection that apply to public projects, and
- the lack of consistent requirements for site supervision and follow-inspection by a Certified Arborist at key points during and following construction.

Increasingly, City staff in other departments leading municipal projects are consulting with Forestry Section staff when tree preservation issues arise. However, when these requests are made late in the process it may be too late to adjust plans in order to implement effective tree preservation.



6.5 PROMOTION, EDUCATION, STEWARDSHIP & PARTNERSHIPS

Both the *Peel Region Urban Forest Strategy* (2011) and the *Mississauga Urban Forest Study* (2011) recognize that private property owners and tenants manage most of the existing Urban Forest, and also oversee the lands where most of the opportunities for Urban Forest expansion exist in the city. Therefore, their awareness and support of local Urban Forest objectives is critical in achieving established targets and goals.

> ***Residents of Peel Region have … expressed a desire to steward the urban forest; however, direction is needed. In addition, many New Canadians must now be introduced to the urban forest.***
>
> *Peel Region Urban Forest Strategy*, 2011

In recognition of this reality, the City of Mississauga, and its agency partners and adjacent municipalities, are becoming increasingly involved in various forms of outreach to specific stakeholder groups and the community at large, on a wide range of topics related to urban forestry and natural heritage. Existing awareness campaigns, tools and programs that apply in Mississauga are led by the Region of Peel, City of Mississauga, local conservation authorities, community groups and industry partners. Current initiatives involve promotion, education, stewardship and partnerships, and/or a combination of those elements, and are described briefly below.

6.5.1 WEBSITE AND SOCIAL MEDIA

The City now provides a range of social media connections. Recent developments include the ability of anyone to join the City on Facebook, Twitter, blogs (e.g., for the *Living Green Master Plan*) or newsfeeds. The City also has its own Call Center (3-1-1) which is available Monday to Friday from 7 a.m. to 7 p.m. for various inquiries about City or Regional programs or services, including Forestry. Common forestry and natural heritage inquiries include reports of noxious Giant Hogweed, questions about the Private Tree Protection By-law, and reports of trees on City property that may be hazardous. Live streaming of public committee meetings is also provided through the City's website.

The City's website has a Forestry section that has been recently updated and includes specific pages on:

- City trees and boulevards
- Private trees and encroachment
- Pests and disease management
- Maintaining the City's Natural Areas
- Getting involved (i.e., tree planting and stewardship programs, including links to the One Million Trees program website)
- Tree-related by-laws

The website section is well-organized, comprehensive and concise. In addition to information and links it also includes an interactive map of all the City's Natural Areas where detailed ecological maps and fact sheets on each one can be downloaded. 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.

The City recently launched a stand-alone website for the One Million Trees Mississauga (www.onemilliontrees.ca/) which has a very fresh look, an on-line tracking log for the number of trees planted since program inception and a list of who has planted them, and clear information on:

- who should participate
- how to participate
- different planning considerations for different planting objectives (e.g., for saving energy, for creating a woodland)
- recommended species and planting tips (including deer and rabbit resistant plants)
- planting programs for public lands, residential properties, business properties, and school grounds, and
- the benefits of trees.



Although entirely voluntary, this will be the first mechanism for tracking plantings on private as well as public property throughout Mississauga. This website also provides a cohesive umbrella for a number of supporting organizations that contribute resources and information. The One Million Trees Mississauga campaign also has hardcopy posters and flyers that have been circulated and posted in various public venues, and are available at selected public events.

Although not specific to urban forestry, the City and Region have partnered on a "Let Your Green Show" campaign with its own website (www.letyourgreenshow.ca) that encourages residents to: (1) grow and eat local, (2) use less water, and (3) give their cars a break. Having drought tolerant gardens of native species and planting trees are part of what is promoted through this program.

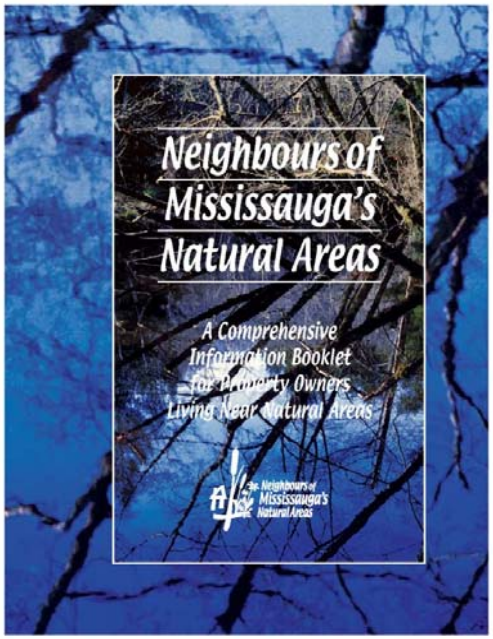
The local conservation authorities also have a number of resources posted on their websites that are directly relevant both to natural heritage and urban forest planning, management and outreach. Examples include plant lists of desirable native species (and undesirable invasive species to avoid), a series of publications on ecosystem services, and brochures providing guidance on how to plant trees and naturalize landscapes.

6.5.2 PROMOTION AND EDUCATION

Staff in the Forestry Section 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. This Section 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, emerald ash borer, and the private tree protection by-law. These publications are available through the Parks and Forestry Division, and are disseminated to residents as appropriate. City staff in other departments (e.g., Planning and Building, Transportation and Works) also have opportunities to educate proponents on the benefits of trees and the City's current policies, guidelines and by-laws related to trees.

The City regularly holds open houses on "hot" urban forestry topics (e.g., emerald ash borer), typically at a City venue (such as City Hall or the community centers). The City has also been involved in some outreach to youth through its various stewardship initiatives.

The City of Mississauga was one of the first municipalities to develop a city-wide brochure for residents abutting City-owned Natural Areas that provides guidance about "do's" and "don'ts". While the information and guidance in this booklet remains relevant, it should be updated.



In addition, some information is posted on a few high profile public Natural Areas on the City's website, and the City and Credit Valley Conservation have developed colourful information brochures on selected public Natural Areas, such as the Lakefront Promenade Park and Marina brochure.

City programs related to urban forestry and natural heritage that have been in place for some time include the Annual Arbour Day Program, Annual Earth Day Program / week, and the Commemorative Tree program that is administered through the Forestry Section, in conjunction with the Commemorative Bench program to provide members of the public a way to recognize or honour others through a lasting tribute of a tree.

SIGNIFICANT TREES

The City also has a Significant Trees Program to get residents to think about the value of trees in their neighborhoods by nominating old, large, interesting and / or unique trees on City property.

6.5.3 STEWARDSHIP, PARTNERSHIPS & FUNDING

The Region of Peel currently has a couple of programs that provide outreach to the community on topics related to urban forestry and natural heritage:

- the *Teach Green in Peel* program is an on-line database that helps teachers in the Region find locally-relevant environmental education resources and programs, and
- Peel's *Fusion Landscapes* program targets residential homeowners or tenants who are interested in landscaping their yard with drought-tolerant and native species, and provides home visits from a landscape technician to a certain number of residences annually.

Over the past decade, the City has been gradually expanding partnerships to pursue a range of stewardship activities with the local conservation authorities as well as a number of other non-profit organizations (e.g., Evergreen, Trees Canada, Riverwood Conservancy, Credit River Anglers, Ecosource, etc.), schools (e.g., University of Toronto Mississauga Campus), the Greater Toronto Airport Authority, and a number of local businesses. This resulted in the planting of close to 30,000 trees and shrubs in 2012 in various locations throughout the City, primarily on City lands. As opportunities for tree planting and/or naturalization on City lands are becoming increasingly limited, more effort will be required to pursue opportunities on other lands in the city.





A total of 33 stewardship programs currently available within the City of Mississauga are listed, along with their sponsors, target group(s), purpose and contact information, in **Appendix E**.

In terms of partnerships with higher levels of government, the City of Mississauga has been actively working with the Region of Peel on urban forest issues since 2009 and continues to benefit from membership in the Peel Region Urban Forest Working Group 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 (CFIA) on cross-boundary invasive pest issues (e.g., ALHB control, and more recently, EAB research).

The local conservation authorities, and in particular Credit Valley Conservation, (CVC), continue to be very active partners with respect to maintaining and restoring natural cover within their regulated areas, and in other public lands across the City. CVC also has a number of outreach and stewardship programs (see **Appendix E**) designed to educate and engage various sectors of Mississauga's community, as well as annual stewardship and volunteer appreciation events. A number of these are pursued in partnership with, and/or with the support of the City. CVC has also been a very active partner with the City in terms of natural heritage planning, and in 2010 completed a Landscape Scale Analysis identifying all current natural areas in the City, as well as prioritizing some of these sites (e.g., for restoration and/or protection) based on ecological attributes. They have also been conducting comprehensive ecological monitoring in a number of the City's public wooded areas, collecting data that can assist the City in management of these areas.

Toronto Region Conservation also provides a number of outreach and stewardship programs available to Mississauga residents (see **Appendix E**), continues to be a source of technical support on natural heritage matters, and has been a key partner in the development of urban forestry products through the Peel Urban Forest Working Group.



Toronto Region Conservation has also been working with the City to establish a Sustainable Neighbourhood Action Plan (known as SNAP) initiative in the Applewood area. The SNAP program is an innovative initiative that seeks to develop action plans to improve the local environment on the neighbourhood

scale and build resiliency against climate change by greening local infrastructure and encouraging positive behaviour changes among residents. Each plan builds the business case for implementation by measuring individual and community benefits and cost savings.

Halton Conservation, although only a small area of their jurisdiction falls within the City, have also provided natural heritage technical support and resources for outreach and stewardship.

The local Association for Canadian Educational Resources (ACER) is also very active locally and has established a number of plots in Mississauga, and elsewhere in the GTA, looking at changes to forested ecosystems over time. Their programs are specifically targeted at engaging youth and are both science-based and applied.

The City has also been very successful through the Partners in Project Green in working with a community of businesses to develop an internationally recognized eco-business zone around Pearson Airport. Activities range from sharing power generation to tree planting and naturalization. The group is now seeking to expand their initiative beyond the Pearson Airport area.

Although there is interest in building more local research partnerships (e.g., with local academic institutions), 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.

With respect to funding, 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 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.

TD Green Streets is another example of a program that provides matching funding (of up to $15,000) to municipalities for a variety of community-based urban forestry initiatives.



7 BEST PRACTICES & OPPORTUNITIES FOR IMPROVEMENT

This section of the UFMP presents relevant best practices and identifies key opportunities for improvement related to Mississauga's Urban Forest and Natural Heritage System. The bulk of the discussion around policies is found in the NH&UFS; the discussion in this document is focussed on policy implementation, management, operational practices, and engagement / stewardship activities. Examples of innovative practices and programs from a number of municipalities in Southern Ontario and beyond are also presented.



7.1 URBAN FOREST MANAGEMENT AND ADMINISTRATION

7.1.1 URBAN FOREST MONITORING

Monitoring the status of Mississauga's Urban Forest and Natural Heritage System, and of actions intended to improve their management and stewardship, is necessary if active adaptive management is to be effectively implemented, targets are to be achieved, and progress is to be made regarding urban forest and natural heritage sustainability.

Building on a previous model, a set of standard criteria and indicators for urban forest management (Kenney *et al.* 2011) was recently developed[22] to provide a useful tool for tracking the three key components of effective urban forest management: the status of the asset, the municipal management approach, and the level of community and stakeholder engagement. The 25 criteria laid out in the model include measures that are commonly used (e.g., canopy cover, species distribution, agency co-operation, tree inventory and tree risk management) and ensure that all aspects of urban forest management are considered and evaluated.

This framework has been adopted for monitoring as part of several other Urban Forest Management Plans in Ontario (e.g., City of Guelph, City of Toronto, Town of Ajax), but is not entirely suited to Mississauga's NH&UFS which looks at the Urban Forest and Natural Heritage System in an integrated manner. Therefore, as discussed in **Section 1.3**, it is recommended that this framework be expanded to include natural heritage considerations, and be adopted for the NHUFS. This expanded framework, which is presented in **Appendix A**, has been developed in consultation with the original framework authors (who are part of the study team for this project).

For the NH&UFS and the UFMP, a review cycle of four years is recommended (see **Section 1.3**), recognizing that the more technical and resource-intensive criteria (e.g., change in canopy cover), may be re-assessed at longer intervals, such as every eight years.

7.1.2 TREE INVENTORY

Municipal tree inventories are typically focussed on trees occurring on municipal and/or public lands where the given municipality has jurisdiction. An inventory allows each tree to be assessed for a wide range of variables including location, size, health and condition, and required maintenance. Having this information in a centralized and accessible digital format is one of the most useful urban forest management tools available. Key uses for a comprehensive tree inventory include:

[22] Kenney, W.A., van Wassenaer, P.J. and A. Satel. 2011. Criteria and Indicators for Strategic Urban Forest Planning and Management. Arboriculture & Urban Forestry 37(3): 108-117

- IMPROVED AND MORE EFFICIENT URBAN FOREST MANAGEMENT AND MAINTENANCE: Staff can use tree inventory information to accomplish a variety of goals and objectives. For example, tree planting locations and storm response activities can be prioritized, and species-based pest management strategies can be developed and implemented. Ideally, the tree inventory should be the main tool for public urban forest management at the individual tree level.

- A BROADER UNDERSTANDING OF URBAN FOREST STRUCTURE: Tree inventory data in combination with spatial data allows for urban forest structure indicators such as diameter class and species distribution to be mapped and assessed. These data can guide tree establishment planning and priority maintenance, and inform urban forest monitoring.

- IMPROVED PROJECT PLANNING: An urban forest inventory integrated into the municipal GIS (Geographic Information System) enables Engineers, Planners, Landscape Architects, and Forestry staff to work collaboratively to locate individual trees in proximity to proposed municipal works, identify potential conflicts, and plan effective tree protection measures in the earliest stages of planning. This can all be accomplished well in advance of project implementation, saving time and costs, and reducing uncertainties.

Mississauga maintains an operating inventory for about 243,000 street trees and some park trees. However, the inventory is not currently optimized for street tree management. In order to be a useful urban forest management tool, a tree inventory must be: 1) maintained up-to-date, 2) user-friendly and integrated into municipal asset management systems and practices, and 3) sufficiently detailed to enable operational planning. The City's tree inventory currently has few attributes that enable tree-by-tree management planning, and should be expanded to include attributes such as site type, maintenance requirements, risk assessment and pest/pathogen identification to be used to its full potential. The inventory should also be expanded to include trees in actively-managed parks (as opposed to City-owned Natural Areas, which do not require an inventory of individual trees), as the same types of risk management and maintenance requirements are generally required for these trees and street trees.

Examples of nearby municipalities with effective and exemplary tree inventories include Kitchener, London and New Tecumseth, Ontario, whose inventories all include maintenance requirements for each tree. Further abroad, good examples include Pittsburgh, Pennsylvania and San Francisco, California, whose inventories are also used in management and maintenance planning due to the inclusion of detailed inventory attributes.

In Ontario, Oakville, London and Ottawa now have portions of their inventories available on-line to the public, as do Pittsburgh and San Francisco, making the inventory an outreach as well as a management tool. In San Francisco, members of the public can contribute to the City's tree inventory by inputting tree location, species and other data on-line.

7.1.3 INTERDEPARTMENTAL COORDINATION

In most municipalities where there are staff dedicated to urban forest and natural heritage management, it is recognized that a multi-departmental and multi-disciplinary approach is required. In Mississauga, while interdepartmental coordination around urban forestry and natural heritage issues is increasing (e.g., recent creation of the Environment Division), additional opportunities for improvement have been identified. These include:

- having Directors and Managers from different departments be familiar with, and help support, the implementation of the NH&UFS and UFMP
- involvement of Forestry Section staff in the early stages of planning for both private and public projects to help ensure that opportunities for tree protection and/or planting are identified at the outset of the process
- keeping staff in various departments, and at all levels, informed about current policies, by-laws, guidelines and practices related to the Urban Forest and Natural Heritage System, and
- establishing a multi-departmental group of key staff who regularly work with trees that meets to share information and identify ways to improve municipal processes. .

In Oakville, the first municipality in southern Ontario to undertake an urban forest study (Town of Oakville 2006) and to develop a comprehensive urban forest management plan, one of the recommendations was to create an Inter-departmental / Interagency Technical Advisory Committee comprised of staff from Parks and Open Space, Engineering, and Planning. The intent was for this group to:

- bring a multi-disciplinary perspective
- review plans (particularly larger scale plans) early in the process to ensure all opportunities for tree preservation and planting are considered, and
- review / develop staff operating procedures or policies supportive of urban forest sustainability.
- A comparable recommendation was made in Guelph, Ontario and Saanich, British Columbia, other municipalities that recently developed urban forest management plans.

In Mississauga, establishment of an internal 'Urban Forest Working Team' including management and staff from Parks and Forestry Division (Community Services Department), Development and Design division (Planning and Building Department), Engineering and Works and Transportation and Infrastructure Planning Divisions (Transportation and Works Department) will help ensure improved interdepartmental coordination, build a better environment for the identification and collaborative resolution of urban forest-related issues, enable knowledge transfer, and ensure consistent application of municipal standards and adherence to policies.



7.1.4 SPECIFICATIONS, STANDARDS AND GUIDELINES

Written specifications, standard detail drawings and guidelines related to tree preservation and planting are useful to ensure best practices suited to the given municipality are adhered to. In Mississauga, tree-related specifications and standards in different departments are not consistent or complete, or entirely aligned with appropriate best practices. For example, the Development and Design Division provides specifications for solid panel or framed hoarding, while Community Services specifications require farm fencing.

To address such issues, some municipalities have developed comprehensive, jurisdiction-wide tree protection and planting specifications for implementation on all types of projects where the municipality has some type of authority. Some examples include:

- City of Palo Alto, CA – "Tree Technical Manual"
- Barrie, ON – "Tree Protection Manual"
- City of Toronto, ON – "Tree Protection Policy and Specifications for Construction near Trees" and "Tree Planting Solutions in Hard Boulevard Surfaces Best Practices Manual"
- Regional Municipality of York, ON – "Street Tree Preservation and Planting Design Guidelines"
- Town of Markham, ON – "Trees for Tomorrow Streetscape Manual"
- Town of Oakville, ON – "Tree Protection and Preservation Guidelines for Site Plan Applications"
- Town of Richmond Hill, ON – "Tree Preservation By-Law No. 41-07 Fact Sheet No. 5 – Guidelines for Construction near Trees"

Such documents provide an easy-to-use and detailed 'one-stop' reference for residents, site plan applicants, municipal staff and others involved for all tree works. In Mississauga, the development of a comprehensive tree technical manual (or similar document) would encourage consistent application of City requirements and facilitate more efficient review and revision of all standards and regulations in the future to ensure Mississauga continues to be a leader in urban forest management.

While tree protection policies and standards are in place in Mississauga, opportunities to strengthen them to promote more effective tree protection should be explored through a comprehensive review and updating of tree

protection specifications. Factors to consider include improved fencing techniques (solid hoarding except where sightlines are an issue), diameter-based tree protection zones to protect larger root zone areas, and innovative technologies such as directional boring, hydraulic and pneumatic soil excavation and "tree-first" design, to protect existing trees affected by construction and development.

Municipalities with leading examples of tree protection specifications and standards include The City of Burlington (Specification SS12), City of Toronto (*Tree Protection Policy and Specifications for Construction near Trees) and* Palo Alto, California.

7.2 TREE AND NATURAL AREA HEALTH AND RISK ASSESSMENT

7.2.1 YOUNG TREE PRUNING

Pruning of young trees to develop good structure, often called 'training', is one of the best investments in the health of the future urban forest. Proactive and early pruning provides trees with good form which can be maintained throughout their lives, thereby lowering the risk of future failure and reducing liability and long-term arboricultural maintenance requirements and costs.

Maintenance during the 'formative years' of a tree's life (which can be conducted from the ground and at little cost) increases the prospects for long-term tree survival and also greatly reduces future liability by ensuring good form and structure early on.

Research and experience from leading municipalities suggests that immature trees should generally be pruned at least three times within the first 10 years after planting, preferably at regular intervals. Young trees should be pruned to 'train' them towards good structure, and typically no more than five to eight pruning cuts are required during each pruning round.

Mississauga should formalize its existing program with an annual implementation plan and supporting budget. Annual planting lists should be used to direct the pruning, which should take place three times within 10 years after planting.

It is suggested that this program be independent from the broader block pruning maintenance (see **Section 7.2.2**) because given the fast growth rate of young trees in good growing sites, it is difficult to incorporate young tree pruning into a cyclical pruning program, and longer cycles will lead to backlogs in structural pruning requirements. Furthermore, young tree pruning can be done much more quickly with much less equipment. While the number of trees planted (and subsequently pruned) in Mississauga varies annually, the City currently plants up to 4000 caliper trees per year as part the street tree replacement, new subdivision and park tree planting programs, and will be planting many more as part of the EAB Management Plan. These trees will all I require a targeted young tree pruning program.

A leading example of a successful young tree pruning program can be found in Calgary, Alberta, where young trees are inspected and pruned (if necessary) a minimum of three times in the first ten years.

7.2.2 CYCLICAL PRUNING

Many municipalities inspect and maintain street trees in a scheduled, cyclical manner called "grid", "block" or "cyclical" pruning. There are many variations to cyclical pruning approaches, and a sampling of municipalities across North America shows that inspection and pruning intervals vary widely between municipalities, from five year cycles to 16-year cycles.

Another strategic approach to cyclical pruning is to establish a different cycle depending on the age or species of the trees being maintained. For example, most trees in Edmonton, Alberta are pruned on a seven year cycle, while elm trees are pruned on a four year cycle.

Over the long term, a planned and cyclical approach can provide significant cost savings over reactionary pruning and tree maintenance. A shorter cycle (i.e., five to eight years) reduces the number of resident service requests which are costly to fulfill as inspection staff time is spent travelling from site to site, rather than progressing through a linear work area. Furthermore, systematic tree maintenance enables earlier detection of pest and other plant health issues, resulting in improved overall urban forest condition.

Mississauga's current pruning cycle is close to optimal at eight years. Funding to improve this level of service from an 11 to 12 year cycle to an 8 year cycle was approved in 2010 and has been implemented gradually. Although this is longer than the optimal cycle of four to five years quoted in some best practices, experience in southern Ontario and elsewhere suggests that a seven to nine year street tree pruning cycle effectively balances costs with tree maintenance

requirements. Cities with long-standing urban forestry programs in Ontario such as Burlington, Hamilton, and Toronto, as well as Calgary (Alberta), Edmonton (Alberta), and Vancouver (British Columbia) all operate on seven to nine-year street tree pruning cycles.

7.2.3 PARK TREE MAINTENANCE

Park tree maintenance in Mississauga is carried out reactively, as it is in many Canadian municipalities. According to the 2000 ISA Ontario Municipal Arborists and Urban Foresters Committee *Best Management Practices for Ontario Municipalities*, trees in active parks (as opposed to public natural areas) should be visually inspected annually, with maintenance on an as-needed basis. However, this is not achievable in most jurisdictions due to resource constraints. The maximum inspection cycle considered acceptable is once every five years, however even this cycle can be difficult to achieve for some.

It is recommended that a maximum five year inspection cycle be implemented in Mississauga for actively-managed park trees, with maintenance continuing to be undertaken on an as-needed basis based on work order requests and the results of visual inspection. Expansion of the City tree inventory to actively-managed park areas should also generate some more immediate maintenance recommendations and, once carried out, will reduce future work requirements and result in longer-term cost savings.

7.2.4 TREE AND WOODLAND RISK MANAGEMENT

Despite being an extremely valuable asset (see **Section 3**), trees can, under some circumstances, pose risks to persons or property. Although tree risk is statistically minimal in relation to many factors of daily life, the potential for tree-related risk increases as trees age, if tree health and condition decline, or if young trees are not properly pruned to develop good structure. The City is responsible for ensuring that its trees are maintained to minimize potential risks presented by them.

Tree risk assessment and mitigation are becoming increasingly recognized as critical components of urban forest management. The key to effective tree risk management lies in an operational policy or protocol that coordinates inspection, mitigation and proactive planning in order to reduce risk, uncertainty and liability. A dedicated protocol that sets minimum standards for risk assessment and documentation, will result in consistent levels of assessment over the long term. Key components of an effective risk management policy or protocol include:



- a policy statement framing the scope of work (i.e., which trees/areas are to be included), assigning responsibility, setting goals and outlining a realistic Standard of Care statement
- determination of acceptable risk, outlining what the City considers an acceptable threshold for risk of tree failure
- minimum levels of training and qualifications of risk assessors, outlining the expected credentials that tree risk assessors should possess
- frequency of assessment, outlining how often publicly-owned trees in different settings (e.g., trails, high-traffic streets, new communities) are to be inspected for risk
- management options, outlining what arboricultural treatments the City will consider for implementation to mitigate risk (such as pruning, cabling, bracing, or removal)

- record-keeping protocols, to enable tracking of inspections and mitigation actions
- strategy funding and/or partnerships, to identify expected costs and anticipated sources of funding to enable the implementation of the strategy, and
- a strategy for program assessment and reporting to enable adaptive management and ongoing improvement.

A comprehensive risk management protocol should also include consideration for post-storm emergency response, including prioritized inspection and maintenance areas.

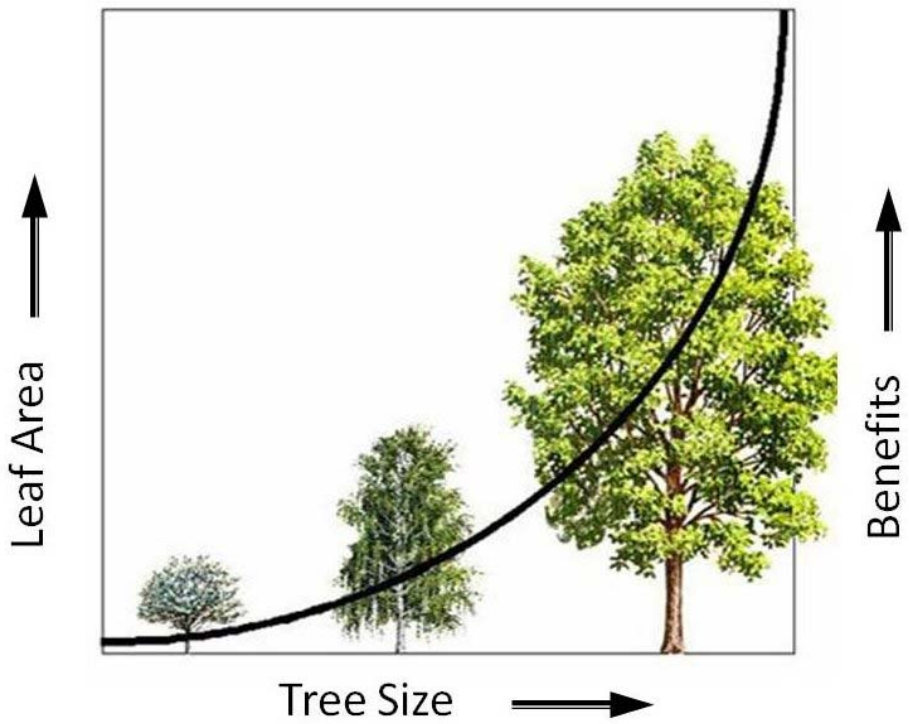


Figure 9. Illustration of the exponential increase in ecosystem services (or benefits) provided by trees as they mature.

Tree risk mitigation is an important practice and one that can extend the life of a tree that might otherwise be considered a risk. Practices such as soil amendments and structural pruning (if performed correctly and managed appropriately) can greatly reduce the risk presented by certain aging trees. Because large trees provide such a disproportionate amount of ecosystem services (as compared to smaller trees) (see **Figure 9**), investing in their retention results in exponentially more benefits to the community.

Recent advances in tree risk assessment have given rise to new levels of risk assessment training and qualification by bodies such as the International Society of Arboriculture. While Forestry staff in Mississauga have received introductory levels of tree risk assessment training, the City's Forestry Inspectors should be provided with advanced training and qualification through the ISA's Tree Risk Assessor Qualification (TRAQ) program as well to enhance this capacity.

Basic visual inspection of trees in actively managed and high-traffic locations (e.g., streetscapes, parks and along woodland trails) should be undertaken and documented systematically to demonstrate the City's fulfillment of its duty of care. Annual inspection is optimal but likely unachievable given resource constraints and fiscal realities. As such, higher-risk trees and locations should be prioritized for tree risk assessment and management.

Management of tree-related risk in woodlands and other natural areas is challenging due to the large numbers of trees present in such areas, and has recently been made even more challenging because of the resources required to deal with emerald ash borer (EAB). It is anticipated that, as the borer spreads across the City and causes increasing ash mortality, more woodlands and natural areas may require fencing or other risk management approaches, due to the rapid rate of root decay and tree uprooting following EAB-induced mortality.

7.2.5 INVASIVE PLANT SPECIES MANAGEMENT

Invasive plant species are considered one of the primary drains on ecological integrity in wooded natural areas of the urban forest. In many parts of southern Ontario, urban forests and wooded natural areas are heavily invaded by invasive trees and shrubs such as Norway maple, Tree-of-Heaven, and European buckthorn, as well as herbaceous plants such as garlic mustard, dog-strangling vine, and many others. The federal and provincial governments do not provide any resources to assist with the control of such plant species (beyond information such as Ontario's Invading Species Awareness Program), and there

are very few coordinated strategies to control invasive plant species, largely because the resources and staff required to implement such efforts would be substantial and the benefits would not be immediately evident to the general public.

Currently, invasive plant species management in Mississauga is relatively small in scale and not effective in completely controlling targeted invasive species. Once exception to this has been the effective efforts to detect and control giant hogweed, an invasive plant known to burn skin and even cause blindness to people exposed to its sap.,

The *Ontario Invasive Species Strategic Plan* (2012) published by the Provincial government identifies a series of 27 Actions for addressing this issue under the topics of: (1) leadership and co-ordination, (2) communication and co-ordination, (3) improving the effectiveness of existing committees, (4) legislation, regulation and policy, (5) risk analysis, (6) monitoring and science, (7) management measures, and (8) communication and education. This document considers all invasive species, not just forest plants, and includes actions that speak to the need for rapid response protocols for new infestations and increasing governmental capacity to develop and implement risk assessment tools. This provides some useful guidance, but does not really help the City prioritize its invasive plant species management approach. Direction for prioritization is provided in a targeted Invasive Species Management Plan for Mississauga, provided in **Appendix C**, which has been developed (as part of this Plan based on analyses of the City's Natural Areas surveys. More details on specific management techniques are provided in Credit Valley Conservation's Invasive Species Strategy (2009).

Effective invasive species management must consider a wide range of factors, including but not limited to: prevention of invasions, identification and mapping of invasive populations, cost-effective control measures, community partnerships, funding, and public education and awareness. Specific recommendations, as provided in **Appendix C**, include:

- Continue dialogue and development of cooperative initiatives for invasive species management with Credit Valley Conservation
- Adopt the general principle of prioritizing management by addressing the invasive species that pose the greatest potential for impact to native vegetation, and which occur in the most valued natural areas in the Natural Heritage System (i.e., "flagship" natural areas")
- Develop a landowner contact program to educate landowners about the potential threat posed by non-native species, including pets
- Identify safe and easily understood management techniques that can be implemented by volunteers, and
- Implement invasive species control for the priority species and areas identified (as identified in **Appendix C**).



7.3 TREE ESTABLISHMENT AND URBAN FOREST EXPANSION

7.3.1 TREE SPECIES SELECTION

The sustainability and health of the future urban forest will rely on the selection and planting of a diversity of tree species, planted in appropriate locations and maintained until they are well-established because doing so builds in resiliency to stressors such as species-specific insect infestations and diseases, as well as stressors linked with climate change (e.g., periods of drought, intense storms). While the use of native species is preferable, some non-invasive, non-native trees are also suitable under difficult growing conditions. Species selection should be based on a wide range of considerations. For example, planting small statured trees under utility wires can reduce the need for costly corrective pruning.

A general guiding principle for species selection of actively managed street and park trees has been the "30-20-10" rule whereby:

- no tree family exceeds 30% of the inventory
- no tree genus exceeds 20% of the inventory; and
- no tree species exceeds 10% of the inventory.

This rule has been adopted as one of the Urban Forest targets for Mississauga.

Recognizing the need to test different species in a context of climate change, the City of Peterborough, Ontario, in its strategic plan, committed to undertaking an innovative step to achieving long-term urban forest sustainability through species suitability trials. The Town of Oakville has made the same commitment. This involves planting small numbers of previously untested species, and closely tracking their performance over time.

Species selection for wooded natural area enhancement, restoration and expansion should not be based on the "rules" above, but rather should be based on ecological and biophysical considerations, and should strive to mimic the community composition of relatively undisturbed wooded areas within the same ecozone. Considerations should include local biophysical conditions and the relative age / successional stage of the wooded area, and the objectives should include the re-creation of native structural diversity over time.



Specific recommendations for Mississauga that will support increasing the diversity of street and park tree plantings include the development of a comprehensive list of suitable and acceptable tree species (to be included with the recommended comprehensive specifications, standards and guidelines) in order to better guide tree establishment planning and practices. The list should include a wide range of information about acceptable species, including site requirements, and acceptable locations. The City should also continue to undertake and monitor species suitability trials, the performance of which can be tracked along with other plantings under the Million Trees Mississauga program.

7.3.2 TREE HABITAT

Tree habitat is a critical consideration when planning tree establishment and urban forest expansion. For example, roadside boulevards rarely provide optimal growth conditions, and plantings in boulevards invariably perform worse than those in neighbouring front yards. Tree establishment success is directly related to the below-ground growing environment, including factors such as soil volume, quality, texture and drainage.

While species requirements vary, minimum recommended soil volumes for large-stature (e.g., 40 cm dbh) trees in areas which receive adequate rainfall are around 30 m^3. In accordance with these requirements, the recent North Oakville urban forest management plan requires 15 m^3, 30 m^3 and 45 m^3 of soil for small, medium and large-sized trees, respectively. The City of Toronto's recent *Tree Planting Solutions in Hard Boulevard Surfaces Best Practices Manual* outlines similar requirements for streetside plantings, and recognizes some efficiencies can be achieved through "shared soil volumes" among groups of trees. Mississauga's *Green Development Standards* (2010) also outlines these soil volume requirements.

It is acknowledged that it may not be possible to substantially increase soil volume for tree plantings in established areas of the City during the course of replacement street tree plantings. However, enhanced rooting environment techniques such as soil cells or continuous trenches should be considered in order to provide adequate soil volumes during the course of new development and through capital projects. A review of the City's tree establishment specifications, standards and guidelines should also consider implementation of minimum soil volumes. While more costly than common tree establishment methods, implementing enhanced rooting environment techniques has been demonstrated to; achieve significantly higher rates of tree establishment

success, enable the development of larger trees, reduce the frequency of tree replacement, and ultimately support the provision of more ecosystem services to the community.

Another key consideration is the quality of the soil in a tree's rooting area. In addition to lack of consideration for soil quality in many planting areas over the years, salt spray continues to be a widespread problem along city streets and boulevards. This spray can damage foliage, reduce growth and sometimes cause death. The development of "witches' brooms" in tree and shrubs branches is a common response. Possible solutions include: planting more salt tolerant species in heavily affected areas, reducing salt use by using alternatives or reducing the proportion of sodium in sprays, limiting salt application in ecologically sensitive areas, and protecting susceptible plants (e.g., with burlap or snow fencing), increasing irrigation and mulching.

7.3.3 TREE ESTABLISHMENT AND NATURALIZATION PROGRAMS

In Mississauga, trees can be established through the Forestry Section's standard operational activities, tree establishment as part of private or public projects, or naturalization/restoration plantings undertaken by the City, conservation authorities, or one of the numerous stakeholders or residents in the City. Opportunities to improve planting specifications, guidelines and practices have been outlined above. Opportunities to improve the implementation of tree establishment programs are discussed in this section.

In order to promote urban forest expansion and ensure trees are planted where the likelihood of post-planting care is highest, the City's request-based tree establishment program should be more effectively promoted and formalized. Such programs exist in many communities; among the most effective examples are in Toronto and in Hamilton, where online information and brochures help residents pre-select desirable species and provide information to help City staff decide whether planting is appropriate.

Suitable sites for tree planting in municipal rights-of-ways should be identified during the course of Forestry operations and included in an inventory. Trying to keep boulevards free of above and below-ground utilities as much as possible also helps create better tree planting opportunities.



For expansion/restoration planting programs, it is important to verify the appropriate tree planting locations and ensure they can support trees for the long-term. It is discouraging for a community group, and a waste of resources, when a naturalized area is altered by an approved development a few years later. Good planning and direction of volunteer activities can avoid these scenarios. When planted trees must be removed, volunteers appreciate efforts to have them properly transplanted. A key component of the City's new One Million Trees Mississauga program should be strategic long-term planning of future potential restoration/expansion sites, which must consider existing planning commitments and future potential land uses. Considerations for prioritizing plantings should include areas where existing canopy cover is low but population densities are high, areas identified for naturalization in conservation authority subwatershed plans, and areas heavily affected by EAB-related mortality of ash trees.

Several other communities have undertaken One Million Tree planting projects, including London (Ontario), Los Angeles and New York. Through various partnerships and community involvement, London's Million Tree Challenge has seen the planting of over 97,000 trees. Among the greatest challenges associated with Million Tree-type programs is to ensure tree survival. Follow-up inspection, post-planting care, and performance tracking must be considered critical components of any large-scale planting program, and should be incorporated into One Million Trees Mississauga.

7.4 TREE PROTECTION AND NATURAL AREA MANAGEMENT

The protection of existing trees is among the most critical aspects of sustainable urban forest management. Existing mature trees provide significantly more benefits than newly-planted ones (see **Figure 9**), and the incremental loss of mature trees makes increasing urban forest canopy coverage difficult. Trees are regularly lost due to natural mortality, pests and diseases, and removal during site development, and at landowners' discretion. While tree removal may be required for risk mitigation or to accommodate development, removal of healthy trees, particularly when they are large-statured native species, should not be undertaken without full consideration of alternative development or design options in addition to tree preservation measures.



7.4.1 OFFICIAL PLAN POLICIES

Over the past few years, an increasing number of municipalities in southern Ontario with active urban forestry programs have introduced urban forest policies into their Official Plans. Examples include the Town of Oakville, Town of Ajax, City of Guelph, City of Brampton and the City of Mississauga. 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.

The current Urban Forest policies in Section 6.4 of Mississauga's *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, these policies could be strengthened by:

- defining the "urban forest".
- including Urban Forest goals or objectives
- defining "no negative impacts to the urban forest"
- supporting the need for identification of opportunities for tree replacement (along with the current policies supporting protection) and requiring planting off-site or cash-in-lieu where replacement cannot be accommodated on site
- supporting the development and implementation of consistent city-wide standards for tree protection and replacement
- expanding the scope of strategic partnerships
- specifying the need to avoid using invasive species, and

"No negative impacts" or "no net negative impacts" to the urban forest should be understood to allow for some removal of trees where required and permitted as part of the planning process, as long as the removed trees, and to the extent possible their functions, are replaced so that ultimately there is "no net loss" and, in time, "net gain" to the urban forest as a whole.

Notably, the NH&UFS includes a section on planning with several strategies that speak to planning for the urban forest, including Strategy #6 "Strengthen Official Plan policies related to the Urban Forest", which provides guidance for moving forward on the gaps identified in this section.

7.4.2 TREE PRESERVATION BY-LAWS

Private Tree Protection By-law

Mississauga, like many urban area municipalities across southern Ontario, has a by-law in place that regulates injury and removal of trees on private property. 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.

Given that Mississauga's by-law has just been updated based on local research and consultations, some time will be required to educate residents and staff about these changes, and to see if these changes better support the City's Urban Forest. While key changes in the recent update include allowing for fewer trees of 15 cm and above to be cut without a permit each year (i.e., two instead of four), the by-law still allows for the removal of some potentially large, mature trees without a permit.

Based on the current conditions of Mississauga's urban forest (see **Section 2**) it is recommended that in four to eight years when the Private Tree Protection By-law comes up for review again, that the City consider the potential benefits of requiring permits to remove all individual trees above a certain diameter on private lands. This change should be considered in conjunction with the anticipated costs associated with regulating more trees, and enforcing this regulation. In Mississauga, as elsewhere, it is not generally advisable to have a private tree by-law that the municipality is not able to adequately enforce.

Notably, Mississauga currently has one by-law inspector dedicated to the administration and enforcement of this by-law. The recent tightening of the by-law will presumably result in a greater work load. This will need to be monitored to ensure that current levels of enforcement can be maintained.

Street Tree By-law

Many municipalities have by-laws regulating the injury or destruction of publicly-owned trees. These by-laws help protect the municipality's assets, and show municipal commitment to its urban forest. Key components of such by-laws can include requirements for compensation if trees must be removed for development, and the ability to levy fines and stop work orders to prevent unauthorized damage to publicly-owned trees.

The City's updated Public Tree Protection By-law, currently under development by City staff, will extend the current by-law to include all trees on City lands (not just on boulevards) and, among other things, will be addressing the treatment of boundary trees[23], as this can become an issue when the tree is shared between the City and a private landowner.

Other Relevant By-laws

The City's Encroachment By-law was last updated in 2011, and is increasingly being used as an effective tool for reducing the expansion of private land uses into adjacent public natural areas (as described in **Section 6.4.2**). There are not many other municipalities with such by-laws, and fewer that actively enforce them as in Mississauga. The City is currently in the process of implementing a more active enforcement program for its Encroachment By-law with assistance from the conservation authorities that includes an education component and systematic tracking of the types and severity of encroachments.

Erosion Control By-laws, also called Site Alteration By-laws, are authorized under the *Municipal Act* (2001) (just like tree by-laws) and regulate the removal or placement of topsoil within a jurisdiction. Among other things, these by-laws typically require the identification of all trees that may be impacted by the proposed grade changes, and therefore provide an opportunity for the identification of tree preservation, tree replacement and/or compensation for trees approved for removal. The benefit, from an urban forest perspective, of these by-laws is that they require permits for activities that may not be under the purview of the *Planning Act* (1990) or other City by-laws, and therefore enable identification of opportunities for tree protection and replacement that may otherwise be overlooked.

The City's Erosion and Sediment Control By-law is an existing regulatory mechanism that could be used to flag the need for tree protection and identify opportunities for tree planting and naturalization while also regulating removal

[23] Boundary trees can become an issue when activities or development on one property have the potential to harm trees shared by the adjacent property owner. The *Forestry Act* (1990) makes it an offense to injure or destroy a boundary tree without the neighbour's formal consent.

and addition of fill in the city. As this by-law is currently being updated by City staff in Transportation and Works, it is a good opportunity to ensure the by-law can be used to achieve Urban Forest and Natural Heritage System objectives. Key gaps identified in the current by-law in this context include:

- an exemption for lands of up to 1 hectare (which is quite large in a jurisdiction where most future development will be primarily infill and intensification)
- only a general requirement for the identification of vegetation on site (rather than specific requirements to provide an inventory of trees, as well as other vegetation, on site)
- an absence of any requirements related to tree protection for specimens being retained, and
- a lack of compliance with the current Private Tree Protection By-law in terms of compensation requirements for trees of at least 15 cm diameter proposed for removal.

Revisions to the by-law to make it more consistent with current in force tree by-laws, and best practices regarding tree preservation would go a long way towards making it a useful tool for identifying opportunities for tree protection and replacement. These changes would also need to be accompanied with education of the City staff administering and enforcing the by-law to ensure effective implementation of these changes, and would be facilitated with support from a Certified Arborist in the Forestry Section familiar with by-law enforcement.

7.4.3 TREE PRESERVATION THROUGH THE PLANNING PROCESS

Tree Preservation under Development Control

The *Planning Act* (1990) (in particular Section 41, Site Plan Control) provides municipalities with the authority to identify trees for protection and require replacements on private lands subject to the development application and approval process (typically termed Site Plan Control). A number of municipalities in southern Ontario use this authority and require that all trees (typically of at least 10 cm or 15 cm in diameter) be assessed and inventoried, and that detailed tree preservation plans be submitted as part of a Site Plan Application.

Site Plan review and approval, if applied in conjunction with guidelines and specifications intended to support tree health and longevity (e.g., appropriate soil volumes, adequate above-ground space, and appropriate species selection), is one of the best tools at a municipality's disposal to foster urban forest sustainability through the development process. It is at this planning level where important decisions around tree protection and planting can be made, and where municipalities with a vision for their urban forest, and the will to implement it, can ensure that all opportunities are explored.

Tree preservation and protection during development under Site Plan Control is required in Mississauga. However, opportunities exist to improve the implementation of these practices, including:

- involvement of Forestry Section staff (where trees exist on the subject lands and at the discretion of Landscape Architects in Planning and Building) in earliest stages of development pre-consultation, before Site Plan Application packages are submitted
- a "fast-tracked" collection and review process for all *Tree Injury or Destruction Questionnaire and Declaration* forms, particularly where mature trees are known to exist
- requiring detailed arborist reporting, including tree inventory and tree preservation methods, for all development applications where trees may be affected
- improving the City's ability to conduct site inspections during development
- increasing the value of securities held against tree protection to increase incentives for compliance, and
- requiring arborist inspections, with supporting reports to be submitted to the City for review.

Tree Preservation outside Development Control

Opportunities to ensure compliance with tree preservation regulations and policies outside of development control are more limited and more difficult to implement. For example, smaller development activities outside of Site Plan-regulated areas in Mississauga may not be regulated pursuant to the Erosion Control by-law, or require Committee of Adjustment approval. In such an instance, the only required permit may be a Building Permit, which must be issued within a Provincially-mandated timeline generally not exceeding 10 days (or a bit longer for larger or more complex structures). In Mississauga, a Building Permit application should be supported by a completed *Tree Injury or Destruction Questionnaire and Declaration,* but these are typically not reviewed

or field verified due to time constraints, and opportunities to explore potential tree preservation options can be missed. A similar situation can occur during installation of a swimming pool, which does not require a permit except for its enclosure.

As such, ensuring compliance with municipal tree preservation requirements outside of development control is not always possible. Nonetheless, tools such as the City's Erosion Control by-law should be reviewed and updated, and Tree Declaration forms should be reviewed and acted upon if potential injury to by-law protected trees is suspected.

Many municipalities have, and enforce, erosion control and/or site alteration by-laws for the removal or placement of topsoil within a jurisdiction, which can be used to identify or prevent contravention of tree preservation by-laws. In southern Ontario municipalities with such by-laws include Markham, London, Kingston, Oakville, Hamilton, Guelph, and Niagara Falls.

7.4.4 TREE PROTECTION DURING MUNICIPAL WORKS

In general, tree protection planning and implementation during municipal operations or capital works should receive the same level of consideration as private site development. Review of conceptual plans, project requirements and potential conflicts should be undertaken early on in the process by a multi-disciplinary review group including project Planners, Landscape Architects, Engineers and Arborists, in order to explore opportunities to minimize tree injury or removal. Where such measures are implemented, City Arborists should be involved in the site review of tree protection measures including hoarding, root-sensitive excavation or other methods. Alternately, these could be supervised by a contract Arborist required to report to the Parks and Forestry Division.

Municipalities are increasingly realizing the benefits of interdepartmental coordination and cooperation when planning large-scale capital projects, or even smaller scale maintenance operations. For example, all Town and Regional capital projects in the Town of Oakville must be supported by a complete Arborist report, including a tree inventory, tree preservation/removal plan, tree compensation calculation and, where required, tree injury or removal permits. Securities can also be held by the department of the municipality responsible for signing off on the tree-related / landscaping works. These approaches should be adopted in Mississauga to demonstrate the City's commitment to leading by example.



7.5 PROMOTION, EDUCATION, STEWARDSHIP & PARTNERSHIPS

As in all municipalities in southern Ontario, much of Mississauga's Urban Forest is located on lands outside of municipal ownership or control. Furthermore, the resources that the City is able to allocate to Urban Forest management cannot support the full range of desired stewardship activities, at least not within the desired timelines. Consequently, the importance of improving the community's appreciation of the value of the Urban Forest, actively encouraging proper tree care and planting practices, and nurturing partnerships with as many stakeholders with an interest in the urban forest as possible is critical.



7.5.1 OUTREACH USING PUBLIC WEBSITES AND SOCIAL MEDIA

Recent social marketing research conducted in the City of Toronto, and elsewhere, has found that one fundamental barrier to fostering stewardship is the growing detachment most people have from nature in our society. The key challenge, then, is how to break and get beyond this barrier.

Municipal 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 and the City of Ottawa, as well as the City Edmonton, Alberta. The City of Mississauga has just updated the Forestry Section of its website and launched the One Million Trees program website, and should continue to update the content and look of these resources.

Websites can also be used as tool for engagement. A growing number of municipalities with active urban forestry programs are putting their municipal tree inventories on-line for use by City staff in other departments and the public. The City of London and Town of Oakville have had their inventories on-line for several years. The City of Ottawa recently launched their on-line tree inventory. The City of Mississauga should, after it is updated and expanded, look to posting its tree inventory on-line for the public (as well as for use by City staff).

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 ambitious One Million Trees Mississauga program over the next 20 years. Notably, the Region of Peel also has an interactive map showing data on its natural areas gathered through the CVCs 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. The City's Natural Areas monitoring program should be better promoted, both internally and externally, as a resource and a platform for engaging stakeholders, and for fostering broader partnerships. The City should also consider developing directories of local residents, businesses and other stakeholders that are interested in stewardship activities and willing to be contacted for future activities, or who just want to be kept informed.

Although an increasing number of municipalities are starting to build social media outreach into their day to day service, few have developed and posted video clips, particularly related to urban forest topics. The City of Calgary is one of the few that has posted videos on how to plant a tree, as has the non-profit Toronto-based organization LEAF. The City's website is already set up for Facebeook, Twitter, You Tube, and already provides live video feeds of committee meetings. Therefore, it would be relatively easy to adapt these tools so they are more targeted to natural heritage and urban forest promotion at key times of the year. Key dates would include:

- National Tree Day (September 25)
- Arbour Day / Earth Week (mid-April)
- International Day for Biodiversity (May 22)

The City should also develop a series of short video clips on topics of interest. Possible examples of topics include: ecosystem services provided by Mississauga's Natural Heritage System and Urban Forest, how to plant a tree, and a video about EAB. In all cases the messaging should be clear and engaging. Where possible, these materials should be made available in languages other than English that are widely spoken in the Mississauga. Key themes to convey through these materials include:

- the direct connections between the health of the Natural Heritage System and Urban Forest, and human health
- the ability and importance of the contributions of individual private citizens and businesses to local sustainability
- the fact that local programs and resources are readily available, and
- that the City is working to protect, manage and expand the Urban Forest and Natural Heritage System on public lands, but needs local residents, businesses and other stakeholders to contribute if natural heritage and urban forest objectives are to be met.

7.5.2 GENERAL AND TARGETED MARKETING

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 that 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. It is quite commonplace now for programs to have their own logos.

The One Million Trees Mississauga program is an 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. The City has also developed a "look" for Parks and Recreation publications, and recognizes the importance of clear messaging and captivating the audience.

In addition to general marketing to the general public, the NH&UFS (and supporting UFMP) includes a range of outreach tools targeted to certain groups because of their disproportionate ability to influence the development of Mississauga's landscape. Key groups identified through the project consultations include: youth / students, businesses / corporations, local arboriculture firms and landscapers, developers and their planning consultants, and new Canadians.

Examples of approaches for targeting these groups include:

- 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)
- bringing programs like TRCA's "Watershed on Wheels" (that has been designed to meet Grades 1 through 8 Ontario science and technology curriculum expectations) to the attention of the various school boards, and
- supporting programs like ACER (based in Mississauga) that provide science-based and applied learning to high schools related to trees and the environment.

7.5.3 PROMOTING THE VALUE OF NATURAL AREAS AND THEIR SENSITIVITIES

One of the key opportunities identified through this project is to better promote the ecosystem services provided by the Natural Heritage System and the Urban Forest, and specifically to promote the value of Natural Areas in the city in terms of their contributions to quality of life, and their need for management that carefully balances appropriate access with protection of key ecological functions.

Some of the most current and relevant materials related to ecosystem service provision are cited in **Section 3** of this UFMP, and in the NH&UFS. These materials and sources can be used as the basis for developing City brochures (web based and hardcopy) that promote the importance of these ecosystem services in the context of Mississauga.

In addition, the City's Natural Heritage System, and the City-owned Natural Areas within it, should be promoted for (a) their ecosystem services, and (b) their intrinsic ecological values (e.g., provision of habitat, support of biodiversity, provision of ecological connectivity in the landscape) while still highlighting their sensitivities to overuse and misuse.

A good example is the City of Kitchener which distinguishes its publicly accessible natural areas from its active recreational parks in name and in planning. 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.

7.5.4 STAKEHOLDER ENGAGEMENT & FOSTERING COMMUNITY PARTNERSHIPS

Municipalities with progressive natural heritage and/or urban forest agendas are recognizing that stewardship by the community and local stakeholders is key to natural heritage and urban forest sustainability because so much of the extant and potential urban forest is on private lands.

Encouraging and supporting tree planting, and particularly site-appropriate native species, is a key strategy employed by many such municipalities. The City of Guelph and Town of Richmond Hill both have municipal programs that provide: (a) information and education on how residents can naturalize their lawns and gardens with native species, (b) plants and/or advice at a discount or free. The Toronto-based non-profit organization LEAF continues to provide a range of urban forestry services focussed on supporting tree planting and care in residential yards in the Greater Toronto Area, York Region, and beyond.



In Mississauga there are already tree planting / landscaping programs targeted to residents through the Peel Fusion Landscapes Program, Toronto Region Conservation's Healthy Yards Program and CVC's Grow Your Green Yard Program. There are also programs sponsored by the City, CVC, Toronto Region Conservation and Evergreen (see **Appendix E**) that target businesses / corporate lands and schools. The City has been able to bring many of these programs together through the One Million Trees Mississauga program where they are promoted, with relevant resources and information. The City should continue to foster and leverage these partnerships to support its urban forest objectives, and to provide support to these various initiatives where possible.

Many municipalities have commemorative tree and/or bench programs, and some larger municipalities also have arboreta (typically associated with an academic institution), however very few have memorial programs tied to a central, municipally-owned arboretum that also serves as an educational and research centre. An example of a native tree arboretum is the Louise Pearson Memorial Arboretum in Tennessee, while other notable arboreta focused on educational and research objectives include Missouri Botanical Gardens in St. Louis and the Louise Kreher Forest Ecology Preserve. Closer to Mississauga there is the Royal Botanical Gardens in Hamilton, and the University of Guelph's Arboretum which both have memorial components but are primarily focused on educational and research objectives.

Having a City-owned and operated Arboretum / Memorial Forest would be a unique opportunity to provide a centralized place of natural respite, reflection and solace for the memorial of loved ones, as well as a place for the City to educate and engage youth and other members of the community on the diversity of native trees (and shrubs) that can grow in Mississauga, the ecosystem services they provide, and techniques for planting and caring for these plants. The Arboretum could also provide a venue for selected joint research projects between the City and local academic institutions, agencies and non-profit organizations[24].

7.5.5 BUILDING RESEARCH PARTNERSHIPS

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 need to be studied over many years. It is also challenging because municipal staff do not generally have the time or the expertise to pursue research projects independently, and therefore must partner with nearby government agencies and/or academic institutions and/or non-profit organizations that include research as part of their mandate.

The United States Department of Agriculture (USDA) Forest Service, in collaboration with the University of Vermont, has become an excellent urban forest resource, and has worked with many municipalities in the U.S. and Canada (including the region of Peel) to develop and undertake urban forest canopy assessments using the latest tools and technologies. This relationship should continue to be fostered, and the Region and Peel Urban Forest Working Group should continue to collaborate with the USDA group if opportunities arise.

In Canada, there is no comparable government body dedicated to urban forest issues, and therefore urban forest research closer to home is left to universities, colleges and agencies. In Ontario, two of the best known and most well-established urban forestry programs are in Lakehead University (Thunder Bay), and the University of Toronto, which coincidentally has a campus in Mississauga. There have already been several Mississauga-based research projects related to urban forestry undertaken through this campus, but none in collaboration with the City. Opportunities to pursue mutually beneficial local research projects should be explored.

Both the CVC and Toronto Region Conservation authorities are active in research and monitoring generally related to natural heritage, but increasingly also looking at urban forest-specific issues as well. Several local non-profit groups, such as ACER, are also actively involved in monitoring. The City should work with these groups to determine where and how their research can support the City's urban forestry interests, and how the City may in turn be able to support their work.

Other agencies such as the Canadian Food Inspection Agency are already actively involved in EAB research. There may be opportunities to have pilot or case studies in Mississauga that would also help inform local management needs.

As discussed above, the establishment of a City-owned and operated Arboretum / Memorial Forest is currently underway. This venue will provide an ideal location for future collaborative research projects, as well as engagement, education, stewardship, and respite.

There are many potential projects that could be pursued, and these would to a large extent be determined based on joint interest, available resources, and the mandates of the individuals / organizations involved. Potential projects, several of which were recommended through the *Mississauga Urban Forest Study* (2011), could include:

- responses of different native tree species to different soil types and conditions in the city
- evaluation of the use of structural soils, subsurface cells and other enhanced rooting environment techniques for street trees
- working with local growers to diversify stock and reduce reliance on clones, and
- development of a seed collection program for native ash species (to bank the genetic stock) in partnership with Toronto Region Conservation, CVC and the National Tree Seed Centre.

[24] Notably, a terms of reference and site selection process for the Arboretum design are being completed as part of this Plan and provided to the City under separate cover.

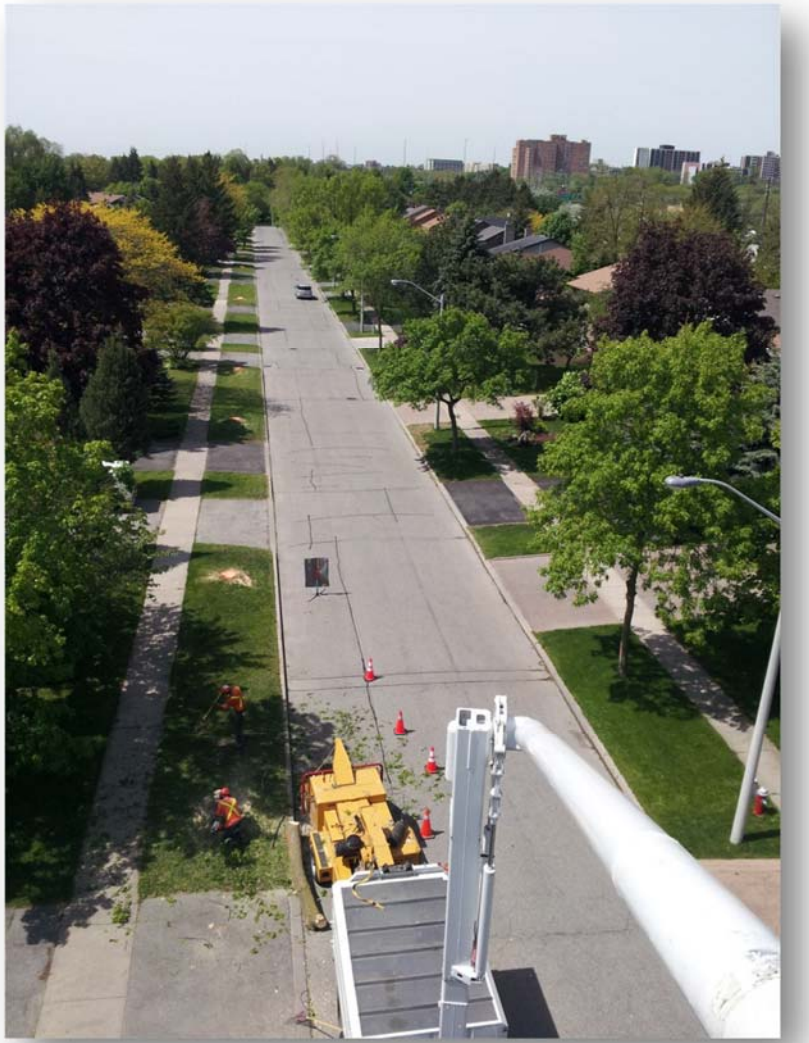
7.5.6 FUNDING OPPORTUNITIES AND INCENTIVES

Current funding for urban forest initiatives are available to the municipality, if proposals are submitted and awarded through Tree Canada (in partnership with TD, and more recently CN), but many of the funding grants require either a non-profit community group or school take the lead. Organizations such as Evergreen, the Ontario Trillium Foundation, Tree Canada, and LEAF all offer grants of variable sizes to schools and community groups. Environment Canada and the Ontario Ministry of Natural Resources also offer some tax rebates / subsidies to landowners (see Appendix F in the NH&UFS for a complete list). Even though many of these are not directly accessible to the municipality, websites like that of the One Million Trees Mississauga program can promote and be a central place for residents and local schools to review and screen these resources. The grants that are already available should also be considered when the City is exploring the development of its own incentives related to Natural Heritage System and Urban Forest stewardship.

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. In addition, the City of Mississauga is currently exploring the feasibility of a unique incentive via a tax rebate tied to maintaining a certain proportion of the yard in permeable surface to recognize its infiltration function and contribution to storm water management. There are also various incentives (e.g., free trees, free labour), associated with many of the programs identified in **Appendix E**.

More conventional incentives that have been used elsewhere and could also be effective in Mississauga include:

- improved recognition through an awards program that includes awards specifically for natural heritage and urban forest stewardship (note this is already being pursued through the *Living Green Master Plan* 2012), and
- opportunities for support and/or recognition of larger scale efforts or support through the naming of parklands / open space, buildings / rooms, multi-use trails, and gardens.



8 RECOMMENDED ACTIONS

The following recommended actions have been developed with consideration for existing conditions and available resources, relevant best practices and precedents from the scientific and technical literature and other jurisdictions, recommendations from the studies completed by the Peel Urban Forest Working Group, and input from consultations with City staff and a range of stakeholders and representatives of the community. These recommendations have been developed to:

- work within a built-up land use context where most anticipated development will be in the form of infill and intensification
- build on existing practices, policies and programs that are supportive of Urban Forest and Natural Heritage System objectives (as laid out in Section 5.2)
- include a variety of implementation guidance to improve tree protection and Urban Forest establishment and expansion on both public and private lands, and
- achieve established objectives and targets using cost-effective and collaborative approaches.

The following 30 Actions have also been developed to provide more detailed technical, operational and/or tactical guidance regarding the implementation of a number of the Strategies identified within the broader Natural Heritage & Urban Forest Strategy (NH&UFS). The Strategies from the NH&UFS that relate to the UFMP Actions described in this Plan are identified below. Although each Action can be understood as part of this Plan, they are best understood within the broader context of the NH&UFS as well.

While the ultimate goal of strategic urban forest management planning is to achieve urban forest sustainability, it is important to propose realistic actions and achievable targets that are in-line with the City's resource base. The recommended Actions presented here support the longer-term goal of Urban Forest sustainability and will lead to marked improvements in the health, longevity and function of the City's Urban Forest and Natural Heritage System, but are also considered within the City's means and draw on external support, resources and funding wherever possible.



The Actions are organized by the five topics addressed through this UFMP, and in the same order, and are not listed by priority, as follows:

- Section 8.1: Urban Forest Program Administration (Actions #1 To #5)
- Section 8.2: Tree And Natural Area Health and Risk Management (Actions #6 To #10)
- Section 8.3: Tree Establishment, Naturalization and Urban Forest Expansion (Actions #11 To #14)
- Section 8.4: Tree Protection and Natural Area Management (Actions #15 To #20)
- Section 8.5: Promotion, Education, Stewardship and Partnerships (Actions #21 To #30)

The recommended timing for each of these Actions, as well as the anticipated new resources required to implement them, are identified in the UFMP Implementation Guide, and summarized in Section 9.

8.1 URBAN FOREST MANAGEMENT AND ADMINISTRATION

ACTION #1: ADOPT THE MONITORING FRAMEWORK DEVELOPED FOR MISSISSAUGA'S NATURAL HERITAGE SYSTEM AND URBAN FOREST

Related NH&UFS Strategy: #26

Implementation Guidance:

- Use the 20-year framework identified for the NH&UFS (2014 – 2033) broken down into five four-year review periods, as follows:
    - 2014 – 2017: 1st State of the Natural Heritage System and urban forest report due in early 2018
    - 2018 – 2021: 2nd report due in early 2022
    - 2022 – 2025: 3rd report due in early 2026
    - 2026 – 2029: 4th report due in early 2030
    - 2030 – 2033: 5th report due in early 2034
- Circulate highlights of these Update reports to all City departments, and to all stakeholders and the community
- Use this framework, and the related NH&UFS Strategies and UFMP Actions, to develop and implement four-year city-wide Management Plans and Annual Operating Plans (AOPs) outlining priority-based annual work plan
- Revise strategic action items at end of each four-year management planning cycle, as required
- Use the Monitoring Framework provided in **Appendix A**

Current Practices: Implementation of this action item will be a new addition to the Forestry Section work plan.

Best Practices: A number of other municipalities in southern Ontario (e.g., Town of Ajax, City of Burlington, Town of Oakville, City of Toronto) have begun the implementation of strategic urban forest management plans that include monitoring components and have adopted a comparable framework. While the planning horizon and content of the plans may differ, they share common structural elements linking higher-level objectives with implementable tasks through a three-tiered framework that allows for review, tracking and adaptive management.

Rationale: Utilizing the framework of the UFMP to guide its implementation will ensure that regular review and active adaptive management will be undertaken. Urban forest managers will be better able to anticipate necessary changes and improve their ability to plan operating and capital budgets, allocate resources to address priorities, and incorporate new knowledge to learn from successes and shortcomings of the urban forestry program over time.

ACTION #2: MONITOR THE STATUS OF THE NATURAL HERITAGE SYSTEM AND THE URBAN FOREST WITH SUPPORT FROM THE REGION, LOCAL AGENCIES AND OTHER PARTNERS

Related NH&UFS Strategy: #26

Implementation Guidance:

- Use the data collected through the Natural Areas Survey updates for most of the monitoring of the NHS, and supplement with additional data from the conservation authorities where available and appropriate
- Assess Mississauga's canopy cover (using leaf on aerial satellite imagery) once every eight years
- Assess street and park tree species diversity and condition using the current street and park tree inventory once every eight years
- Complete an assessment at the end of each four-year management planning cycle using the integrated Monitoring Framework developed for the NH&UFS (see **Appendix A**).
- Review the status of NH&UFS Strategies and UFMP Action Items at the end of each four-year management planning cycle
    - Include consideration of the tree plantings being tracked through the One Million Trees program (i.e., how many, by whom, etc.)

Current Practices: Implementation of this action item will be a new addition to the Forestry Section work plan. The addition of natural heritage metrics to the existing framework is a unique endeavour undertaken as part of the NH&UFS.

Best Practices: Applied urban forestry research has developed a suite of criteria and indicators for use by urban forest managers to conduct periodic assessments of the urban forest, management approaches, and status of community engagement and partnerships. First adopted in the Town of Oakville in 2008, this framework is recommended by the Toronto Region Conservation Authority in all its urban forest studies, and becoming increasingly recognized by municipalities as a useful tool to establish baselines and undertake periodic urban forest program performance review.

Rationale: Tracking the status of Urban Forest and Natural Heritage System metrics and various aspects of urban forestry programs and practices will enable the implementation of active adaptive management, and will enable staff to evaluate and adjust management activities in response to changing needs and circumstances. Monitoring also provides useful information for communicating the status of urban forestry in Mississauga to staff outside the Forestry Section, to Council, stakeholders and the community.

ACTION #3: FORMALIZE INVOLVEMENT OF CITY FORESTRY STAFF IN CITY PLANNING AND INFORMATION SHARING RELATED TO TREES AND NATURAL AREAS

Related NH&UFS Strategy: #1

Implementation Guidance:

- Ensure Forestry staff are consistently circulated or consulted on development applications (Site Plan Applications, subdivision plans, Committee of Adjustment applications, etc.), and capital projects to ensure opportunities for tree protection and/or planting are identified at the outset of the process
    - Ensure a representative from the Forestry Section is involved in monthly Development Approval Review Committee meetings and capital project review meetings when required by the Landscape Architects in Planning and Building to help assess when tree preservation/planting may be required
    - Try to ensure Forestry staff are circulated on Building Permits if trees may be impacted or removed when possible
    - Consult with Forestry staff when tree issues arise through the Committee of Adjustment process
- Establish an internal urban forest working team including management and staff from the Parks and Forestry Division, Development and Design Division (Planning and Building department), Engineering and Works, and Transportation and Infrastructure Planning Divisions (Transportation and Works department)
    - Hold bimonthly meetings (6 times annually) addressing key urban forest-related issues including UFMP action item implementation, planning coordination, etc.
    - Include, as required, staff from other departments, divisions and sections

Current Practices: Several formal processes are in place to facilitate collaboration between departments, especially regarding development proposal review. These include circulation of Site Plan Applications and other development proposals, Development Application Review Committee, and interdepartmental meetings (as required). Some staff in Community Services, Planning and Building, and Transportation and Works request Forestry staff support on an "as-needed" basis.

Best Practices: Every municipality has a unique organizational framework and different mechanisms for coordinating tree-related planning, management and operational activities between departments. However, irrespective of the organizational framework, to be effective, trees and natural areas must be dealt with in a collaborative, multi-departmental way. This means breaking down the so-called 'silo effect', so that cooperation around shared tree issues can be achieved.

Rationale: Improved interdepartmental coordination and cooperation will enable knowledge transfer, ensure consistent application of municipal standards and adherence to policies, and provide opportunities for creative planning and problem solving in support of Urban Forest and Natural Heritage System objectives.



ACTION #4: DEVELOP CONSISTENT AND IMPROVED CITY-WIDE TREE PRESERVATION AND PLANTING SPECIFICATIONS AND GUIDELINES

Related NH&UFS Strategies: #14, #15

Implementation Guidance:

- Develop "made in Mississauga" tree preservation and tree planting standards, specifications and guidelines consistent with technical and scientific best practices and examples from neighbouring jurisdictions for city-wide use in public and private projects
    - For tree preservation specifications and standards, consider factors such as pre-construction care and maintenance, tree species, diameter-based tree protection zones, root zone compaction protection, post-construction inspection and maintenance
    - For tree hoarding/fencing, eliminate need for deep in-ground staking; instead provide two acceptable, minimally-invasive construction specifications (i.e., solid framed plywood hoarding and framed construction fencing).
    - For tree planting specifications and guidelines, consider factors such as tree species selection, stock sizing, density, soil quality/texture/volume, planting depth, post-planting maintenance.
    - Include an acceptable tree species list for different site types and apply to all projects Develop typologies for different tree growing environments, including engineered soil solutions (e.g., open planters, soil cells, etc.)
    - In specifications and standard drawing notes, include references to relevant City policies and by-laws
- Implement new standards and specifications city-wide:
    - Ensure that in all internal tree-related resources (i.e., relevant Community Services, Planning and Building, and Transportation and Works policies, manuals and standard drawings) are consistent with new specifications and standards, or that new specifications and standards replace the existing ones.
    - Ensure that all external tree-related resources (web, manuals, etc.) include and/or are consistent with the new specifications and standards

Current Practices: Existing specifications and standards are available for public and private projects but are not comprehensive or consistent, and require updating to current and appropriate best practices (e.g., *Community Services Subdivision Requirements Manual* (2002), Development and Design and Forestry Section standards (2008)).

Best Practices: A number of municipalities have developed comprehensive tree preservation and planting specifications, standards and guidelines to help ensure consistent application of improved urban forestry practices. Some integrate many aspects of urban forestry in one document, while others focus on a single topic, such as tree establishment. Examples include: Palo Alto, California and in Ontario, Barrie, Markham, York Region, London, Toronto.

Rationale: Implementing updated tree preservation and tree planting specifications, standards and guidelines city-wide will improve protection of existing trees and support expansion of urban forest canopy, show the City is leading by example, and help ensure consistent approaches are followed.

ACTION #5: UPDATE THE INVENTORY OF CITY STREET AND PARK TREES, AND KEEP IT CURRENT

Related NH&UFS Strategy: #15

Implementation Guidance:

- Expand knowledge of the City's tree resources by improving and enhancing the street and park tree inventory
    - Maintain GIS integration to facilitate information sharing among City departments
    - Include additional inventory attributes including: 1) site type description, 2) maintenance requirements, 3) risk assessment, 4) pest/pathogen identification, and 5) species approximate age (not a range)
    - During scheduled street tree maintenance, utilize the City's current asset management software to update existing street tree inventory with enhanced inventory attributes
    - Expand inventory to actively-managed areas of municipal parks
- Utilize inventory to plan urban forest maintenance operations on streets as well as in parks, and to better manage tree-related risk on public lands
- Make the basic inventory information available to the public on the City's website so they can see what trees are on their streets and in their parks

Current Practices: The existing GIS-based tree inventory of 243,000-plus City trees is useful for knowing what species are where, and for sharing this information with other departments, but is missing key attributes that limit the inventory's use as an urban forest management planning tool.

Best Practices: To optimize its utility as an urban forest management tool, a tree inventory must be: 1) maintained and up-to-date, 2) user-friendly and integrated into municipal asset management systems and practices, and 3) sufficiently detailed to enable operational planning. A wide range of tree inventory options are available, and many jurisdictions have some type of municipal tree inventory, more commonly street tree management-oriented inventories, although inventories of trees in actively-managed parks are equally important. A high quality street tree inventory, such as in the one used in the City of Kitchener, can include a large number of inventory attributes, such as insect/disease signs and symptoms, site type, deadwood levels, structural condition, and, most importantly, maintenance requirements.

Rationale: Improved knowledge of the condition and maintenance requirements of street and park trees, if used effectively through a coordinated asset management program, will improve urban forest health and sustainability, reduce future operating costs as maintenance is undertaken in a proactive and planned manner and reduce the incidence of tree-related risk as potential issues are identified and addressed before they become problematic or difficult to manage.

8.2 TREE AND NATURAL AREA HEALTH AND RISK ASSESSMENT

ACTION #6: OPTIMIZE STREET AND PARK TREE MAINTENANCE CYCLES

Related NH&UFS Strategies: #15

Implementation Guidance:

- Retain maintenance frequency of street tree pruning cycle at once every eight years (maximum)
- Change program title from Street Tree Elevation Program to Street Tree Maintenance Program to reflect broader scope of pruning
- Establish a five-year inspection cycle for trees in actively-managed park areas (i.e., outside of City-owned Natural Areas), implementing maintenance on an as-needed basis

Current Practices: Current Street Tree Elevation Program pruning frequency is approximately eight years per tree. Current park tree maintenance is reactive or request-based.

Best Practices: Best practices suggest that a four to five-year pruning cycle optimally balances operation costs and maintained tree value. However, longer cycles can be effective if supported by more comprehensive urban forest management programs. Many urban foresters agree that a seven or eight-year street tree pruning cycle is optimal. Several cities with active urban forestry programs in Ontario such as Burlington, Hamilton, and Toronto, ON operate on seven to nine-year street tree pruning cycles.

In most municipalities, park tree maintenance tends to be largely reactive in nature. According to the 2000 ISA Ontario Municipal Arborists and Urban Foresters Committee *Best Management Practices for Ontario Municipalities*, trees in active parks should be visually inspected annually. However, this is likely unachievable in most jurisdictions due to resource constraints. The maximum inspection cycle considered acceptable is once every five years. However, this cycle is difficult to achieve for most municipalities. For example, in Burlington, ON park trees are visually inspected approximately once every seven years, and maintenance is carried out on an as-needed basis.



Rationale: Increased maintenance frequency will result in improved tree health, reduction in tree-related risk, improved identification and monitoring of urban forest pests/pathogens. In addition, a combination of cyclical inspection and as-needed maintenance for park trees will balance the City's duty/standard of care for tree health and risk management with available resources.

ACTION #7: IMPLEMENT A YOUNG STREET AND PARK TREE MAINTENANCE PROGRAM

Related NH&UFS Strategies: #15

Implementation Guidance:

- Using the City's tree asset management system, schedule every newly-planted caliper-sized City-owned tree for inspection/pruning 3 times within 10 years following planting. Undertake ground-based structural pruning, as needed, for each tree included in the program by City crews or contractors
    - Schedule future inspections/maintenance by trained arborists until young trees are fully established and trained for good future structure
- Consider utilizing part-time summer employees (students, etc.) to support program implementation
- Increase per-tree cost in General Fees and Charges by-law to fund improved young tree maintenance program and ensure regular review of this charge

Current Practices: Some young trees are structurally pruned, but the program is not comprehensive or formalized. Stake removal and other maintenance are undertaken for plantings under warranty, but active maintenance tapers off quickly after the warranty period expires (typically two years). Inspections of planted materials on private property at the end of the planning process are generally undertaken by Engineers or Landscape Architects.

Best Practices: A formal young tree pruning program can help to ensure the future development of healthy, large-statured and structurally stable trees. Best practices show that newly-planted caliper trees should be inspected and, if necessary, pruned at least three times in the first ten years following establishment. A formal program to track trees from establishment to maturity and schedule regular inspection and pruning is optimal.

If necessary due to resource constraints, the relatively non-technical task of young tree structural pruning can be undertaken by staff such as properly trained summer workers or even City-approved volunteers. Successful young tree pruning programs have been implemented in Calgary, Alberta, where young trees are inspected and pruned (if necessary) a minimum of three times in the first ten years, and New York, NY where a formalized "Citizen Tree Pruner" program has graduated more than 11,000 volunteers since inception and complements the City's staff-based neighbourhood pruning program which focuses on mature trees.

Rationale: Young tree maintenance is one of the most cost-effective ways to reduce incidence of tree-related risk, and improve future urban forest health and condition. Inspections by Forestry staff and/or qualified arborists will ensure proper planting/maintenance and assumption of good-quality trees for the future urban forest.



ACTION #8: DEVELOP AND IMPLEMENT A STREET AND PARK TREE RISK MANAGEMENT PROTOCOL

Related NH&UFS Strategies: #15

Implementation Guidance:

- Develop a tree risk management protocol or strategy that includes key considerations outlined in the UFMP
  - Balance need for conservation of large/old trees with risk issues
  - Utilize street tree inventory to prioritize areas for tree risk inspection (e.g., areas with predominantly larger and mid-sized trees)
- Implement proactive tree risk management for street trees, actively-managed park areas, and in proximity to formal woodland trails
- City-owned woodland risk tree management should be coordinated with Conservation Management Plans (see **Action #20**)
- Improve Forestry Section staff tree risk assessment training (e.g., ISA Tree Risk Assessment Qualification program)

Current Practices: Tree risk assessment and management are largely reactive and/or request-based. Risk can sometimes be identified and/or managed during the course of regularly scheduled street tree maintenance. Recently, emerald ash borer management requirements have reduced ability for Forestry Inspectors to undertake woodland tree risk assessment/management activities.

Best Practices: Implementation of a tree risk policy, strategy 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. Recent advances in tree risk assessment have resulted in new levels of risk assessment training and qualification by bodies such as the International Society of Arboriculture (e.g., Tree Risk Assessor Qualification). Forestry staff and local arboriculture contractors should be encouraged to seek advanced tree risk assessment training and, ultimately, such qualifications should be required by the City.

Basic visual inspection of trees in actively managed and high-traffic locations (e.g., streetscapes, parks and along woodland trails) should be undertaken on a regularly scheduled cycle of sufficient frequency to demonstrate the City's fulfillment of its duty of care. Annual inspection is optimal but likely unachievable given resource constraints and fiscal realities. As such, higher-risk trees and locations should be prioritized for tree risk assessment and management, ideally through an up-to-date inventory and proactive tree maintenance program.

Rationale: Improved tree risk management protocol will reduce incidence of tree-related risk and associated costs, reduce the City's potential liability with respect to municipal trees, and will also improve Urban Forest health.



ACTION #9: DEVELOP AN URBAN FOREST PEST MANAGEMENT PLAN

Related NH&UFS Strategies: #15

Implementation Guidance:

- Address prioritized management of forest pests and pathogens in natural and developed areas
- Incorporate active management (e.g., removal, control) along with education and avoidance
- Build on the format and framework developed for dealing with emerald ash borer (EAB) and be used for future pest invasions as required
- Work with neighbouring municipalities, the Region of Peel, the Canadian Food Inspection Agency (CFIA) and other agencies to coordinate research, monitoring and management efforts.

Current Practices: There is an EAB management plan that was approved in 2012 and is now in effect. However, there is no City-wide invasive species management strategy, nor a framework for future pest management. In the past, awareness of urban forest pests in southern Ontario municipalities has been relatively limited. However, with the extensive damage it is causing to both public and privately owned trees, the current spread of EAB presents an excellent opportunity to engage the community on urban forest pest issues.

Best Practices: A comprehensive urban forest pest management approach is needed to strategically identify and prioritize potential threats, identify areas at greatest risk, and outline potential strategies to proactively control, mitigate and adapt to invasive tree pest and disease species.

Rationale: Improved urban forest pest management, if it is proactive and effective, can increase Urban Forest and Natural Heritage System resilience to other stressors. Improved public awareness of invasive pest issues can also be an opportunity to highlight the ecosystem services provided by the urban forest, improve public support of urban forest pest and other management activities, and foster engagement in local tree and woodland care.

ACTION #10: UNDERTAKE TARGETED INVASIVE PLANT MANAGEMENT IN THE NATURAL HERITAGE SYSTEM

Related NH&UFS Strategies: #12, #17

Implementation Guidance:

- Adopt the general principle of prioritizing management by addressing the invasive species that pose the greatest potential for impact to native vegetation, and which occur in the most valued Natural Areas in the Natural Heritage System ("flagship" areas)
- Implement invasive species control for the priority species and areas identified in the Invasive Species Management Plan (**Appendix C**)
- Ensure that management of high priority invasive species is integrated into the relevant Conservation Management Plans (see Action #20)
- Continue dialogue and development of cooperative initiatives for invasive species management with the local conservation authorities.
- Develop a program to educate landowners (corporate and residential) about the potential threat posed by non-native species, including domestic cats
- Identify safe and easily understood management techniques that can be implemented by volunteers
- Increase resource allocation to invasive species management in naturalized areas (including post-naturalization assessment and monitoring) and continue to leverage partnerships and funding opportunities to expand collaborative efforts.

Current Practices: Management of invasive plants in the City has been limited to some *ad hoc* work by City staff and stewardship activities. Exceptions are the relatively successful control of the noxious Giant Hogweed, at least in areas where it may come into contact with people, and EAB, which is the subject of a recently-implemented, multi-year control program. There have been other initiatives, primarily with volunteers, to control garlic mustard, but these projects have not been a result of a strategic program. Key challenges include the lack of resources to implement actual on-the-ground control and the lack of effective control strategies for some species, notably Dog-strangling Vine.

Best Practices: The negative impact of invasive plants and fauna on biological diversity is widely accepted, and is a widespread problem. Effective control programs elsewhere have been limited to specific areas. The main reason for this is the overwhelming magnitude of the issue compared to the resources available to address it. Prioritizing species and areas with the objective of maximizing the benefit to preservation of biological diversity; along with utilizing volunteer help and the expertise of partners (e.g., conservation authorities) is the best approach for addressing this management issue.

Rationale: Some invasive species, several of which occur commonly in Mississauga, have the capacity to significantly impact the biological diversity of natural heritage features. Some also pose a threat to people. For this reason, the problem should not be ignored. In addition to the positive impact on natural features, control initiatives that involve the community assist in garnering support for Natural Area protection, and raise the profile of management needs.

8.3 TREE ESTABLISHMENT, NATURALIZATION AND URBAN FOREST EXPANSION

ACTION #11: DEVELOP A TARGETED URBAN FOREST EXPANSION PLAN

Related NH&UFS Strategies: #11, #13

Implementation Guidance:

- Work with the Region of Peel and other partners to develop a GIS-based tool for prioritizing tree planting in the City (and the Region) based on a variety of considerations, including: biophysical (e.g., canopy cover), land use cover (e.g., paved versus open space), environmental (e.g., close to an existing watercourse or natural area), human health (e.g., within a poor air quality area), and social (within public open space where shade is lacking).
- In Mississauga priority areas for expansion should include consideration of:
    a. the City's Natural Heritage System data/mapping analysis
    b. gaps identified through the City's tree inventory (see Action #5)
    c. the *City of Mississauga Urban Forest Study* (2011) heat island mapping and preliminary Priority Planting Index (PPI)
    d. 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
    e. neighbourhoods with canopy cover well below the City's current average of 15%
    f. areas anticipated to be most heavily affected by emerald ash borer-caused tree mortality, and
    g. areas identified as having air quality issues (e.g., see the *Southwest GTA Oakville-Clarkson Airshed Action Plan*)
- Explicitly identify those areas of the Green System that are within the conservation authority natural heritage systems (but outside of the City's Natural Heritage System), and target them as high priority for restoration and stewardship initiatives in concert with the relevant conservation authority
- Confirm priority areas with key City staff and, where private lands are identified, work with private landowners and external stakeholders to pursue opportunities

Current Practices: Tree planting areas are identified based on the City's knowledge of known gaps and the interest of stakeholders and/or volunteers in undertaking plantings in a given area. Biophysical, environmental and social considerations related to ecosystem services are not necessarily considered.

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.). However, few municipalities have developed strategic planting tools that incorporate a variety of biophysical, environmental and social parameters to identify priority tree planting areas. Recent projects in a several jurisdictions in the North America (e.g., Calgary, Cambridge, District of Columbia, Idaho and Virginia) have begun to develop and apply tools that prioritize tree planting locations based on consideration of various ecosystem services that would be provided. Areas for provision of various ecosystem services are identified using GIS-based tools that combine geospatial canopy cover and land use mapping with other criteria and/or variables that are used as surrogate measures for various services (e.g., a large park in a densely populated community would be a high priority for provision of health and social benefits to the community).

The need to be more strategic about tree planting (and follow-up maintenance) is also recognized by the Peel Urban Forest Working Group region-wide and at the local municipal scale in the urban forestry studies they have produced. Consequently, the Region of Peel will be developing a GIS-based tool for helping local area municipalities, agencies, and other stakeholders prioritize tree planting areas based on a variety of variables. The City of Mississauga will be an active partner in this project.

Rationale: Strategic prioritization and implementation of opportunities for urban forest expansion will accelerate the provision of urban forest benefits where they are most needed, and support achieving UFMP and NH&UFS objectives.

ACTION #12: IMPLEMENT A TARGETED URBAN FOREST EXPANSION PLAN

Related NH&UFS Strategies: #11, #13

Implementation Guidance:

- Use the GIS-based targeted tree planting prioritization tool (see Action #11) to identify areas to meet urban forest and natural heritage objectives
- Continue to identify and utilize currently unused street tree planting locations, improving soil conditions where required and possible
- Increase public promotion of and develop supporting materials for a request-based street tree planting program
- Through the One Million Trees Mississauga Program, implement a formalized tree establishment tracking program associated with all Urban Forest expansion (tree planting) activities, including streetscape and naturalization/restoration plantings

Current Practices: The Parks and Forestry Division co-ordinates numerous community-focused tree planting, naturalization and stewardship programs in the spring, summer and fall. These activities are often community-organized or conducted in conjunction with CVC, TRCA, local businesses, and other non-profit organizations. Tree planting locations are generally in response to community requests or requests from the conservation authorities, and do not necessarily consider other strategic objectives. As a result, some areas in the City that may be priorities for tree establishment (e.g., for health reasons) may be overlooked.

Mississauga residents can request street or other public tree planting, but the program is not well-publicized and utilized. The One Million Trees Mississauga Program was launched in April 2013 to expand naturalization and restoration plantings, and include tracking of trees planted both by the City and other groups who participate.

Best Practices: Request-based street tree planting is available for residents city-wide in Mississauga, helping promote citizen engagement in urban forest expansion and stewardship. City staff are currently working on the development of an online self-serve process whereby residents can email in service requests for forestry functions, and would be one of the first municipalities in southern Ontario to provide such a service. Hamilton and Toronto also have effective resident request tree planting programs, with promotional materials available online and as brochures. In Toronto, a species list accompanies the request form, helping residents to easily select trees suited for their site.

Several best practices can guide larger-scale planting programs, such as restoration or naturalization plantings. In New York, the MillionTreesNYC program reaches out to developers and large landowners and business improvement districts to develop long-term greening plans. About 70% of the trees will be planted in parks and other publicly-owned spaces, with the remainder coming from private organizations and homeowners through this program. Through the New Forest Creation aspect of the program, the City selects species best adapted to specific sites, using existing natural forests as references. This program includes monitoring and opportunities for corrective action as needed.

Rationale: Strategic prioritization and implementation of opportunities for Urban Forest expansion will accelerate the provision of Urban Forest benefits where they are most needed, and support achieving UFMP and NH&UFS objectives. In addition, the role of undeveloped open space in supporting natural heritage is especially important in urban areas where opportunities to create viable natural heritage systems are limited by existing development, and restoration or enhancement are the only mechanisms to increase system resilience.



ACTION #12: TRACK AND RECOGNIZE NATURALIZATION / STEWARDSHIP INITIATIVES ON PUBLIC AND PRIVATE LANDS

Related NH&UFS Strategies: #11, #13

Implementation Guidance:

- Complete the ongoing mapping of existing naturalization projects to create an inventory of naturalized sites throughout the city
- Formalize the selection process for City-supported naturalization projects so that naturalization in strategic locations to best support the Natural Heritage System (e.g., immediately adjacent to a Significant Natural Area or within a Special Management Area) can be prioritized
- Prioritize naturalization opportunities based on: (a) adjacency to the existing Natural Heritage System or connection between Natural Heritage System areas, (b) areas identified through conservation authority subwatershed plans, as well as Credit Valley Conservation's Draft Natural Heritage System, Landscape Scale Analysis, and (c) the current Lake Ontario Integrated Shoreline Strategy and Credit River Parks Strategy; and dovetail these priorities with known urban forest expansion opportunities (see Actions #10 and #11)
- Increase resource allocation to naturalization (including post-naturalization site assessment / monitoring), and continue to leverage partnership / funding opportunities so that collaborative naturalization / tree planting efforts on private lands can be expanded
- Communicate the extent and benefit of naturalization projects internally, to the public, and to outside agencies(see related Actions#24, #25, #26 and #27)
- Develop a mechanism for recognizing and tracking medium to large scale naturalization projects (e.g., more than 0.2 ha or 0.5 acres) in the city, particularly on private lands (possibly building on the existing annual review and update of the Natural Areas System database)

Current Practices: The City has been pursuing naturalization projects since the early 1990s, both independently and in collaboration with the local conservation authorities, and other local organizations and stakeholders. Naturalization projects, to date, have been undertaken largely in response to requests from community groups and the conservation authorities, as well as a limited number of areas identified by City staff. However, a proactive approach to prioritizing restoration and enhancement opportunities is limited by existing capacity. There has been some prioritization of projects based on considerations specific to the Natural Heritage System (e.g., proximity to a protected natural area, identification through the CVC's LSA study).

Some City naturalization projects have been evaluated as part of annual Natural Areas System updates to determine if these areas meet criteria for inclusion in the Natural Heritage System, but systematic mapping and tracking of these areas city-wide has been limited by available staffing resources.

Best Practices: In addition to Mississauga, a number of urban and urbanizing municipalities in southern Ontario have recognized the potential role of naturalization in supporting local natural heritage objectives, as well as the potential cost savings of shifting away from the traditional maintenance practices (e.g., mowing, planting beds of annuals, watering) towards the integration of naturalization zones where manicured lawns are not required to accommodate other active uses. The City of Guelph has had a naturalization program in place since 1991 that identifies portions of City parks suitable for naturalization using site-appropriate native species. Toronto Region Conservation has been working with the City of Toronto for many years to implement naturalization and tree planting in suitable areas. Priority areas have included Toronto's ravines, and public lands along the waterfront and City parks, and some projects have included significant educational components, such as the Humber Bay Butterfly Habitat. Both jurisdictions as well as Richmond Hill, Region of Peel, and the conservation authorities also have programs to encourage naturalization on private lands (which are available to residents and businesses in Mississauga) (see **Appendix E**).

Rationale: Naturalization (including tree planting in a naturalized context) supports the maintenance, enhancement and expansion of the Natural Heritage System and the Urban Forest. These activities, particularly when undertaken outside of the Natural Heritage System, help link the City's Natural Heritage System to the broader Green System both conceptually and on the ground, and can result in the creation of areas that, in time, will meet criteria for inclusion in the Natural Heritage System. Creating better links between the Green System and the Natural Heritage System / Urban Forest through naturalization and tree planting embodies a "total landscape" approach to natural heritage management in an urban landscape.

ACTION #12: IMPLEMENT AND ENFORCE IMPROVED TREE ESTABLISHMENT PRACTICES ON PUBLIC AND PRIVATE LANDS

Related NH&UFS Strategies: #15, #20

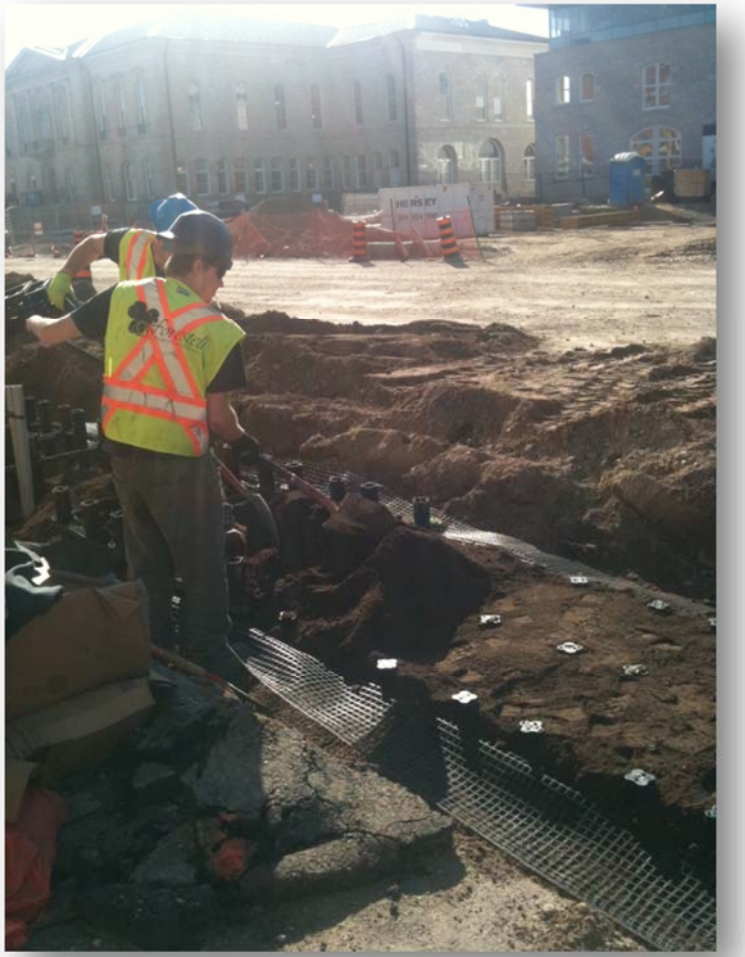
Implementation Guidance:

- Require implementation of Mississauga 'Stage One' Green Development Standards requirements for tree habitat, including minimum soil volumes and tree density requirements or alternate standards developed through revised and updated tree preservation and tree establishment specifications and standards
- Implement improved engineered tree growing environment solutions (e.g., open planters, structural cells, etc.) for all capital projects and, where appropriate, Site Plan and other controlled developments
- In conjunction with updated and revised tree planting specifications, standards and guidelines (see Action #4), ensure that all City forces and contractors involved in tree establishment implement improved practices
- Undertake species suitability trials for trees planted on public lands
- Provide training to Community Services, Planning and Building, and Transportation and Works staff involved in reviewing and overseeing implementation of planting specifications regarding tree establishment best practices (e.g., minimum soil volumes, soil quality parameters, how to assess if nursery stock is healthy, etc.)
- Ensure street tree plantings and maintenance works are inspected by a qualified Arborist and/or Forestry staff prior to final acceptance of planting of City-owned trees

Current Practices: City planting contractors are expected to adhere to existing standards, and site inspection of tree establishment is typically conducted in conjunction with inspection of other infrastructure elements. This inspection is not necessarily done by inspectors with specific knowledge of tree establishment requirements (e.g., stock quality, planting, depth, post-planting maintenance, etc.).

Best Practices: There is a wide range of best practices for tree establishment, which must be explored in detail through a comprehensive review and update of planting establishment practices, specifications, standards and guidelines. Required implementation of updated specifications, supported by effective inspection and compliance enforcement, will result in improved tree establishment practices.

Rationale: In the past, as development occurred in Mississauga, inadequate consideration has been given to soil volume or quality. If Urban Forest targets are to be achieved, there needs to be a dramatic shift in planting practices so that trees are provided with adequate space and viable soil conditions.



8.4 TREE PROTECTION AND NATURAL AREA MANAGEMENT

ACTION #15: UPDATE PUBLIC TREE PROTECTION BY-LAW

Related NH&UFS Strategies: #8

Implementation Guidance:

- In the updated Public Tree Protection by-law, ensure complete protection of all City-owned trees (street, park, natural areas, etc.) through:
    - clear definition of prohibited actions (injury, defacement, removal, tree protection zone encroachment etc.)
    - consistency with other tree protection policies (e.g., tree preservation standards)
    - sufficient penalties to act as a deterrent and to issue stop-work orders
- Ensure effective public and internal communication regarding by-law updates

Current Practices: The current Street Tree By-law in effect is outdated and is being reviewed by City staff.

Best Practices: Many municipalities have by-laws regulating the injury or destruction of publicly-owned trees. Key components of such by-laws include:

- Clearly defined parameters of tree ownership, especially in cases where trees straddle public and private property lines
- Requirements for compensation if trees must be removed for development
- Ability to levy fines and stop work orders to prevent damage to publicly-owned trees

An effective by-law program must be supported by financial and human resources, and must be adequately promoted internally and to the community to ensure adherence.

Rationale: An effective Public Tree Protection by-law will demonstrate the City is leading by example and show the City's commitment to the sustainability of its Urban Forest.

ACTION #16: UPDATE EROSION CONTROL, NUISANCE WEEDS AND ENCROACHMENT BY-LAWS

Related NH&UFS Strategies: #8

Implementation Guidance:

- For the Erosion Control By-law:
    - Change the permit exemption for topsoil removal from lands 1 ha and less to a smaller area (e.g., 0.2 ha)
    - Prohibit stockpiling of topsoil within the drip-line of any protected trees or vegetation
    - Provide more specific requirements for identification of vegetation on-site that identifies species, size and condition of all trees of 15 cm dbh or more, as well as more general identification (location, type) of other vegetation on site
    - Require that where more than two trees of 15 cm or more are being removed that they be replaced on site or compensated with cash in lieu (per the updated Private Tree Protection By-law)
    - Require that trees and vegetation being retained on site, as well as any potentially affected in adjacent lands, be protected with a clearly marked and fenced Tree Protection Zone
    - Require that an arborist report to be completed by a Certified Arborist retained for the duration of the project
- For the Nuisance Weeds by-law:
    - Incorporate flexibility to recognize naturalization benefits associated with vegetation greater than 30 cm in height, where appropriate.
    - Review 'Schedule A' to include a broader range of Nuisance Weeds, such as dog-strangling vine (*Cynanchum rossicum*), giant hogweed (*Heracleum mantegazzianum*) and others.
- For the Encroachment By-law:
    - No gaps have been identified in this by-law, but it should nonetheless be reviewed at least once over the 20 year period of the NH&UFS and supporting UFMP to ensure it continues to be an effective tool that is consistent with current legislation

Current Practices: The current Erosion Control By-law in effect is outdated and is being reviewed by City staff. It currently exempts top soil removal from lots 1 ha and less in area, except for removal adjacent (within 30 m) to water bodies, which requires a permit in all cases. As part of the permitting process,

applicants must provide the location and type of vegetative cover in the area to be affected; however, the by-law is not currently being used as a tool to support urban forestry or natural area objectives. The Nuisance Weeds By-law is not widely used, but could be interpreted to conflict with naturalization initiatives. The Encroachment By-law is being effectively used to keep and move unauthorized uses out of City-owned Natural Areas abutting private lands.

Best Practices: Many municipalities have, and enforce, erosion control and/or site alteration by-laws to address the removal or placement of topsoil within a jurisdiction. Examples of cities in southern Ontario with such by-laws include the City of Markham, City of London, City of Kingston, Town of Oakville, City of Hamilton, City of Guelph, and the City of Niagara Falls. Nuisance weed by-laws (often within broader property by-laws) are also common, and potential conflicts between regulations on plant heights and naturalization have been identified elsewhere (e.g., Richmond Hill, Guelph).

Mississauga was the first and is one of the few municipalities to have, and actively enforce, an Encroachment By-law that prohibits unapproved activities and land uses in public Natural Areas. These range from dumping waste to extending parking lots, and are common occurrences. Over the past nine years the City has reclaimed nearly 3.5 hectares.

Rationale: All City by-laws should be in-line with current legislation, consistent with broader City objectives and actively enforced if they are to be effective. Erosion Control By-laws or Site Alteration By-laws typically require the identification and description of all trees that may be impacted by the proposed grade changes, and therefore provide an opportunity for the identification of tree preservation, tree replacement and/or compensation for trees approved for removal. The benefit, from an urban forest perspective, of these by-laws is that they require permits for activities that may not be under the purview of the *Planning Act* or other City by-laws, and therefore enable identification of opportunities for tree protection and replacement that may otherwise be overlooked. In Mississauga, where future development will largely be infill and intensification, it will be important to have a size threshold of much less than 1 ha if most proposed works are to be captured and regulated.

ACTION #17: UPDATE THE PRIVATE TREE PROTECTION BY-LAW

Related NH&UFS Strategies: #8

Implementation Guidance:

- Monitor and assess the effectiveness of the recently revised by-law in regulating the removal and replacement of trees, particularly mature trees, on private property for the next four to eight years
- In four to eight years, consider further strengthening the by-law to include all trees above a certain diameter, and making any other updates in response to issues identified over the assessment period
- Consider the cost implications of further strengthening the by-law
- As previously, undertake consultations with City staff, key stakeholders and the community as part of the by-law re-evaluation process

Current Practices: The current Private Tree Protection By-law (254-2012), which was updated over 2012 and enacted March 2013, regulates the removal of three or more healthy trees greater than 15 cm diameter per calendar year on any parcel of private property. It also establishes a replacement ratio for trees approved to be removed of 1:1 for trees between 15 and 49 cm diameter, and 2:1 for trees 50 cm in diameter or greater. If replacement trees cannot be planted on site due to space limitation or the owner's desire, the tree replacement securities will be applied to the Corporate Replacement Fund.

Best Practices: An increasing number of municipalities in southern Ontario have adopted private tree protection by-laws. In urban and area municipalities (as opposed to regions or counties), the by-laws tend to regulate the removal of individual trees, and tend to use diameter class. Regulated diameters range from 15 cm to more than 40 cm. Different municipalities also provide exemptions and exceptions that reflect their particular circumstances. In general, private tree by-laws are considered to be educational tools as much as they are regulatory tools, and are most effective when widely promoted and enforced when required.

Rationale: Mississauga's canopy cover is currently about 15% and likely to decrease more before it increases (largely as a result of emerald ash borer). The remaining mature trees in the landscape play a significant role in sustaining the remaining canopy cover, and shifting towards expanding it. In cases where such trees cannot be saved, it is important that they at least be replaced in order to contribute to the City's future canopy.

ACTION #18: INCREASE EFFECTIVENESS OF TREE PRESERVATION AS PART OF PRIVATE PROJECTS

Related NH&UFS Strategies: #14, #18, #20

Implementation Guidance:

- Develop a transparent methodology and/or clear criteria for inclusion (or exclusion) of an area from the "Residential Woodlands" category in consultation with internal and external stakeholders
- Fast track (max. 3 days from receipt to final review) review of *Tree Injury or Destruction Questionnaire and Declaration* forms accompanying Building Permit, Pool Enclosure Permit and other development permit applications with legislated review and permit issuance requirements
- Enable Forestry Inspectors to conduct periodic 'spot inspections' of development sites to ensure compliance with tree protection policies
- Increase the value of securities held against tree preservation to tree amenity value (as determined using accepted valuation methodologies) and withhold Letters of Credit for minimum of two years for all protected trees which may be adversely impacted during site development
- Require development proponents to retain an Arborist prior to undertaking of site works and establish a schedule for regular inspection of tree preservation methods implemented on site, accompanied by reports submitted to Forestry Section and Planning and Building department

Current Practices: Through discussions with Forestry staff, several gaps in current practices were identified where opportunities for tree preservation and/or replacement could be identified:

- Residential Woodlands are identified as mapped in the Official Plan, but this mapping no longer reflects current conditions and should be updated using clear criteria
- Lack of adequate review and follow-up of 'Tree Declaration' forms means opportunities for tree preservation and/or replacement identified through Building Permit process may be overlooked. Because legislated permit issuance timelines severely constrain opportunities for review and follow-up, closing this gap will be challenging.
- Forestry requires Arborist reports and follow-up inspections, but adherence to these requirements is not strictly enforced, and site inspections are not always undertaken to ensure compliance with municipal requirements and policies

Best Practices: A wide range of practices can improve the effectiveness of tree preservation implementation during and following site development. Effective planning before development begins is critical to successful on-site outcomes, but does not guarantee effective implementation. However, the ability to impose conditions upon Site Plan and other development approvals or tree injury permits offers opportunities to promote tree preservation. For example, staff can require tree preservation measures such as root-sensitive excavation or root pruning as conditions of tree injury permits if construction is required within Tree Protection Zones. Similarly, regular Arborist inspection and reporting can ensure tree preservation is properly and effectively implemented.

The Town of Oakville is a leading example of effective implementation of tree preservation during development. The Town's permitting processes and tree protection policies strongly encourage adherence, and are actively enforced as required. The Town's Tree Protection Audit process requires a minimum of three scheduled site inspections and written reports, which must include a number of factors including 'Tree Impact Evaluation', mitigation recommendations, soil amendments, and photographic records, as necessary.

Rationale: Increased preservation of trees during development will promote Urban Forest sustainability by maintaining existing trees. Working with landowners and the community to identify opportunities for tree preservation and replacement demonstrates the City's commitment to its Urban Forest targets, and also presents opportunities for increasing awareness and engagement.



ACTION #19: INCREASE EFFECTIVENESS OF TREE PRESERVATION AS PART OF MUNICIPAL OPERATIONS AND CAPITAL PROJECTS

Related NH&UFS Strategies: #14, #18, #20

Implementation Guidance:

- Forestry Section should undertake field-based and pre-planning review of municipal infrastructure works or other projects
- A tree inventory and Arborist reporting should be required for municipal works (as it is for private developments)
- Require the Parks and Forestry Division to hold securities for all infrastructure projects where street trees, or trees in greenbelt or park lands may be impacted
- Release securities only upon inspection (by an Arborist) of satisfactorily completed works

Current Practices: Currently, application of tree preservation during capital projects and other municipal works is not necessarily consistent with best practices. When tree preservation is implemented, either Parks Planning Landscape Architects or Transportation and Works technologists inspect. There is some pre-consultation with Forestry staff on capital projects or other municipal works, typically after the overall designs are approved.

Best Practices: Involvement of Forestry staff at the planning stages of capital projects would allow for alternative designs to be considered to accommodate tree preservation where warranted, and ensure that adequate space for planted trees is provided in the original designs. Municipalities, like the City of Toronto are increasingly realizing the benefits of interdepartmental coordination and cooperation when planning large-scale capital projects or smaller scale maintenance operations, and ensuring there is more regular on-site involvement and supervision by trained Arborists.

Rationale: Increased preservation of trees during municipal works, and creation of better plantable areas, will promote Urban Forest sustainability, show the City is leading by example, and avoid last minute retrofitting of designs to try and accommodate trees.



ACTION #20: DEVELOP AND IMPLEMENT CONSERVATION MANAGEMENT PLANS FOR CITY-OWNED SIGNIFICANT NATURAL AREAS

Related NH&UFS Strategy: #16

Implementation Guidance:

- Use a standard table of contents (provided in **Appendix D**) to develop short (5 to 10 page) Conservation Management Plans that focus on operational needs and are "go to" documents to guide the management requirements of City-owned or managed Significant Natural Areas
- Include a standard checklist of potential management categories for use in screening and prioritizing Significant Natural Areas and Natural Green Spaces (provided in **Appendix D**)
- Integrate conservation management needs into a single document for each Significant Natural Area, including invasive species management needs (see Action #10) and EAB management needs
- Develop Conservation Management Plans based on:
    - management needs and priorities based on an analysis of the Natural Areas database and reports (provided in **Appendix D**)
    - consideration of ecological data collected by the conservation authorities, where available

  - accessibility and safety assessments conducted in relation to human use, include risk tree assessments conducted along formalized trails
- Prioritize areas for the development and implementation of Conservation Management Plans based on both ecological considerations (e.g., area size, quality of vegetation) and human use considerations (e.g., level of use, extent of documented use-related impacts, presence of potential safety hazards)
- Prioritize management within each Conservation Management Plan
- Identify opportunities for outreach and engagement in each area by:
  - flagging unique opportunities for interpretation and/or education (e.g., presence of an unusual or representative species or features, examples of ecological processes or functions, examples of encroachment and/or misuse)
  - flagging management activities suitable for volunteers and/or local user groups
  - ensuring opportunities for low impact, passive recreation (e.g., fishing, hiking) are permitted and encouraged where appropriate

Current Practices: The need for area-specific Conservation Plans was identified in the 1996 Natural Areas Survey report. Several have been produced over the intervening years (e.g., GT-2, Cawthra Woods, Frank McKenchie Park, Creditview Wetland) and many, but not all, of the recommendations in those plans have been implemented, with some work underway to update the implementation section of at least one plan. However, the majority of identified Natural Areas in the city do not have Conservation Management Plans to guide site-specific management needs.

There is already regular data collection in most of the publicly owned Natural Areas being undertaken by the City (as part of its ongoing Natural Areas updates) as well as Credit Valley Conservation (as part of their natural areas monitoring program). There is also additional data being collected on ash trees related to the implementation of the City's Emerald Ash Borer Strategy (2012).

Best Practices: Resolution of management issues requires recognition of needs at the operation level. This is best accomplished through management plans developed on a site-specific basis. Municipalities rarely have the resources to undertake these for all natural areas, although several have developed "Conservation Master Plans" (e.g., City of London) or "Management Plans" (e.g., Huron Natural Area in the City of Kitchener, Hungry Hollow in the Town of Halton Hills, Crother's Woods in the City of Toronto) for selected City-owned natural areas to prioritize and guide their management needs. Other agencies that have a prime mandate to manage natural areas also typically develop and implement such plans (e.g., conservation authorities, Ontario Parks and Parks Canada).In a number of cases these plans have actively, and successfully, engaged local user groups (e.g., mountain bikers, cross-country skiers, anglers) who have a vested interest in the preservation of these places.

Rationale: Conservation Management Plans will provide a formal mechanism for building on existing information to develop operational plans that identify and prioritize key management requirements for all public Natural Areas. As the population of Mississauga grows, more people will want to visit and recreate in its Natural Areas. Therefore there is a pressing need to keep these areas safe for public use, and to try and manage the level and types of use so the ecological value of these areas is not eroded. Mississauga is in the unique position of having current inventory and management needs identified for almost all of the City-owned woodlands in its Natural Heritage System, greatly facilitating translation into site-specific operational plans.



8.5 PROMOTION, EDUCATION, STEWARDSHIP AND PARTNERSHIPS

ACTION #21: CREATE SHORT VIDEO CLIPS ON TOPICS AND ISSUES RELATED TO THE NATURAL HERITAGE SYSTEM AND URBAN FOREST

Related NH&UFS Strategies: #19, #22

Implementation Guidance:

- Develop a series of short videos on key topics designed to engage and educate a cross-section of Mississauga's community. Key topics could include:
  - Ecosystem services provided by the City's trees and Natural Heritage System (with an emphasis on the systems approach)
  - How to plant a tree and/or naturalize your garden
  - How to care for your tree / naturalized garden
  - How to pick the right species
  - How to enjoy and respect the City's public natural areas
- Videos should be short (i.e., about 2 minutes), be illustrative, be in plain (non-technical) language, and if possible made available in languages other than English spoken by large sectors of the community
- Videos could be designed and marketed through the One Million Trees program launched in April 2013, and could also be featured on the City's main webpage, and advertised through the City's social media

Current Practices: The City recently updated the urban forestry sections of its website and developed a creative stand alone website for the One Million Trees campaign, but does not have any informative or demonstrative video clips posted.

Best Practices: Although an increasing number of municipalities are building social media outreach into their day to day service, few have developed and posted video clips, particularly related to urban forest topics. The City of Calgary is one of the few that has posted videos on how to plant a tree, as has the non-profit Toronto-based organization LEAF.

Rationale: Short video clips are an excellent tool to engage people of all ages who may not be so inclined to pick up a brochure or download a PDF pamphlet on-line. These can also be posted and shared in a variety of locations and through a variety of media.

ACTION #22: MAKE THE CITY'S TREE INVENTORY PUBLICLY ACCESSIBLE TO SUPPORT OUTREACH, EDUCATION AND STEWARDSHIP

Related NH&UFS Strategies: #19

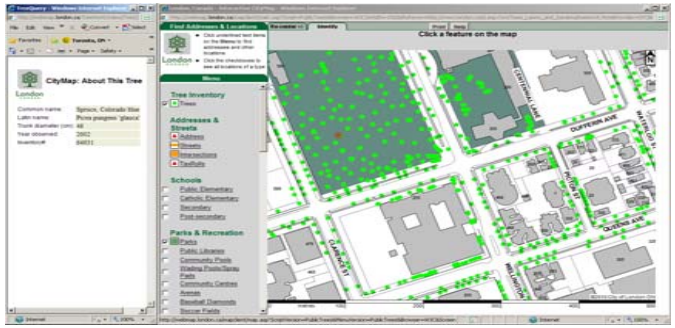
Implementation Guidance:

- The City's tree inventory should, at least in part, be made available to the public in a readily usable on-line format that is compatible with the City's asset management system for trees so that residents (and other interested parties) can (a) identify the location and species of the trees in the inventory, and (b) submit on-line service requests if needed, and verify the status of those requests on-line

Current Practices: The City's tree inventory, which includes about 243,000 street trees as well as some park trees, is fairly comprehensive but requires updating, and is currently only used by and available to City staff.

Best Practices: A growing number of municipalities with active urban forestry programs are putting their municipal tree inventories on-line for use by City staff in other departments and the public. The City of London and Town of Oakville have had their inventories on-line for several years. The City of Ottawa recently launched their on-line tree inventory.

Rationale: Having the City's tree inventory (at least in part) on-line is a good way to keep people informed about the trees in their neighbourhoods, and illustrate how the City is tracking and managing its treed assets. A further use of this tool could be to facilitate the work order request system related to City trees by allowing people to submit requests on-line and potentially check the status of their request, rather than calling City staff to inquire.



ACTION #23: IMPROVE AND MAINTAIN AWARENESS AMONG ABOUT CURRENT NATURAL HERITAGE SYSTEM AND URBAN FOREST POLICIES, BY-LAWS AND TECHNICAL GUIDELINES

Related NH&UFS Strategies: #1, #20

Implementation Guidance:

- Target groups should include local arborists, local developers, private open space users, and youth
- Activities should include but not be limited to:
  - information sessions for local arborists and the development community
  - workshops in neighbourhood community centres and places of worship
  - meetings with large open space land owners/managers
  - incorporating outreach tools developed for the public and tailored to the target group (e.g., short reference documents focused on key topics developed as "take-away" resources for participants)

Current Practices: Information is provided to stakeholders and the general public through pamphlets (available on-line and at community centres), and is provided to proponents and contractors when they submit applications for permits or other planning related activities. Information is also conveyed to landowners who are being warned or charged with an infraction to a natural heritage or urban forest-related by-law. In addition, the Forestry Section holds open houses on "hot topics" (such as emerald ash borer). However, there is not a proactive and targeted outreach program or plan to keep proponents, and the community informed about current practices, policies and legislation.

Best Practices: Most municipalities do not currently engage in targeted outreach programs that focus on informing local developers, and their contractors, about the relevant urban forest and natural heritage policies, by-laws and guidelines. However, it is increasingly recognized that proactive outreach can be a very effective way to ensure that natural heritage and urban forest requirements are respected through the planning process. Best practices identified to date include: taking presentations and workshops to the venues where the target audience meets (rather than asking them to come to the City facilities), presenting the materials in a positive (rather than a punitive) context (e.g., this is the new way of doing business in Mississauga, incorporation of green elements will benefit everyone, etc.), and identifying incentives for cooperation (e.g., faster application processing, the possibility of receiving some type of recognition). Proactively approaching those involved at the outset of the process – rather than identifying issues and concerns later – can also facilitate the process.

Rationale: Trees and natural areas in urban settings must, by their very nature, be considered from various perspectives if they are to be successfully integrated into an urban setting. Trying to genuinely achieve this integration while still ensuring all the other needs and requirements are met (e.g., servicing, safety, accessibility, parking, etc.) is a real challenge for all municipalities. However, this integration cannot happen until proponents (and their contractors) are aware of and willing to respect the policies, by-laws and guidelines intended to make it happen.

ACTION #24: CONTINUE TO SUPPORT AND EXPAND TARGETED ENGAGEMENT OF LOCAL BUSINESS AND UTILITY LANDS

Related NH&UFS Strategies: #21

Implementation Guidance:

- Build on the success of Partners in Project Green and other stewardship initiatives with local businesses, and continue to collaborate with Credit Valley Conservation, Toronto Region Conservation and non-profits to encourage tree planting and naturalization on corporate business grounds, in industrial parks and in commercial plazas
- Expand relationships with the various local utilities and transportation companies (e.g., Hydro One, Ministry of Transportation, Canadian National Rail, Canadian Pacific Rail, Enbridge, etc.)
- Approach businesses interested in "greening" their image to sponsor or support various natural heritage and/or urban forest projects or events (e.g. design and development of the Arboretum/Memorial Forest) in exchange for formal recognition
- Develop a directory of corporations with lands in the Green System who could be approached to undertake naturalization
- Use the One Million Trees Program as a platform for expanding and recognizing stewardship
- Expand stewardship resources in the Forestry Section to help organize and implement the wide range of stewardship activities in partnership with other agencies and non-profits

Current Practices: The City, with the local conservation authorities, over the past decade or more, has been gradually building partnerships with some local businesses (e.g., businesses around the airport through Partners in Project Green). These partners have undertaken tree planting and naturalization projects on their lands, often with the support of employee volunteers. The City has worked with local utility companies in several locations to identify opportunities to incorporate naturalization without compromising safety.

Best Practices: The substantial opportunities for naturalization and forestation in Mississauga (as in other municipalities) in business parks and on commercial and industrial properties is recognized by the City, as well as the agencies and non-profit groups (e.g., in Mississauga - the conservation authorities and Evergreen) who have programs specifically targeting this group (see **Appendix E**). Additional opportunities exist along utility corridors and right-of-ways, but require better communication between the utility and transit companies and the City to ensure opportunities that do not compromise safety considerations are identified.

Rationale: Properties associated with various businesses, particularly in business parks, as well as utility corridors and right-of-ways, present substantial opportunities for naturalization and forestation in Mississauga. These activities can also engage employees of these businesses in looking at the landscape in a different way. If Mississauga is to achieve its Urban Forest and Natural Heritage System targets, it will require the commitment and active stewardship of lands beyond those under the City's control.

ACTION #25: CONTINUE TO SUPPORT AND EXPAND TARGETED ENGAGEMENT OF YOUTH AND STEWARDSHIP OF SCHOOL GROUNDS

Related NH&UFS Strategies: #21

Implementation Guidance:

- Continue to work with the conservation authorities, Evergreen and others on the greening of school grounds (see **Appendix E**)
- Identify potential partnerships with different school boards, and private schools as well as local youth groups (e.g., Peel Environmental Youth Alliance - PEYA, Mississauga's Mayor Youth Advisory Committee - MYAC)
- Explore opportunities to coordinate with local groups with interest in working with youth (such as ACER)
- Provide support for school-led funding applications for natural heritage or urban forest projects, as well as resource support if possible
- Use the One Million Trees Program as a platform for expanding and recognizing stewardship
- Identify liaisons with all local school boards and private schools responsible for environmental education, and:
    - encourage the incorporation of existing Toronto Region Conservation, Credit Valley Conservation and Conservation Halton school-directed programs into their curricula
    - explore opportunities for school grounds greening (and encourage exploration of funding opportunities if there is interest)
    - explore options for local schools to "adopt" nearby City-owned Natural Areas
    - explore opportunities for older (e.g., high school students) to become involved in local monitoring activities
- Expand stewardship resources in the Forestry Section to help organize and implement the wide range of stewardship activities in partnership with other agencies and non-profits

Current Practices: The City, with the local conservation authorities, over the past decade or more, has been gradually building partnerships with a few schools (e.g., Erindale) to support stewardship initiatives on their properties.



Best Practices: The substantial opportunities for naturalization and forestation in Mississauga (as in other municipalities) on school grounds is recognized by the agencies and non-profit groups who have programs specifically targeting these two groups (see **Appendix E**). At the consultations held as part of the NH&UFS, the importance of actively engaging the City's youth through meaningful stewardship initiatives was expressed very strongly by a number of participants, and by the City's Environmental Advisory Committee (which includes several youth representatives).

Rationale: School grounds present substantial opportunities for naturalization and forestation in Mississauga, and youth stewardship engages the future stewards of the Urban Forest and the Natural Heritage System. Connections made with nature early on stay with a person for life.

ACTION #26: CONTINUE TO SUPPORT AND EXPAND TARGETED ENGAGEMENT OF RESIDENTS AND COMMUNITY GROUPS, AND STEWARDSHIP OF RESIDENTIAL LANDS

Related NH&UFS Strategies: #21

Implementation Guidance:

- Continue to promote and build on the existing Significant Tree Program, as well as the existing street tree replacement program
- Continue to build the existing directory of local residents and community groups interested in being involved in stewardship
- Continue to try and align stewardship efforts with the interest of the particular group , and identify management tasks that are appropriate for volunteers
- Use the One Million Trees Program as a platform for expanding and a recognizing stewardship
- Expand stewardship resources in the Forestry Section to help organize and implement the wide range of stewardship activities in partnership with other agencies and non-profits

Current Practices: There are currently has several programs targeted to tree planting and/or naturalization of residential lands in the City sponsored by the Region (e.g., Fusion Landscaping) and the conservation authorities (e.g., yard greening programs) (see **Appendix E**), as well as resources available on-line. The City has partnered with these agencies, and other organizations and programs to support stewardship of residential properties.

Best Practices: Municipalities with progressive natural heritage and/or urban forest agendas are recognizing that stewardship by the community and local stakeholders is key to natural heritage and urban forest sustainability. The City of Guelph and Town of Richmond Hill both have municipal programs that provide: (a) information and education on how residents can naturalize their lawns and gardens with native species, (b) plants and/or advice at a discount or free. The Toronto-based non-profit organization LEAF continues to provide a range of urban forestry services focussed on supporting tree planting and care in residential yards in the Greater Toronto Area and beyond.

Rationale: Many of the remaining opportunities for urban forest expansion, and naturalization, exist on lands not owned by the City or the conservation authorities. Furthermore, the activities of people in the City impact the local Natural Areas and Urban Forest. Therefore building on existing partnerships and supporting stewardship on lands not owned by the City is crucial.



ACTION #27: CONTINUE TO WORK WITH VARIOUS PARTNERS TO UNDERTAKE STEWARDSHIP ON PUBLIC LANDS

Related NH&UFS Strategies: #21

Implementation Guidance:

- Continue to develop and expand partnerships with the Region (e.g. Peel's Fusion Landscape Program) and conservation authorities to deliver a range of stewardship programming (see **Appendix E**)
- Try to align stewardship activities with priority areas identified through either natural heritage and/or urban forest expansion priorities (see Action #12)
- Align stewardship efforts with the interest of the particular group (e.g., planting, management, trail maintenance, interpretive elements, etc.), and
- Identify management tasks that can be realistically undertaken by volunteers
- Pursue and/or support joint funding opportunities for *stewardship* (see Appendix F in the NH&UFS)
- Continue to build the existing directory of local stakeholders interested in being involved in stewardship activities
- Expand stewardship resources in the Forestry Section to help organize and implement the wide range of stewardship activities in partnership with other agencies and non-profits

Current Practices: The City, over the past decade or so, has been gradually building partnerships with some local community and environmental organizations to support and expand naturalization and reforestation efforts, primarily on public lands. Groups such as the Credit River Anglers Association, Riverwood Conservancy, and others have been active partners in a number of stewardship projects. The City maintains a database of these partners to keep interested parties aware of future events.

Best Practices: No municipality has enough resources to undertake all the potential naturalization and/or tree planting and/or care that is required to fully sustain and expand the urban forest and natural heritage areas. Therefore, many municipalities work to leverage partnerships with local agencies and non-profits. Where these activities are recognized as a high priority, some municipalities have created a full or part-time position dedicated to coordinating various stewardship activities (e.g., City of Kitchener, City of Guelph, City of Toronto).

Rationale: If Mississauga is to achieve its Urban Forest and Natural Heritage System targets, it will require the support of the community and local groups and agencies on a range of stewardship of private landowners. This can be facilitated by having active leadership activities. The City can show leadership and initiative by demonstrating good stewardship on lands under its jurisdiction.



ACTION #28: DESIGN AND OPERATE A CITY ARBORETUM / MEMORIAL FOREST FOR THE COMMUNITY THAT PROVIDES A PLACE FOR SPIRITUAL CONNECTIONS TO NATURE

Related NH&UFS Strategies: #21

Implementation Guidance:

- Select a suitable City property using transparent criteria that include accessibility via public transit, size to accommodate multiple uses, ability to support natural heritage and urban forest objectives
- Be the first municipality in Canada to establish its own Arboretum / Memorial Forest that provides a place for commemoration, education, research and stewardship
- Develop a design for and operate an arboretum and memorial forest that:
    - Provides a central location for non-denominational commemoration of persons through tree planting
    - Serves as a demonstration arboretum of the range of native tree (and shrub) species that can thrive in Mississauga, as well as some of the habitat types
    - Provides opportunities for learning and stewardship, as well as research

Current Practices: The City currently has a Commemorative Tree program that is administered through the Forestry Section, in conjunction with the Commemorative Bench program. The purpose of the existing program is to provide members of the public with a way to recognize or commemorate others through a lasting and tangible contribution. With the future creation of a "Memorial Forest" or Arboretum, all future commemorative trees would be planted in one central location instead of various sites across the City.

Best Practices: Many municipalities have commemorative tree and/or bench programs, and some larger municipalities also have arboreta (typically associated with an academic institution), however very few have commemorative programs tied to a central, municipally-owned arboretum that also serves as an educational and research centre. An example of a native tree arboretum is the Louise Pearson Memorial Arboretum in Tennessee. Other notable arboreta focused on educational and research objectives include Missouri Botanical Gardens in St. Louis and the Louise Kreher Forest Ecology Preserve. Closer to Mississauga are the Royal Botanical Gardens in Hamilton, and the University of Guelph Arboretum, which both have memorial components but are primarily focused on educational and research objectives.

Rationale: This is a unique pursuit in the City of Mississauga that will fulfill social, education and research needs related to natural heritage and the Urban Forest while also contributing their enhancement.



ACTION #29: PARTNER WITH LOCAL AGENCIES AND INSTITUTIONS TO PURSUE SHARED RESEARCH AND MONITORING OBJECTIVES

Related NH&UFS Strategies: #23

Implementation Guidance:

- Engage in discussions with University of Toronto in Mississauga, the non-profit group ACER, conservation authorities and others about undertaking joint research projects that would inform the City's urban forestry program
- Engage in discussions with other non-profit organizations and agencies (e.g., EAB injection trials with the Canadian Food Inspection Agency), as well as the Region, to explore opportunities to pursue joint research projects
- Consider providing places on City lands to conduct research trials, and helping to establish study plots in exchange for the development of study design, data collection, analysis and reporting of results
- Potential projects could include:
    - responses of different native tree species to different soil types and conditions in the city
    - evaluation of the use of structural soils, subsurface cells and other enhanced rooting environment techniques for street trees
    - working with local growers to diversify stock and reduce reliance on clones
    - development of a seed collection program for native ash species (to bank the genetic stock) in partnership with TRCA, CVC and the National Tree Seed Centre

Current Practices: The City was recently involved in the collection and analysis of urban forestry data to support the Peel Region and City of Mississauga urban forest studies undertaken through the Peel Urban Forest Working Group. Although the City is interested in pursuing additional joint research and monitoring projects, it is currently a challenge to meet all the requirements of undertaking the day-to-day operations, management and outreach, and there is little to no time left for pursuing joint research projects.

Best Practices: The USDA Forest Service, in collaboration with the University of Vermont, has been an excellent source of urban forest information and have worked with many municipalities (including Peel Region) in the U.S. and Canada to develop and undertake urban forest canopy assessments using the latest tools and technologies. In Canada, there is no comparable government body dedicated to urban forest issues, and therefore research collaborations are often the by-product of a keen municipal staff person who pursues particular areas or interest. An Arboretum in the City of Mississauga, as recommended in Action #28, presents a good potential place to support such collaborations.

Rationale: Urban forestry is still a relatively "young" practice and there is still many unanswered questions about how best to undertake different operational and management practices. Working with local agencies and institutions to try and answer questions of joint interest can help better inform day-to-day urban forest activities, and also provide opportunities for educating and engaging youth and the community.



ACTION #30: BUILD ON EXISTING PARTNERSHIPS WITH THE REGION OF PEEL AND NEARBY MUNICIPALITIES TO FACILITATE INFORMATION SHARING AND COORDINATED RESPONSES

Related NH&UFS Strategies: #23

Implementation Guidance

- Maintain and build on working relationship with the existing Peel Region Urban Forest Working Group[25] by:
  - Remaining actively involved in working group meetings
  - Continuing to partner on data sharing and analysis related to canopy cover assessment and monitoring
  - Working together to pursue funding and/or other forms of support from the Provincial and/or federal governments regarding urban forest issues
  - Continuing to seek or provide assistance from/to the group on urban forest planning or management tasks as appropriate
- Broaden and formalize the collaboration to include other nearby municipal and agency partners to engage in:
  - Information sharing on mutual urban forest issues (e.g., invasive pest management, responses to climate change)
  - Joint and coordinated responses to environmental threats related to the urban forest (e.g., invasive pests, air quality management)
  - Pooling resources regarding monitoring of key environmental stressors, and joint responses to them
  - Pursuing support (financial and other) for urban forestry initiatives

Best Practices: Urban forestry has not been recognized as a core activity, or responsibility, of municipalities in Canada until relatively recently, and it could be argued it is still not nearly well enough recognized. Nonetheless, there are several local examples of effective inter-jurisdictional collaboration on urban forestry issues, a couple of which are listed below.

The Canadian Food Inspection Agency (CFIA) has worked with Mississauga and other municipalities (i.e., Toronto and Vaughan) to control the spread of Asian long-horned beetle (which affects a broad range of deciduous tree species) over the past decade.

Toronto Region Conservation Authority has also been very active with municipalities across the GTA (including Mississauga) in providing technical assistance in terms of conducting urban forest plot data collection, data analysis (based on both field plots and aerial imagery), report development and, in some cases, facilitating stakeholder consultations.

Current Practices: Mississauga has collaborated with the Region on urban forest issues since 2009 and has been a member of the Peel Region Urban Forest Working Group, along with Conservation Authority (CVC, TRCA), Brampton and Caledon staff, since its inception in 2011. To date this collaboration has resulted in the production of the *Peel Region Urban Forest Strategy* (2011) and *Mississauga Urban Forest Study* (2011), and has also allowed for ongoing information exchange and discussion between municipalities.

Mississauga has also collaborated with the CFIA (on the assessment and monitoring of high priority key pests, as well as the implementation of some targeted pest management activities), and keeps in touch with the urban foresters in other nearby municipalities on an informal basis.

Rationale: Continuation of the current working relationship with the Region and the Peel Region Urban Forest Working Group will be of mutual benefit, and facilitate future studies and planning exercises, as well as help ensure consistency and conformance with Regional planning objectives and policies. Broadening this collaboration in a more formal way with other nearby municipalities (and agencies where appropriate) will facilitate the exchange of best practices and other information, which will help improve urban forest management and planning, and may also provide more leverage for urban forest-related requests to higher levels of government.

[25] The PUFWG currently consists of staff active in urban forest planning and management from the Region of Peel, Town of Caledon, City of Brampton, City of Mississauga, Credit Valley Conservation and Toronto Region Conservation Authority.

9 IMPLEMENTATION GUIDANCE

A total of 30 Actions have been identified through the City of Mississauga's UFMP to provide technical and operational support for many of the 26 Strategies identified in the broader NH&UFS.

A stand alone Implementation Guide for the UFMP has been developed that is designed to facilitate implementation by:

- providing recommended timing for implementation
- identifying City department or division(s) that will lead the implementation
- listing the key implementation components
- identifying which Actions require new City resources for their implementation, and
- indicating which groups or organizations could provide potential partnerships and/or resources and/or funding.

Actions are not listed according to their priority (which is reflected in the timing for implementation column), but rather organized under the same five themes which this UFMP includes:

(1) urban forest program administration,
(2) tree health and risk management
(3) tree establishment and urban forest expansion
(4) tree protection and urban forest preservation, and
(5) promotion, education, stewardship & partnerships.

These themes reflect the topics discussed in this UFMP, which provide the context and rationale for the Actions.

Although the UFMP is a stand-alone document, it is closely related to the NH&UFS and is best understood within the broader context provided by that document, and so it is suggested that the two be read together. The links between specific UFMP Actions and NH&UFS Strategies are identified in each document's Implementation Guides.



The Implementation Guide for the UFMP is provided separately from the UFMP so that it can remain a working document for the entire 20 years of the Plan and be more easily updated. The UFMP itself is intended to be more of a static document that will continue to provide a vision, objectives and guiding principles, as well as targets, that will endure over the 20 year period of the Plan.

The current new budget identified through this UFMP Implementation Guide is $2,866,970 including resources for two seasonal staff and two students to support expanded stewardship efforts starting in the second four year period (i.e., 2018). The resource requirements are spread across the 20 year period of the Plan as follows:

- 2014 – 2017: $915,000
- 2018 – 2021: $291,710
- 2022 – 2025: $603,420
- 2026 – 2029: $453,420
- 2030 – 2033: $603,420

URBAN FOREST PROGRAM ADMINISTRATION (ACTIONS #1 TO #5):
The bulk of the new resources identified through the UFMP are required to update and maintain the City's street tree and park tree inventory. The usefulness of this tool is critical to moving the City towards more proactive and effective management of its treed assets. It is also an excellent potential outreach and education tool for the public. Some new funds are also identified for the development of consolidated City-wide tree protection and planting guidelines and specifications, another key tool for ensuring that trees identified for protection are properly protected, and that trees are planted with adequate space and soil quality to ensure their ability to grow to maturity.

The work and resources associated with monitoring and reviewing the UFMP and NH&UFS (as per the framework provided in the **Appendix A**) is anticipated to be undertaken with existing resources, and in partnership with the Region and local conservation authorities. Regular review (i.e., once every four years) of these documents, and the state of the assets themselves will facilitate the implementation of adaptive management approaches if required. 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.

The cost 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, is identified in the NH&UFS.

TREE AND NATURAL AREA HEALTH AND RISK MANAGEMENT (ACTIONS #6 TO #10): Many of the improvements in the maintenance of street and park trees identified through the UFMP are anticipated to be possible within budgets that have already been identified. However, some new resources will be required to develop a City-wide invasive tree pest / disease management plan, and to undertake targeted invasive plant management in some of the City's public Natural Areas. Investments made up front to manage these problems can result in substantial future savings..

TREE ESTABLISHMENT, NATURALIZATION AND URBAN FOREST EXPANSION (ACTIONS #11 TO #14): No new costs are expected to be required to implement the Actions associated with improved tree establishment and naturalization efforts. Support from the Planning and Building Department in terms of enforcing existing policies and by-laws is expected to facilitate implementation.

PROMOTION, EDUCATION, STEWARDSHIP AND PARTNERSHIPS (ACTIONS #21 TO #30): All of the costs associated with expanding outreach and education to a wide range of stakeholders and the community at large are identified in the NH&UFS. However, the additional new costs associated with expanded stewardship are identified in the UFMP Implementation Guide. These are associated with the identified need for two seasonal staff and two students to support implementation of Actions #24 through #27.

Although the NH&UFS and UFMP are each stand-alone documents with their own Implementation Guides, effective implementation of this UFMP will require coordination with implementation of the NH&UFS, as well as that both are funded. This allocation of funds should be viewed not so much as an expense, but more as a cost-effective investment into Mississauga's sustainability that will help ensure the physical and mental well-being of the community, while also helping Mississauga mitigate and adapt to climate change.

10 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.

Atmospheric Carbon: Carbon dioxide gas (CO^2) suspended in the Earth's atmosphere. A greenhouse gas, atmospheric carbon dioxide is known to be a primary contributor to climate change.

Boundary Tree: "Every tree whose trunk is growing on the boundary between adjoining lands is the common property of the owners of the adjoining lands," as defined by the *Forestry Act, 1990.*

Canopy Cover: The proportion of land area that lies directly beneath the crown or canopy of trees and tall shrubs. The extent of urban forest canopy cover is typically expressed as a percentage of land area. It is generally recognized that increasing canopy cover is an objective of urban forest management.

Ecosystem Goods: this terms is used for products provided by nature such 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".

Ecosystem Services: This 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.

Enhanced Rooting Environment Technology: Methods and materials implemented and installed to provide urban trees with greater soil volumes and higher quality soils than used in most current practices, with the objective of promoting improved root growth and urban tree health.

Evapotranspiration: The combined process of water evaporation and plant transpiration, whereby liquid water is converted into water vapour. The process of evapotranspiration is beneficial in urban areas for its cooling effects.

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.

Genetic Potential: A tree's inherent potential to reach a maximum size, form and vigour. Achievement of maximum genetic potential enables a tree to provide the greatest number and extent of benefits possible. Urban trees are frequently unable to reach their genetic potential.

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*).

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.

Grid Pruning: The maintenance and inspection of municipally owned trees at regularly scheduled intervals. This type of management is often planned on a grid-based pattern for ease of implementation.

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, often to the detriment of native species.

Native Species: A species that occurs naturally in a given geographic region that may be present in a given region only through natural processes and with no required human intervention.

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.

Replacement Value: A monetary appraisal of the cost to replace one or more trees, as described by the Council of Tree and Landscape Appraisers.

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.

Tree Protection Zone (TPZ): An area within which works such as excavation, grading and materials storage are generally forbidden. The size of a TPZ is generally based upon the diameter or drip-line of the subject tree.

Urban Forest: All trees, shrubs and understorey plants, 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.

APPENDIX A. NATURAL HERITAGE AND URBAN FOREST MONITORING FRAMEWORK

The criteria, indicators and objectives in this table have been adapted from Kenney *et al.* (2011)[26] and revised extensively to (a) incorporate measures for the Natural Heritage System, (b) incorporate targets developed for the Natural Heritage System and urban forest the City of Mississauga for the next 20 years, and (c) be tailored for the City of Mississauga. This framework is intended to be used as a basis for monitoring the status of the city's natural heritage and urban forest assets, as well as the status of planning and management for these assets, and the level of engagement and partnerships related to stewardship of these assets.

The "level" which the City of Mississauga is at (i.e., low, moderate, good or optimal) for each indicator, where known, as of the date of the finalization of this Plan is shaded in mauve.

Criteria and Indicators for assessing Mississauga's Natural Heritage System (NHS) and Urban Forest (UF).

Criteria	Performance Indicators				Key Objectives	Targets, Approach and Responsible Party(ies)
	Low	Moderate	Good	Optimal		
1. NHS Size	The existing NHS cover equals 0-25% of the potential.	The existing NHS cover equals 25-50% of the potential.	The existing NHS cover equals 50-75% of the potential.	The existing NHS cover equals 75-100% of the potential.	To maintain and expand total NHS cover across the city to improve the system's ecological functions and maximize the ecosystem services it provides.	TARGET: 12% to 14% NHS cover by 2033; 14% is considered close to the City's potential in the current land use context. APPROACH & RESPONSIBLE PARTY(IES): Based on GIS mapping completed as part of annual Natural Areas Survey updates undertaken by the City.
2. NHS Connectivity: Aquatic	Less than 60% of the city's watercourses have at least 30 m of vegetation on each side.	Between 60% and 74% of the city's watercourses have at least 30 m of vegetation on each side.	Between 75% to 85% of the city's watercourses have at least 30 m if vegetation on each side.	More than 85% of the city's watercourses have at least 30 m if vegetation on each side.	To maintain and improve the ecological functions of the city's watercourses, including their primary functions as ecological corridors.	TARGET: 75% of the watercourses have vegetation for at least 30 m on either side by 2033 APPROACH & RESPONSIBLE PARTY(IES): To be assessed remotely using current aerial photography and GIS by CVC (and TRCA) as part of their ongoing watershed monitoring activities.

[26] Kenney, W.A., van Wassenaer, P.J. and A. Satel. 2011. Criteria and Indicators for Strategic Urban Forest Planning and Management. Arboriculture & Urban Forestry 37(3): 108-117

Criteria	Performance Indicators				Key Objectives	Targets, Approach and Responsible Party(ies)
	Low	Moderate	Good	Optimal		
3. NHS Connectivity: Terrestrial	Less than 50% of Significant Natural Areas are linked through the City's NHS or other Green System components.	Between 50% and 74% of Significant Natural Areas are linked through the City's NHS or other Green System components.	Between 75% and 85% of Significant Natural Areas are linked through the City's NHS or other Green System components.	More than 85% of Significant Natural Areas are linked through the City's NHS or other Green System components.	To maintain and improve the ecological connectivity among the city's Significant Natural Areas, including recognition of the supporting role open green spaces outside the Natural Heritage System can play.	TARGET: 85% of Significant Natural Areas are linked through the NHS or other Green System components APPROACH & RESPONSIBLE PARTY(IES): To be assessed remotely using current aerial photography and GIS by the City as part of their ongoing Natural Areas Survey (i.e. terrestrial monitoring).
4. NHS Quality	Overall terrestrial and aquatic quality across the city has declined since 2013.	Overall terrestrial and aquatic quality across the city has remained more or less the same since 2013.	Overall terrestrial and aquatic quality across the city has improved somewhat since 2013.	Overall terrestrial and aquatic quality across the city has improved substantially since 2013.	To track changes in the quality of the city's terrestrial and aquatic ecosystems using data from a representative sample of sites that focus on community structure, composition and function (e.g., water quality, fisheries, macroinvertebrates, forest integrity, wetland integrity).	TARGET : Substantially improve overall terrestrial and aquatic quality across the city using 2013 as a baseline. APPROACH & RESPONSIBLE PARTY(IES): Based on data collected from ~50 terrestrial and aquatic monitoring plots by CVC and analyses done through updates to CVC's Landscape Scale Analysis and Integrated Watershed Monitoring Program for Mississauga.
5. UF Canopy Cover	The existing UF cover equals 0-25% of the potential.	The existing UF cover equals 25-50% of the potential.	The existing UF cover equals 50-75% of the potential.	The existing UF cover equals 75-100% of the potential.	To maintain and expand total UF cover across the city to improve the system's sustainability and maximize the ecosystem services it provides.	TARGET : 15% to 20% UF cover by 2033; potential UF cover is currently unknown APPROACH & RESPONSIBLE PARTY(IES): Based on canopy cover assessments undertaken jointly through the Peel Urban Forest Working Group (with support from the USDA Forest Service).
6. UF Canopy Cover Distribution	Canopy cover is lower than or meets the total UF cover in 0% to 24% of the neighbourhoods and/or land uses identified as high priority for tree planting.	Canopy cover meets or exceeds the total UF cover in 25% to 49% of the neighbourhoods and/or land uses identified as high priority for tree planting.	Canopy cover meets or exceeds the total UF cover in 50% to 74% of the neighbourhoods and/or land uses identified as high priority for r tree planting.	Canopy cover meets or exceeds the total UF cover in 75% or more of the neighbourhoods and/or land uses identified as high priority for tree planting.	To improve urban forest canopy coverage in high priority areas where it is deficient. *Priority areas are to be determined through implementation of the Natural Heritage & Urban Forest Strategy.*	TARGET : Canopy cover meets or exceeds the total UF cover in 50% to 75% or more of the neighbourhoods and/or land uses identified as high priority for reforestation by 2033. APPROACH & RESPONSIBLE PARTY(IES): Based on canopy cover assessments and a subsequent Tree Planting Priority study to be undertaken jointly through the Peel Urban Forest Working Group over 2014.

Criteria	Performance Indicators				Key Objectives	Targets, Approach and Responsible Party(ies)
	Low	Moderate	Good	Optimal		
7. Size distribution of City Street and Park Trees	Any size (i.e., DBH) class represents more than 75% of the street and park tree population.	Any size class represents between 50% and 75% of the street and park tree population.	No size class represents more than 50% of the street and park tree population.	Approximately 25% of the tree population is in each of four size classes.	Size, generally considered a surrogate for age, should be relatively evenly distributed among street and park trees to ensure a balanced cycle of regeneration.	TARGET : Gradual shift to "moderate" performance, but may not be possible by 2033. APPROACH & RESPONSIBLE PARTY(IES): To be assessed from the street and park tree inventory by City staff (Forestry Division).
8. City Street and Park Tree Species Diversity	Fewer than 7 species dominate the entire street and park tree population city-wide.	No species represents more than 20% of the entire street and park tree population city-wide.	No species represents more than 10% of the entire tree population city-wide or 30% on a given street or park.	No species represents more than 5% of the entire street or park tree population city-wide or more than 20% on a given street or park.	Establish a genetically diverse street and park tree population city-wide , excluding invasive non-native species, as well as at the neighbourhood level that is more resilient to climate change, species-specific tree pests and other stressors.	TARGET : No tree species represents more than 5% of the tree population City-wide or more than 20% on a given street by 2033. APPROACH & RESPONSIBLE PARTY(IES): To be assessed from the street and park tree inventory by City staff (Forestry Division).
9. Species Suitability of City Street and Park Trees	Invasive tree species represent more than 15% of the street and park tree population.	Invasive tree species represent between 11% and 14% of the street and park tree population.	Invasive tree species represent between 5% and 9% of the street and park tree population.	Invasive tree species represent less than 5% of the street and park tree population.	Reduce the proportion of City street and park trees that are non-native and invasive to limit the ecological impacts and management costs associated with these species.	TARGET : Invasive tree species represent less than 8% of the street and park tree population. APPROACH & RESPONSIBLE PARTY(IES): To be assessed from the street and park tree inventory by City staff (Forestry Division).
10. Condition of City Street and Park Trees	Less than 25% of street and park trees are in good or excellent condition.	Between 25% and 49% of street and park trees are in good or excellent condition.	Between 50% and 74% of street and park trees are in good or excellent condition.	More than 75% of street and park trees are in good or excellent condition.	To improve the condition and minimize the risk potential of all publicly- owned trees.	TARGET : City input required to current status and possible target APPROACH & RESPONSIBLE PARTY(IES): To be assessed from the street and park tree inventory by City staff (Forestry Division).
11. Condition of Publicly-owned Natural Areas	Publicly-owned Natural Areas have an average site ecological integrity of less than 25%	Publicly-owned Natural Areas have an average site ecological integrity of 25% to 49%.	Publicly-owned Natural Areas have an average site ecological integrity of 50% to 75%	Publicly-owned Natural Areas have an average site ecological integrity of more than 75%.	Measuring changes in the ecological structure and function of publicly-owned Natural Areas through assessments of key structural elements (e.g., tree health and dead wood in forested habitats), plant and vegetation community diversity, and wildlife populations (primarily birds).	TARGET : Improve the average ecological integrity of publicly-owned Natural Areas. Need CVC input to current status. APPROACH & RESPONSIBLE PARTY(IES): Based on data collected from terrestrial monitoring of a sub-set of the City's Natural Areas by CVC and analyses done through updates to CVC's Terrestrial Monitoring Bulletins.

12. Natural Heritage & Urban Forest Strategy (and supporting Urban Forest Management Plan) Implementation	Less than 25% of recommended NH&UFS Strategies (and supporting UFMP Actions) implemented.	Between 25% and 49% of recommended NH&UFS Strategies (and supporting UFMP Actions) implemented.	Between 50% and 74% of recommended NH&UFS Strategies (and supporting UFMP Actions) implemented.	Between 75% and 100% of recommended NH&UFS Strategies (and supporting UFMP Actions) implemented.	Most or all NH&UFS Strategies (and supporting UFMP Actions) need to be implemented to ensure that Mississauga's natural heritage and urban forest assets are sustained for the long term and continue to sustain the community.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (in various departments) through their program review.
13. Canopy Cover Assessment	No assessment	Visual assessment	Sampling of tree cover using aerial photographs or satellite imagery.	Sampling of tree cover using aerial photographs or satellite imagery included in jurisdiction-wide GIS.	High resolution assessments of the existing and potential canopy cover for the entire community.	TARGET : Maintain "optimal" status over the period of this Plan. APPROACH & RESPONSIBLE PARTY(IES): Assessment done in 2011 to be re-assessed periodically using the best available tools through the Peel Urban Forest Working Group and partners.
14. Natural Heritage System Policies and Enforcement	Natural Heritage System policies are not consistent with the basic Provincial and Regional requirements.	Natural Heritage System policies are consistent with the basic Provincial and Regional requirements.	Natural Heritage System policies are consistent with the basic Provincial and Regional requirements, and include consideration of local conditions and issues.	Natural Heritage System policies are consistent with the basic Provincial and Regional requirements, and support locally-developed targets.	The Natural Heritage System is afforded a high level of protection and local natural heritage objectives and targets are supported.	TARGET : Achieve "optimal" status by 2033, or sooner. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (in Planning and Building) through their program review.
15. Tree Protection Policy Development and Enforcement	No tree protection policies are in place for trees on public or private lands.	Policies (including Official Plan policies, guidelines and by-laws) are in place to protect public trees.	Policies (including Official Plan policies, guidelines and by-laws) are in place to protect public and private trees with some enforcement.. Replacement for trees removed is encouraged.	Policies that ensure the protection of trees on public and private land are consistently enforced and supported by an educational program. Replacement and/or compensation for trees removed is required.	Trees on both public and private lands are afforded a high level of protection through policies in the Official Plan and supporting policies, guidelines and by-laws. Where protection is not feasible, replacement and/or compensation is required.	TARGET : Achieve "good" status by 2033, or sooner. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (in various departments) through their program review.
16. Publicly-owned Natural Areas Management Planning and Implementation	No Conservation Plans developed or in effect. Limited management / stewardship undertaken	Conservation Plans developed and in effect for some high priority publicly-owned Natural Areas	Conservation Plans developed and in effect for all high priority publicly-owned Natural Areas	Conservation Plans developed and in effect for all publicly-owned Natural Areas.	To ensure the ecological structure and function of all publicly-owned Natural Areas is protected and, where needed, enhanced, while still accommodating safe and appropriate public uses.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.

17. Publicly-owned Street and Park Tree Inventory	No inventory	Sample-based inventory of publicly-owned street and park trees	Complete inventory of publicly-owned street and park trees in some type of management system and GIS	Complete inventory of publicly-owned street and park trees in some type of management system and GIS that is actively maintained	Complete inventory of the City's street and park trees to facilitate and direct their proactive management. This includes: age distribution, species mix, tree condition, and risk assessment.	TARGET : Achieve "optimal" status well before 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.
18. Native Plant Management	No program or policies for native plant species are in place.	Voluntary use of site-appropriate native species on publicly and privately- owned lands occurs.	The use of site-appropriate native species is *encouraged* on a project-appropriate basis in both intensively and extensively managed areas.	The use of site-appropriate native species is *required* on a project-appropriate basis in both intensively and extensively managed areas. Hardy non-native, non-invasive tree species may be accepted in harsh sites where trees are required.	Preservation and enhancement of local natural biodiversity by increasing the proportion and population of site-appropriate native plant species.	TARGET : Achieve "optimal" status well before 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.
19. Invasive Plant Management	No program or policies for invasive plant species are in place.	Risks associated with invasive species are promoted. Ad hoc management of invasive plants is undertaken as resources permit.	The use of invasive species is *discouraged* on a project-appropriate basis in both intensively and extensively managed areas. A targeted program for management of high priority areas for invasive species is in place.	The use of invasive species is *prohibited* on a project-appropriate basis in both intensively and extensively managed areas. A targeted program for management of high priority areas for invasive species is in place and being implemented.	Preservation and enhancement of local natural biodiversity by reducing the proportion and population of non-native and invasive plant species.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.
20. Tree Establishment Planning and Implementation	Tree establishment is *ad hoc.*	Tree establishment occurs on an annual basis on public lands and is encouraged on private lands.	Tree establishment is directed by needs derived from a tree inventory (on public lands) and is supported on private lands as resources permit.	Tree establishment is directed by needs derived from a tree inventory (on public lands) and by a jurisdiction wide prioritization study on private lands. There are dedicated resources committed to planting (and follow-up maintenance) on both public and private lands.	UF renewal is ensured through a comprehensive tree establishment program driven by a range of biophysical and community-based considerations.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.

21. Tree Habitat Suitability	Trees are planted without consideration for site conditions.	Tree species are considered in planting site selection.	Community-wide guidelines are in place for the improvement of planting sites and the selection of suitable species.	All trees are planted in compliance with established community-wide guidelines and best practices.	All trees are planted in habitats which will maximize current and future benefits provided by being planted in sites with adequate soil quality and quantity, and growing space to achieve their genetic potential.	TARGET : Achieve "good" or "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (in various departments) through their program review.
22. Maintenance of Publicly-Owned Street and Park Trees	No maintenance of publicly-owned trees.	Publicly-owned trees are maintained on a request/reactive basis. No systematic (block) pruning.	All publicly-owned street and park trees are systematically maintained on a cycle longer than 8 years.	All mature publicly-owned street and park trees are maintained on a 5 to 8-year cycle. All immature trees are structurally pruned.	All publicly-owned trees are maintained to maximize current and future benefits, and reduce longer-term maintenance costs and associated risks.	TARGET : Achieve or "optimal" status in full by 2033, or before. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.
23. Tree Risk Management	No tree risk assessment/ remediation program is in place. Request based/reactive system.	Sample-based tree inventory which includes general tree risk information has been completed. Request based/reactive risk abatement program is in place.	Complete tree inventory which includes detailed tree failure risk ratings is in place. Risk abatement program is in effect eliminating hazards within a maximum of one month from confirmation of hazard potential.	Complete tree inventory which includes detailed tree failure risk ratings is in place and maintained. Risk abatement program is in effect eliminating hazards within a maximum of one week from confirmation of hazard potential.	Risk related to publicly owned trees is minimized to the greatest extent possible through appropriate policies and procedures.	TARGET : Achieve "good" or "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their program review.
24. Cooperation and support among City departments	There is no collaboration between departments on NHS or UF issues.	There is some informal collaboration between departments on NHS or UF issues.	There is some formal collaboration between departments on NHS or UF issues.	Key staff from all departments involved in NHS and UF issues meet regularly to pursue shared goals.	The level of cooperation among municipal departments involved in NHS and UF issues is increased to maximize opportunities for resource sharing and pursuit of NHS and UF objectives.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (various departments) through their program review.
25. Success in improving awareness of the Natural Heritage System and urban forest as community assets	Community surveys indicate that natural heritage and the urban forest are generally seen as of limited value.	Community surveys indicate that natural heritage and the urban forest are recognized as having value by a minority.	Community surveys indicate that natural heritage and the urban forest are recognized as having value by between 50% and 74%.	Community surveys indicate that natural heritage and the urban forest are recognized as vital to the community's environmental, social and economic well-being by more than 75%	All sectors of the community recognize that the natural heritage and urban forest assets within the City are key contributors to quality of life and provide a wide range of ecological services that are difficult, costly or impossible to replace.	TARGET : Achieve "good" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): To be assessed through targeted surveys conducted by City staff, or possibly university students, once every four to eight years over the course of this Strategy.

26. Outreach to large private and institutional landholders	Large private landholders are not engaged on natural heritage or urban forest issues.	Educational materials and advice available to landholders who are interested.	Educational materials, advice, technical support and incentives are available to landholders who are interested.	The City (and other agencies) are actively working with large landowners to share available educational materials, advice, technical support and incentives.	Large private landholders embrace city-wide goals and objectives through specific resource management plans and/or ongoing naturalization / reforestation activities on their properties.	TARGET : Maintain "good" to "optimal" status to 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their outreach and stewardship program review, and the Million Trees Program.
27. "Green" and Building Industry Cooperation	Limited cooperation from segments of the "green" industry (nurseries, tree care companies, etc.), builders and developers in supporting NH&UFS and UFMP objectives.	The "green" industry, builders and developers generally comply with established policies, guidelines and by-laws.	The "green" industry, builders and developers comply with established policies, guidelines and by-laws	The "green" industry, builders and developers comply with and sometimes go beyond established policies, guidelines and by-laws, and work with the City to integrate green development tools and approaches.	"Green" industry, builders and developers operate with high professional standards, are committed to respecting established policies, guidelines, and by-laws and working with the City to support natural heritage and urban forest objectives by integrating green development tools and approaches.	TARGET : Achieve "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Planning and Building, Forestry Division).
28. Involvement of Neighbourhoods and Community Groups	Neighbourhoods and community groups are not involved in natural heritage or urban forest activities or programs.	A few neighbourhoods and community groups are involved in natural heritage and/or urban forest activities or programs.	Many neighbourhoods and community groups are involved in natural heritage and/or urban forest activities or programs.	Representatives from neighbourhoods and community groups across the city are involved in natural heritage and/or urban forest activities or programs.	Active involvement of neighbourhoods and community groups from across the City in natural heritage and urban forest stewardship fosters a connection with these community assets, and a sense of responsibility for their well-being ..	TARGET : Achieve "good" or "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their outreach and stewardship program review, and the Million Trees Program.
29. Involvement of Local Businesses and Development Organizations	Local businesses and development organizations are not involved in natural heritage or urban forest activities or programs.	A few local businesses and development organizations are involved in natural heritage and/or urban forest activities or programs.	Many local businesses and development organizations are involved in natural heritage and/or urban forest activities or programs.	Representatives from local businesses and development organizations across the city are involved in natural heritage and/or urban forest activities or programs.	Active involvement of local businesses and development organizations from across the City in natural heritage and urban forest stewardship provides leadership by example in the city and beyond.	TARGET : Achieve "good" or "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their outreach and stewardship program review, and the Million Trees Program.

30. Involvement of Local Schools and Academic Institutions	Local schools and academic institutions are not involved in natural heritage or urban forest activities or programs.	A few local schools and academic institutions are involved in natural heritage and/or urban forest activities or programs.	Many local schools and academic institutions are involved in natural heritage and/or urban forest activities or programs.	Representatives local schools and academic institutions across the city are involved in natural heritage and/or urban forest activities or programs.	Active involvement of local schools and academic institutions from across the City in natural heritage and urban forest stewardship instills the value of these assets in the future leaders, and provides opportunities for leveraging existing programs to collect data and undertake research.	TARGET : Achieve "good" or "optimal" status by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Forestry Division) through their outreach and stewardship program review, and the Million Trees Program.
31. Regional Cooperation	The City, the Region and local conservation authorities rarely cooperate on matters of urban forestry or natural heritage.	The City, the Region and local conservation authorities cooperate on matters of urban forestry and natural heritage on an ad hoc basis. .	The City, the Region and local conservation authorities cooperate on matters of urban forestry and natural heritage on a regular, formalized basis.	The City, the Region and local conservation authorities work together to develop and implement urban forest strategies and natural heritage planning.	Together, the City, the Region and local conservation authorities are able to address issues and pursue larger-scale natural heritage and urban forest objectives in an integrated and cost-effective manner.	TARGET : Maintain "optimal" status to 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Planning and Building, Forestry Division) and key staff at the Region, Credit Valley Conservation and Toronto Region Conservation.
32. Provincial and Federal Cooperation and Support	The Provincial and Federal governments cooperate on matters of urban forestry or natural heritage on a limited basis.	The Provincial and Federal governments cooperate on matters of urban forestry or natural heritage on a regular basis.	The Provincial and Federal governments cooperate on matters of urban forestry or natural heritage on a regular basis, and provide support to municipal governments.	The Provincial and Federal governments provide dedicated technical and funding support to municipal governments on urban forestry and natural heritage matters.	Together, the City, the Region and local conservation authorities are able to address issues and pursue larger-scale natural heritage and urban forest objectives in an integrated and cost-effective manner.	TARGET : Try to solicit "moderate" to "good" performance by 2033. APPROACH & RESPONSIBLE PARTY(IES): As assessed by City staff (Planning and Building, Forestry Division) and key staff at the Region, Credit Valley Conservation and Toronto Region Conservation.

APPENDIX B.

Summary of how the 27 recommendations from the *City of Mississauga Urban Forest Study* (2011)[27] have been addressed through this Urban Forest Management Plan and the broader Natural Heritage & Urban Forest Strategy.

Mississauga Urban Forest Study (2011) Recommendation	Relationship to Mississauga's Urban Forest Management Plan (UFMP) and broader Natural Heritage Urban Forest Strategy (NH&UFS)
1. Neighbourhoods identified by the Priority Planting Index should be targeted for strategic action that will increase tree cover and leaf area in these areas.	Incorporated into NH&UFS Strategies #11 and #13, as well as supporting UFMP Actions #11 and #12.
2. Use the parcel-based TC metrics together with the City's GIS database to identify and prioritize contiguous parcels that maintain a high proportion of impervious cover and a low percent canopy cover.	Incorporated into NH&UFS Strategy #13, as well as supporting UFMP Action #11.
3. Increase leaf area in canopied areas by planting suitable tree and shrub species under existing tree cover. Planting efforts should be focused in areas where mature and aging trees are over-represented, including the older residential neighbourhoods located south of the Queensway. Neighbourhoods in these areas that maintain a high proportion of ash species should be prioritized.	Incorporated into NH&UFS Strategy #13, as well as supporting UFMP Actions #11 and #12.
4. Utilize the Pest Vulnerability Matrix during species selection for municipal tree and shrub planting.	Evaluation of local pest priorities is incorporated into NH&UFS Strategy #15 and supporting UFMP Action #19.
5. Establish a diverse tree population in which no single species represents more than 5 percent of the tree population, no genus represents more than 10 percent of the tree population, and no family represents more than 20 percent of the intensively managed tree population both city-wide and the neighbourhood level.	Increasing street and park tree diversity is addressed through UFMP Target #5 and is also Incorporated into NH&UFS Strategy #16 and supporting UFMP Action #9.
6. In collaboration with the Toronto Region Conservation Authority and Credit Valley Conservation, develop and implement an invasive species management strategy that will comprehensively address existing infestations as well as future threats posed by invasive insect pests, diseases and exotic plants.	Invasive plant management is incorporated into NH&UFS Strategy #15 and supporting UFMP Action #10; invasive tree pest management is incorporated into NH&UFS Strategy #15 and supporting UFMP Action #9.
7. Utilize native planting stock grown from locally adapted seed sources in both intensively and extensively managed areas.	The broader use of native planting stock is to be implemented through Strategy #15 and supporting UFMP Action #4.
8. Evaluate and develop the strategic steps necessary to increase the proportion of large, mature trees in the urban forest. Focus must be placed on long-term tree maintenance and by-law enforcement to ensure that healthy specimens can reach their genetic growth potential. The value of the services provided by mature trees must be effectively communicated to all residents.	A number of strategies and actions are designed to support the preservation of mature trees in the City. These include: NH&UFS Strategies #4, #6, #7, #8 (and supporting Actions #15, #16 and #17), Strategy #14 (and related Action #17), Strategy #15 (and supporting Actions #6 and #8), Strategy #20 (and supporting Actions #4, #6 and #9).
9. Determine the relative dbh of the tree population in Mississauga; consider utilizing relative dbh as an indicator of urban forest health.	This recommendation is not being pursued through the UFMP or NH&UFS.

[27] This study was led by Toronto Region conservation with support from the Region of Peel, the three area municipalities (Mississauga, Brampton and Caledon) and Credit Valley Conservation.

10. Conduct an assessment of municipal urban forest maintenance activities (e.g. pruning, tree planting) to determine areas where a reduction in fossil fuel use can be achieved.	An analysis of municipal urban forest maintenance practices was done through the UFMP, but efficiencies related to fossil fuel use were not specifically identified, although the increasing shift towards proactive management is intended to ensure that more work is done in fewer trips to the same location.
11. Reduce energy consumption and associated carbon emissions by providing direction and assistance to residents and businesses for strategic tree planting and establishment around buildings.	Direction and assistance to residents and businesses in terms of planting to maximize the cooling benefits of trees on their properties is provided through various sources under the One Million Trees Program, as per NH&UFS Strategy #21 (and related Actions #24 and #26).
12. Focus tree planting and establishment in "hot-spots" identified by thermal mapping analysis.	Consideration for the hot spot data is incorporated into NH&UFS Strategy #13 and supporting UFMP Action #11.
13. Review and enhance the Tree Permit By-law 474-05 to include the protection all trees that are 20 cm or greater in diameter at breast height.	The City's Private Tree Protection By-law was recently updated. As discussed under Action#17, it is recommended it be reviewed again in four to eight years.
14. Develop a comprehensive Public Tree By-law that provides protection to all trees on publically owned and managed lands.	As per Action #15, the City is currently in the process of updating its Street Tree By-law to be a more comprehensive Public Tree By-law.
15. Develop a Tree Protection Policy that outlines enforceable guidelines for tree protection zones and other protection measures to be undertaken for all publically and privately owned trees	Action #4 recommends the development, and implementation, of improved city-wide tree protection and planting specifications for trees on public and private lands.
16. Allocate additional funding to the Urban Forestry Unit for the resources necessary to ensure full public compliance with Urban Forestry By-laws and policies.	Resource requirements above and beyond what is currently approved for the various Actions are identified through the NH&UFS and UFMP Implementation Guides under separate cover
17. Create a Community Animator Program that assists residents and groups acting at the neighbourhood scale in launching local conservation initiatives.	Although a Community animator is not specifically recommended through this Plan, a number of engagement strategies and actions are identified through the NH&UFS and the UFMP.
18. Conduct a detailed assessment of opportunities to enhance urban forest stewardship through public outreach programs that utilize community-based social marketing.	As assessment of stewardship opportunities has been completed through the NH&UFS and UFMP (see **Appendix E**), and recommendations to build on these programs and incorporate social marketing are made through Strategy #19, and supporting Actions #21 and #22.
19. Develop and implement a comprehensive municipal staff training program as well as information sharing sessions that target all departments and employees that are stakeholders in sustainable urban forest management.	The importance of and need for internal training and education is identified though Strategy #1, and supporting Action #3.
20. Increase genetic diversity in the urban forest by working with local growers to diversify stock and reduce reliance on clones.	Identified in Action #29 as a potential project.
21. Utilize the UTC analysis together with natural cover mapping to identify priority planting and restoration areas within the urban matrix.	Consideration for the canopy cover analysis done is incorporated into NH&UFS Strategy #13 and supporting UFMP Action #11.

22. Implement the target natural heritage system in the Etobicoke and Mimico Creeks Watersheds; work with CVC to identify and implement the target natural heritage system in the Credit Valley Watershed.	The CVC and TRCA watershed target Natural Heritage Systems have been considered in the identification of potential expansion areas identified and recommended through Strategy #13, and should continue to be considered in future identification of expansion areas, as well as in the identification of future acquisition areas (Strategy #16).
23. Develop and implement an urban forest monitoring program that tracks trends in the structure and distribution of the urban forest using the i-Tree Eco analysis and Urban Tree Canopy analysis. The structure and distribution of the urban forest should be comprehensively evaluated at regular 5-year intervals and reported on publically.	Urban forest monitoring is recommended through Strategy #26, and supporting Actions #1 and #2, and is to utilize established criteria and indicators.
24. Develop a seed collection program for native ash species in partnership with TRCA, CVC and National Tree Seed Centre.	Identified in Action #29 as a potential project.
25. Develop municipal guidelines and regulations for sustainable streetscape and subdivision design that 1) ensure adequate soil quality and quantity for tree establishment and 2) eliminate conflict between natural and grey infrastructure.	This recommendation is to be implemented through Strategy #14 and supporting UFMP Action #4.
26. Apply and monitor the use of structural soils, subsurface cells and other enhanced rooting environment techniques for street trees. Utilizing these technologies at selected test-sites in the short-term may provide a cost-effective means of integrating these systems into the municipal budget.	Assessment of the use of structural soils identified in Action #29 as a potential research project.
27. Utilize the criteria and performance indicators developed by Kenney et al. (2011) to guide the creation of a strategic management plan and to assess the progress made towards sustainable urban forest management and planning.	Urban forest monitoring is recommended through Strategy #26, and supporting Actions #1 and #2, and is to utilize established criteria and indicators framework by Kenney at al. (2011).

APPENDIX C.
INVASIVE SPECIES MANAGEMENT PLAN

1.0 INTRODUCTION TO INVASIVE SPECIES IN MISSISSAUGA

Invasive species pose great challenges to ecological integrity in Natural Areas in the City of Mississauga. Invasive species are usually non-native species that displace some or most of the native components of the community (White *et al.* 1993). They include plants, insects, fish and animals, particularly domestic pets. Effective invasive species management should consider a wide range of factors, including but not limited to: prevention of invasions, identification and mapping of invasive populations, prioritization of species and areas for management, control measures, community partnerships, funding, and public education and awareness.

Credit Valley Conservation (CVC) has developed a draft *Invasive Species Strategy* (CVC 2009) that provides a lot of information on invasive plant and animal species including priority for removal and a summary of removal techniques. Given that majority of the City is in the CVC watershed, this strategy is highly relevant and should be consulted for guidance. It is relied on heavily in this report for suggesting priority species, with some refinements based on specific knowledge of Mississauga. Moreover, the CVC has been involved in invasive species control for several years, including some priority sites in Mississauga in collaboration with City staff. Initiatives for invasive species control should be coordinated with the CVC as appropriate.

Invasive species occur in aquatic and terrestrial environments, and management expertise and techniques for species in these two environments are very different. Given CVC's focus on aquatic and wetland systems, it is suggested that they would be better suited to taking the lead on management of aquatic organisms, although it is recognized that there is a strong inter-relationship between the aquatic and terrestrial habitats, and cooperative initiatives can be beneficial.

The City is currently involved in the management of invasive species, however, the approach is generally *ad hoc* and in reaction to immediate needs, or is opportunistic in response to specific requests or initiatives from stewardship groups. The main purpose of this Plan is to identify priority species and areas so that limited City resources can be used with the greatest effect.

2.0 CONSIDERATIONS FOR INVASIVE SPECIES MANAGMENT

Invasive species are prevalent within the City and as such require management in order to maintain and/or improve the ecological diversity and function of the City's ecosystems. Mechanisms that allow non-native invasive species to out-compete native species for resources and space include, but are not limited to:

- ability to rapidly colonize after disturbance
- absence of natural predators (in the case of wildlife)
- absence of limiting factors (e.g., climate, species competition)
- tolerance to changing environmental condition (e.g. drought)
- high reproductive rates
- easy dispersal by wind, water, wildlife, and humans
- ability to inhibit growth or establishment of other species by predation or the release of toxins (allelopathy)
- ability to kill native species (as in several forest pathogens), and
- hybridization (genetic contamination).

Increasing temperatures due to climate change has facilitated the spread of some invasive species that were otherwise unable to survive through the winter months. Changes in precipitation patterns may also contribute to the spread of invasive species. As native species which are adapted to our "normal" climate become stressed and extirpated from local habitats due to climate change, more tolerant invasive species may spread and dominate remnant natural sites.

2.1 Prevention, Eradication, and Control

Prevention, eradication and control are the major approaches to managing non-native invasive species. Prevention is preferable, both economically and to prevent further degradation of natural areas and their native biodiversity, however, prevention is rarely possible owing to lack of knowledge of how species will behave when they establish (i.e., will they be invasive or not), and the inability to control dispersion. For practical purposes, eradication is the next preferred option, followed by implementing a control program, if an eradication program is not feasible owing to the inability to completely remove species or because of constant re-introduction.

2.2 Education and Outreach

Part of any comprehensive invasive species management plan is the prevention of the spread of invasive species into natural areas. Some invasive species originate from adjacent lands, often as escaped horticultural plantings. Thus educating the community about the importance of native species, the potential impact of non-native invasive species, and how they can help to prevent the spread of invasive species is important. Similarly, it is often important to involve the community in the management of neighbouring natural areas as these communities then feel a sense of connection and appreciation for the natural areas and how they should be managed.

In terms of involving the public in invasive species management, there may be certain natural areas and invasive species which are suitable to be managed by the general public. Species that can be controlled through hand-pulling and are easily recognizable are generally most suitable for management with volunteers. However, with instruction provided by knowledgeable individuals, more involved eradication methods (e.g., levers for pulling small trees and shrubs) and more difficult to recognize species can also be tackled by volunteers. Safety is another aspect to consider with certain invasive species. Any invasive species which is a human health risk (e.g. Giant Hogweed, *Heracleum mantegazzianum*) is not appropriate for community management due to the high level of risk to their health. Also, any activities involving chemical control should be carried out by a licensed professional.



2.3 Taking a Comprehensive Approach

It is essential to the success of eradication and control programs that a comprehensive approach to invasive species management be taken. A comprehensive approach includes:

- proactive searches for invasive species,
- successive years of species removal and monitoring, and
- native plantings to replace invasive species.

Pro-active searches

The presence of invasive species in the City's natural areas is relatively well known as a result of many years of inventory associated with annual Natural Area Survey (NAS) updates. It is suggested that a map of the City's Significant Natural Areas be created that highlights those areas that support invasive species and that are a high priority for management.

Multiple Years of Management

Many species cannot be eradicated in a single management treatment because they will: 1) germinate out of the seed bank that has established while the species has been growing at the site; 2) sprout from roots not completely removed; and/or 3) re-establish from other locations. The first and second concerns will require that each area be monitored for a period of about five years following removal to undertake further treatment as required. The level of effort can be expected to diminish as the seed bank is exhausted and/or remnant root fragments are removed. The third concern will require long term monitoring which can be undertaken through the annual NAS updates.

Planting with Native Species

Restoration of sites where invasive species have been removed may not always be necessary, but in most cases will enhance biodiversity and could inhibit the re-establishment of invasive species. Where management involves the removal of trees in a woodland environment (for example with Norway Maple or Emerald Ash Borer), planting with native trees would be important as they are critical for maintaining the continuous forest canopy needed to sustain woodland plants and animals. Likewise, planting will be important if there is a large area of invasive species removed and limited opportunity for native plants to colonize spontaneously. However, in cases where invasive removal is localized and there is a healthy native plant assemblage present, it is recommended that re-colonization be allowed to occur naturally. Replanting should always be restricted to species that occur at the site (or at least are typical of the City's Natural Areas) and should be procured from local stock (as opposed to being imported from the United States).

2.4 Integrating with other Programs

The program for controlling non-native species should be integrated with other City initiatives so it becomes part of a more comprehensive program for Natural Area management. Invasive species control, including species and control techniques, should be identified in the Conservation Plans for each of the high priority Significant Natural Areas. Control efforts can then be implemented with consideration for other management needs (such as trail creation/ maintenance/ closure, education programming, arboricultural prescriptions, restoration or enhancement) to achieve efficiencies.

Invasive species control should also be integrated with education and stewardship programs to highlight the importance of the issue and encourage volunteers to support control efforts.

2.5 Selecting an Appropriate Management Technique

Articulating the various techniques for management for specific species is beyond the scope of this document and since techniques are being refined on an ongoing basis, would soon be out of date. The CVC's Invasive Species Strategy (2009), Appendices 4 and 5, provide a discussion of various techniques and a summary of techniques for several of the priority species identified in this report. Also, the website for the Ontario Invasive Species Council (http://www.ontarioinvasiveplants.ca) provides comprehensive information on control techniques, as well as links to other publications and organizations. If it has not been done already, the City should consider membership on the Council.

3.0 FRAMEWORK FOR DETERMINING PRIORITIES

All areas within the City's Natural Heritage System (NHS) have some non-native invasive species present. In some cases their extent is minimal, and if the site is relatively large and in good condition (i.e., has little disturbance), the invasive species may not pose a huge threat. However, degradation from invasive plants is a substantial threat in a high proportion of areas in the NHS. Because of this, and the high cost to provide adequate invasive species management in all sites where it is a problem, sites and species must be prioritized for management such that **the most invasive species are managed in the areas where there is the potential for the greatest success**.

A key consideration in developing this framework is recognition of the relatively limited resources that can be devoted to invasive species management in comparison to the magnitude of the problem. For this reason, the following principles for establishing priority management are recommended:

1) That management focus on the species with the greatest potential to impact natural areas
2) That a few flagship Significant Natural Areas be targeted for thorough management (as opposed to doing a small amount in many Natural Areas)
3) That there be a focus on species that pose a potential threat to human health, and
4) That. notwithstanding the preceding principles, the City be opportunistic and provide encouragement and assistance to community groups who wish to undertake management in particular areas.

Natural Areas that have the greatest ecological significance and provide the best opportunity for preserving high quality ecological structure and function in the long term should have the highest priority for management. Successful management is generally difficult to accomplish in smaller sites as they are influenced by the surrounding landscape to a larger degree. For example, focussing efforts in small isolated woodlands that are dominated by Common Buckthorn and Garlic Mustard may not be the best use of effort and funds as there is a high probability of invasive species re-introduction, and the potential quality of the site may not justify on-going management. Of course this may be different if the site provides some important function, such as habitat for a valued species. Another factor to consider is the willingness of community groups to work in their neighbourhood Natural Area.

3.1 Determination of Species for Management

To assist in setting priorities for species management, a list of invasive species and the degree of their invasiveness are provided in Appendices 1-3 of CVC's Invasive Species Strategy (2009). Appendix 1 addresses invasive plants and categorizes them based on their degree of threat. We recommend that all plant species listed in Categories 1 and 2 be candidates for management in the City. However, those two categories include 47 species, which is overwhelming in terms of management effort. To further prioritize which species should be addressed first, those which are the perceived to be greatest threat to the best sites in Mississauga are identified below. This selection is based on years of experience evaluating Significant Natural Areas as part of annual NAS updates.

- Black Swallowort (*Cynanchum nigrum and C. rossicum*)
- Common Buckthorn
- Giant Hogweed
- Garlic Mustard
- Japanese Knotweed
- Non-native Honeysuckles (including: *Lonicera japonica, L. maakii, L. tatarica, L. x belli* and *L. xylosteum*)
- Purple Loostrife
- Common Reed

The City currently has a management methodology for Giant Hogweed. However, due to limited staff resources, it relies on City staff, consultants, and residents to report locations of the plant. To date, the management approach has been quite effective, however the management of this species could benefit from a more proactive approach that seeks to map the locations where this species occurs throughout the City. Other species are managed on a relatively *ad hoc* basis, largely in response to opportunities presented by volunteer groups.

Appendices 2 and 3 in the CVC report address aquatic species and forest pathogens. Emerald Ash Borer and Asian Long Horn Beetle are already, and should continue to be, identified as priorities for management. The management approach for Emerald Ash Borer is somewhat different from other species in that there is no completely effective control method for eradicating this lethal pest. The goal in the case of Emerald Ash Borer is to slow the inevitable mortality of ash trees such that all ash trees are not eliminated from the canopy at the same time. By extending the period over which mortality occurs, the cost of planting and establishing replacement canopy trees can be spread over several years and the impact of substantial canopy loss at one time can be mitigated. A small number of significant ash trees may be preserved indefinitely through repeated injections. This is the approach which has been approved in the City's current Emerald Ash Borer Management Plan (2012).

The only other priority invasive species recommended for management is domestic cat. Domestic cats kill millions of birds across North America each year and have a devastating effect on ground-nesting bird species. Management of this species will rely on education to inform pet-owners of the impact that free-roaming cats have on the environment. This should be supplemented by a cat control by-law. Although such by-laws are difficult to enforce, they do provide a mechanism for control and allow animal control officials and the humane society to respond to complaints and possibly be involved in control in "flagship" Significant Natural Areas.



3.2 Determination of Areas for Management

As noted above, initiatives for managing invasive species should focus on the natural areas that have the highest overall value within the Natural Heritage System, referred to here as "flagship" natural areas. Characteristics of flagship natural areas include:

- Excellent or good condition as provided in evaluations from annual NAS updates
- Designated as Significant Natural Area
- Presence of Provincially Threatened or Endangered species
- Environmental Significant Area (ESA), Area of Natural or Scientific Interest (ANSI), or Provincially Significant Wetland (PSW) designations
- High Floristic Quality Index (FQI), and
- Large size.

It is recommended that the FQI be used as a metric for determining the quality of an area as it integrates many of these characteristics. In Mississauga, Natural Areas with a high FQI tend to be large, have little disturbance, and are subsequently often designated as Significant Natural Areas and/or ESAs, ANSIs or PSWs.

One challenge with this approach is that many (if not most) of the flagship Natural Areas are, at least in part, on privately owned lands. The City should proceed with management on publically owned lands, and instigate landowner contact to explore opportunities for management on privately owned lands.
As outlined in the framework above, we recommend that the sites with the highest FQI scores be targeted as first priority for invasive species management. The Significant Natural Areas that are rated as having "High" quality (i.e., an FQI > 40) are listed at the end of this Appendix (**Table C-2**). Generally, priority for management should be according to FQI rank. However, **it is recommended that within this list of 40 Significant Natural Areas, the following sites, all of which have FQI scores of over 60, receive the highest priority for management**.

1. **Rattray Marsh (CL9)**
2. **Riverwood (CRR10)**
3. **Erindale (CRR6)**
4. **Cawthra Woods (LV7)**
5. **Loyalist Creek Hollow (CRR7)**
6. **Unnamed (CRR8)**
7. **Sawmill Valley Trail (EM4)**
8. **Tecumseh (CL24)**
9. **Whiteoaks (CL39)**

All of these sites have some publicly owned lands where the City should be able to implement control measures. The privately owned portions of these sites will need to involve land-owner contact programs. In the case of the two golf course sites, the site managers should be approached to see if invasive species control can be integrated into their management protocols. This would be especially beneficial if either site was seeking Audubon certification.

3.3 Target Plant Species Occurring in Priority Sites Significant Natural Areas

Table C-1 indicates which of the priority invasive plant species occur in each of the nine high priority Significant Natural Areas. This information is based on the NAS database and should be updated as inventory information is refined for each site through annual updates.

4.0 RECOMMENDATIONS

1. Continue dialogue and development of cooperative initiatives for invasive species management with the CVC.
2. Adopt the general principle of prioritizing management by addressing the invasive species that pose the greatest potential for impact to native vegetation, and which occur in the most valued natural areas in the Natural Heritage System (i.e., "flagship" natural areas").
3. Develop a landowner contact program to educate landowners about the potential threat posed by non-native species, including pets.
4. Identify safe and easily understood management techniques that can be implemented by volunteers.
5. Implement invasive species control for the priority species and areas identified (as identified in **Tables C-1** and **C-2**).

5.0 REFERENCES

Credit Valley Conservation. 2009. Invasive Species Strategy. Draft. 73 pp.

White, D.J., E. Haber and C. Keddy. 1993. Invasive plants of natural habitats in Canada. An integrated review of wetland and upland species and legislation governing their control. Prepared for the Canadian Wildlife Service and Environment Canada. Ottawa, Ontario. pp. 76-77.

Table C-1. Top Nine Priority Natural Areas for Invasive Species Management

	CL9 Rattray Marsh	CRR10 Riverwood	CRR6 Erindale	LV7 Cawthra Woods	CRR7 Loyalist Cr. Hollow	CRR8 unamed	EM4 Sawmill Valley Trail	CL24 Tecumseh	CL39 Whiteoaks
Black Swallowort		x	x	x	x		x	x	
Common Buckthorn	x	x	x	x	x	x	x	x	x
Giant Hogweed		x			x	x	x	x	
Garlic Mustard	x	x	x	x	x	x	x	x	x
Japanese Knotweed		x		x	x	x	x		x
Non-native Honeysuckles	x	x	x	x	x	x	x	x	x
Purple Loosestrife	x	x	x	x	x	x	x	x	x
Common Reed	x	x	x	x	x	x			x

*Non-native Honeysuckles include *Lonicera japonica*, *L. maakii*, *L. tatarica*, *L. x belli*, and *L. xylosteum*.

Table C-2. Natural Areas within the City of Mississauga's Natural Heritage System ranked as "High" with Floristic Quality Index (FQI) scores greater than 40 (listed in decreasing quality)

Natural Areas System	Native FQI
Rattray Marsh (CL9)	83.64
Riverwood (CRR10)	71.49
Erindale (CRR6)	70.79
Cawthra Woods (LV7)	66.71
Loyalist Creek Hollow (CRR7)	65.92
Not Yet Named (CRR8)	65.09
Sawmill Valley Trail (EM4)	63.67
Tecumseh (CL24)	61.86
Whiteoaks (CL39)	60.31
Fletcher's Flats (MV2)	58.33
Levis Valley (MV19)	57.42
Edward L. Scarlett & Red Oak Plan & Not To Be Named (ET03)	57.20
Willowvale Fields & Creditview Wetlands (EC13)	56.53
Meadowvale C.A. (CRR1)	55.97
Garnetwood (ET04)	55.73
Credit Meadows (CRR2)	52.61
Britannia Woods (H09)	52.40
Not Yet Named (GT4)	51.03
Birch Glen (CL21)	48.45
Jack Darling Park (CL16)	48.40
Not Yet Named (CRR11)	46.34
Erin Wood (CE10)	45.62
Mississauga Valley (MY1)	45.24
Mary Fix (MI17)	45.09
Turtle Glen (CL43)	44.18
Not Yet Named (NE4)	43.62
Totoredaca (MB6)	43.40
Richard Jones (CV12)	42.83
Not Yet Named (LV1)	42.61
Fairbirch (CL22)	42.24
Wildwood (NE9)	42.21
Not To Be Named (CV2)	42.15
Credit River Flats (MI7)	42.00
Not Yet Named (SD1)	41.92
Not Yet Named (MV12)	41.83
Bishopstoke Walk (CC1)	41.15
Not Yet Named (SP3)	41.02
Orchard Heights (ET08)	40.80
Not Yet Named (SP1)	40.53

APPENDIX D.
GUIDANCE FOR NATURAL AREAS CONSERVATION MANAGEMENT PLANS

The purpose of the Conservation Management Plans is to provide guidance for management activities and a record of what actions were taken, when and by whom. Other information, such as the number and type of vegetation communities that occur, species richness, etc. is all available on the Fact Sheets completed for each area as well as the NAS database and need not be repeated here. The Conservation Management Plans are intended to compliment the NAS Fact Sheets and Database and vice versa. Conservation Management Plans should be reviewed prior to annual updates so that management actions can be evaluated. Fact Sheets and the database should be readily available to managers and supervisors who should review them when determining and planning management prescriptions.

It is assumed that the management protocols for various issues are documented elsewhere. For example, the protocols for removing Giant Hogweed and trees infected by Emerald Ash Borer are established, and they do not need to be repeated in each Conservation Management Plan. Protocols for common issues (e.g., closing trails, addressing encroachment, etc.) should be formalized, if not done already. Some sites may have unique management issues, in which case the protocol for addressing it could be provided in more detail in the related Conservation Management Plan.

It is recommended that a Conservation Management Plan template be created following internal discussion of the suggested contents, so that they are all organized the same way and contain the same information, thus promoting ease of use. The final format, content and configuration of these plans will depend on internal considerations and should be tailored to work well with current operation practices.

It is proposed that the Conservation Management Plans be treated as living files that are updated an modified as management is undertaken, as new issues are identified, and in response to new techniques and approaches to management.

Suggested Table of Contents

Name and Designation of Area: e.g. Riverwood, CRR10, Significant Natural Area

Map of Area: map(s) should show:

- boundaries
- ownership
- location of noxious and/or significant species
- trails (if known) including unsanctioned trails
- water features (wetlands and watercourses)
- location of management need (e.g., approximate extent of invasive species, location of unsanctioned trail to be removed, etc.)

Ownership
List names and contact information of lands in private ownership

Community Groups and Other Agencies
List any relevant community groups (e.g., Friends of …) or agencies (e.g., CVC) that may wish to be informed, or be involved with management activities.

History of Past Management (if any)
Provide a brief summary of any management that has been undertaken in the past.

Issues to be Aware of When undertaking Management

- Presence of Noxious Plants:
  - Names:
  - Locations (mapped where possible; if widespread, then note "throughout"):
- Presence of Significant Species (plants and/or animals)
  - Names:
  - Locations (mapped where possible):
- Water features (e.g., wetland, seeps, watercourse etc.)
- Gas pipelines or other utilities

Checklist of Management Issues (note occurrence and priority from annual updates)
We suggest that the priority for management could be established as part of annual updates. However, they could also be undertaken or updated by Community Services. Rather than establishing criteria for "high", "medium", or "low" priorities, it is suggested that the issues at each site be ranked, so that the most urgent criteria in a particular area gets top priority. The urgency of management may vary from one site to another (e.g., unsanctioned bike trails may be most critical at one site and removal of garlic mustard most critical at another). The annual update field sheets should be modified to reflect the final checklist of issues, so information can be easily transferred from annual updates to the Conservation Management Plans.

☐ Invasive species
☐ Noxious species (e.g., Giant Hogweed)
☐ Forest management (e.g., potential hazard trees)
☐ EAB or other forest pathogens
☐ Excessive windthrow
☐ Trail management (e.g. maintaining safe trails, removal of unsanctioned trails)
☐ Management of inappropriate activities (e.g., forts, BMX/mountain bike use, motorized vehicle use, campfires, dumping of refuse, illicit cutting or plant removal)
☐ Vandalism (e.g.. tree-carving, urban graffiti, arson (fire))
☐ Encroachment
☐ Naturalization, enhancement and/or restoration opportunities (including riparian areas of watercourses, creation of amphibian habitat, expansion of future forested areas)
☐ Management of soil erosion and/or compaction (including bank stabilization, trail misuse)
☐ Special Concerns (e.g., endangered/threatened species management, unique/rare species or communities, fish habitat management)
☐ Educational opportunities
☐ Stewardship opportunities

Summary of Management Issues and Record of Management (fictitious examples provided)

MANAGEMENT ACTIVITY	**DATE**	**LOCATION**	**PARTICPANTS** (note staff, other agency or volunteer)	**COMMENTS** (including new management considerations)
Giant Hogweed removal per city protocol	July 15, 2015	East bank of Credit River, south of Chappell Cr. – see sketch	J. Day (City staff)	Completed extent of patch s. of Chappell Cr, additional plants north of Chappell Cr. still need to be treated
Continuation of Giant Hogweed control	July 20, 2015	East bank of Credit R., north of Chappell Cr. – see sketch	J. Day (city staff) D. Smith (CVC)	Area north of Chappell Cr. Completed
Trail Removal	August 15	See sketch	J. Day (city staff)	Trail blocked off with brush and replanted, signage erected
Restoration of meadow				Area planted up with native species – see appended list.

Additional Notes

Space should be provided to allow recording any observations made by field crews or others (e.g., volunteers, citizen groups, etc.).

APPENDIX E.
OVERVIEW OF STEWARDSHIP OPPORTUNITIES IN MISSISSAUGA

Program Name	Program Sponsor(s)	Target Group(s)	Target Land Ownership	Brief Program Description	Associated Resources	Contact / More Information
One Million Trees Program	City of Mississauga with CVC, TRCA, Evergreen and Credit River Anglers Association	ALL	ALL	Umbrella program designed to engage a wide range of individuals, businesses, schools, homeowners or community groups in Mississauga in the planting of and care for trees. The target is to plant 1 million trees between 2012 and 2032.	Website providing links to all available programs providing technical and resource support for tree planting and maintenance, as well as on-line resources	Call 3-1-1, or 905-615-4311 if outside city limits http://onemilliontrees.ca
Partners in Project Green (PPG)	Toronto Pearson with CVC, TRCA, Region of Peel, City of Mississauga, City of Brampton	Businesses around the Pearson Airport	Corporate lands around the Pearson Airport	Promotes a wide range of sustainable businesses practices in support of the Pearson Eco-zone. Includes a corporate tree planting program that engages company staff.	• Website • Access to various Eco-zone resources and networking • Recognition on project website	admin@partnersinprojectgreen.com http://partnersinprojectgreen.com
Greening Corporate Grounds	CVC with TRCA, Evergreen	Businesses and institutions in the CVC and TRCA watersheds	Corporate and institutional properties in the Region of Peel	Experts work with participants on landscaping and storm water management projects on the company's grounds. Program includes provision various resources and technical support. Participants are also recognized on CVC's website, get a sign, and are eligible for awards.	Support includes: • Site concept plan • Technical advice • Assistance with planting / maintenance events • Workshops & presentations and educational resources • Program recognition (sign, web listings and eligibility for awards)	Deborah Kenley Greening Corporate Grounds Program Coordinator, Credit Valley Conservation phone: (905) 670-1615 ext. 439 email: dkenley@creditvalleyca.ca http://www.creditvalleyca.ca/your-land-water/green-cities/greening-corporate-grounds/
CVC Private Landowner Invasive Plant Removal Services	CVC	Landowners	Private	A program to provide technical and resource assistance to private landowners to help manage invasive species on their property.	CVC's Invasive Plant Removal Services includes: • Site assessment of your invasive plant problem • Development of your Invasive	Zoltan Kovacs Forester zkovacs@creditvalleyca.ca 905-838-1832

					Plant Removal Plan • Invasive plant, tree, and shrub removal using an Integrated Pest Management approach • Replanting or restoration of the site .	
CVC Private Landowners Aquatic Planting Program	CVC	Landowners with pond or wetland with 6 – 13 meters square of planting area	Private	Low cost aquatic planting service providing on-site consultation, preparation of planting plans, choice of four aquatic plant species and installation.	Low cost aquatic planting service providing on-site consultation, preparation of planting plans, choice of four aquatic plant species and installation.	Paul Biscaia Restoration Technician pbiscaia@creditvalleyca.ca 905-670-1615 ext. 427
CVC Aquatic Restoration Services	CVC	Landowners	All		CVC has knowledgeable staff that can provide a free consultation on wetlands, streams, ponds or dams and assess opportunities for projects that benefit the natural environment such as: • Stream rehabilitation • Wetland creation and rehabilitation • Making dams more fish and environmentally friendly • Pond management • Buffer plantings • Invasive aquatic plant management.	Kate Hayes Manager, Ecological Restoration khayes@creditvalleyca.ca 905-670-1615 ext. 428
Caring for the Credit Corporate Volunteering Program	CVC	Businesses in the CVC watershed	Public parks, natural and open space areas in the CVC watershed	CVC works with local businesses to organize a "greening" event on public lands as part of a volunteer, team building activity. Participants have included the Co-operators, Enersource, UPS and Samsung.	• Coordination of the event • Native plant materials • Tree planting guidance	Annabel Krupp Program Coordinator – Volunteers 905-670-1615 x446 akrupp@creditvalleyca.ca http://www.creditvalleyca.ca/learn-and-get-involved/volunteer/corporate-volunteering/
Volunteer Tree Planting Program	City of Mississauga with Evergreen,	ALL	Public parks, natural and open space areas in	The City organizes various tree planting and maintenance events in the spring and fall (listed on the City's website). Registration is	• Coordination of the event • Native trees • Tree planting guidance	Call 3-1-1, or 905-615-4311 if outside city limits http://www.mississauga.ca/portal/residents/urbanforestry

	CVC, TRCA		Mississauga	required.		
Credit River Watershed Volunteer Tree Planting Program	CVC	Groups in the Credit River watershed	Public parks, natural and open space in the Credit River watershed	A range of events such as tree planting and invasive species management work days in the Credit River watershed.	• All events are free	Annabel Krupp Program Coordinator – Volunteers akrupp@creditvalleyca.ca www.creditvalleyca.ca/volunteer
Grow Your Green Yard Program	CVC	Residents in urban areas of the CVC watershed	Residential properties in the CVC watershed	CVC provides workshops and planting assistance to residents in Mississauga and elsewhere in the CVC watershed. A planting program for urban neighbours. Specialists provide advice on planting plans and materials; discounts on plant materials, free delivery of up to 80 plants, maintenance instruction.	• Free Native Plants (one per participant) • Fact Sheets • Native Woodland Gardens for Homes Guide	Sara Maedel, Urban Outreach Assistant Program Coordinator Sara.maedel@creditvalleyca.ca www.creditvalleyca.ca/gygy http://www.creditvalleyca.ca/your-land-water/green-cities/your-green-yard/
Healthy Yards Program	TRCA	Residents in urban areas of the TRCA watershed	Residential properties in the TRCA watershed	Provides workshops and planting assistance to residents in Mississauga and elsewhere in the TRCA watershed	• Website resources • Free workshops • Demonstration gardens	http://www.trca.on.ca/yards/
Conservation Youth Corps	CVC	Youth in the CVC watershed	Public parks, natural and open space areas in the CVC watershed	Provides learning and volunteer opportunities in environmental stewardship and conservation for youth through week-long work terms and field trip opportunities.	• Bus to and from site for conservation work terms, plus any related equipment or tools	http://www.creditvalleyca.ca/cyc/
Private Landowner Reforestation / Naturalization Program	CVC	Larger landowners in the CVC watershed	Larger private properties in the CVC watershed	Provides a planting plan as well as the planting of seedlings for properties of at least 2 acres that can accommodate at least 1500 seedlings. The majority of reforestation projects are eligible for the Provincial Managed Forest Tax Incentive Program (MFTIP) utilized by landowners to reduce	• bare root seedlings • free site visit • technical support • customized planting plan • delivery and installation of plant stock	Brain Boyd creditvalleyca.ca/forestry forestry@creditvalleyca.ca http://www.creditvalleyca.ca/your-land-water/countryside-living/your-trees-and-forests/cvc-tree-planting-programs/reforestation-planting-program/

				property taxes.		
CVC Private Landowner Aquatic Planting Program	CVC	Landowners with ponds and/or wetlands	Private lands with ponds	Provides a planting plan, aquatic plants, and installation of plants. Must have a pond or wetland with 6 – 13 metres squared of planting area. Minimum of 50 plants per order.	• Access to four aquatic plant species • Free site visit • Technical support • Delivery and installation included	Paul Biscaia Restoration Technician pbiscaia@creditvalleyca.ca creditvalleyca.ca/aquaticplanting
CVC Multi-cultural Outreach Program	CVC	New Canadians		Education Program (contact Andrew for more detail)	• Various	Andrew Kett, Manger, Education akett@creditvalleyca.ca creditvalleyca.ca/education
Etobicoke & Mimico Creeks Watersheds Volunteer Plantings	TRCA	Individuals and groups in the TRCA watershed	Public parks, natural and open space areas in the TRCA watershed	A range of events (e.g., presentations, workshops, plays, invasive species management) and planting opportunities in the Etobicoke and Mimico Creeks Watersheds.	• All events are free	http://trca.on.ca/the-living-city/watersheds/etobicoke-mimico-creek/index.dot
Credit River Anglers Conservation Works	Credit River Anglers Association (CRAA)	Members of CRAA and vounteers	Lands adjacent to the Credit River	Works over the past two decades have included reforestation in the river's riparian areas as well as other forms of riparian area stabilization with funding from the Ontario Trillium Fund, EcoAction, City of Mississauga, and OMNR.	• seedlings • labour • acknowledgement sign	info@craa.on.ca http://www.craa.on.ca/fishing_craateam.shtml
School Greening	CVC	Youth in the CVC watershed	School grounds in the CVC watershed	CVC will assist schools with naturalizing school grounds if the school arranges the appropriate permissions and develops a plan. CVC will also work with one school every year to create a landscape plan for their school grounds.	• coordination of planting event • possible provision of some seedlings • landscape plan (for one school per year)	(905) 670-1615 or 1-800-668-5557 Fax: (905) 670-2210 education@creditvalleyca.ca
Watershed on Wheels	TRCA with CVC	Youth in TRCA and CVC watersheds	N/A	Provision of half-day programs designed to meet the grades 1 to 8 Ontario Science and Technology Curriculum expectations.	• Website with resources for teachers • Half-day school programs • Training for teachers	http://www.trca.on.ca/school-programs/facilities-and-programs/watershed-on-wheels/

School Grounds Greening	Evergreen	Youth	Schools across Canada	Provision of funding, consultant expertise and workshops to support greening of school grounds.	• Funding of $500 to $3500 • Resources for teachers (e.g., Native Plant Database) • Training for teachers	http://www.evergreen.ca/en/programs/schools/index.sn
Planting for Change (P4C)	ACER (Association for Canadian Educational Resources)	Youth / students	Schools	ACER helps classes create a schoolyard planting site that acts as a mini-climate change outdoor classroom/lab that serves as an easily accessible teaching tool to complement curriculum relating to climate change.	• Technical support and guidance / training • Supervision of plantings • Data collection, analysis and reporting	Alice Casselman Unit 44, 3665 Flamewood Drive Mississauga, Ontario L4Y 3P5 T: (905) 275-7685 F: (905) 275-9420 alice.casselman@acer-acre.ca
Youth Stewardship Program	ACER (Association for Canadian Educational Resources)	Youth / students	Public natural areas	The goals for the project are to train students to remove invasive species in a selected area, to carry out a base line inventory of remaining native trees and to lead a community restoration planting. The area chosen has native trees that could thrive with reduced competition.	• Coordination of work done, as well as partners • Training for youth workers	Alice Casselman Unit 44, 3665 Flamewood Drive Mississauga, Ontario L4Y 3P5 T: (905) 275-7685 F: (905) 275-9420 alice.casselman@acer-acre.ca
Riverwood Conservancy	City of Mississauga	Individuals and groups in the Mississauga watershed	Public	Not a formal program but organized volunteer planting and maintenance in the Riverwood area (e.g., Rattray Marsh)	N/A	
Sierra Club Ontario	City of Mississauga / CVC	Individuals and groups in the Mississauga watershed	Public	Do volunteer recruitment for tree plantings on City property coordinated by CVC	N/A	

Natural Heritage & Urban Forest Strategy

MISSISSAUGA
Leading today for tomorrow

Feasibility Analysis for Expansion of the Provincial Greenbelt Plan Area into Mississauga

November 8, 2013

BEACON ENVIRONMENTAL

North-South Environmental Inc.
Specialists in Sustainable Landscape Planning

Sorensen Gravely Lowes Planning Associates Inc.

Table of Contents

1.0 Introduction 1
1.1 Purpose of this Paper 1
2.0 The Greenbelt Plan 1
2.1 Greenbelt Plan Overview 1
2.2 Growing the Greenbelt 2
2.3 Greenbelt Plan Amendment #1 3
3.0 Ontario Greenbelt Alliance Report 4
4.0 Other Municipal Approaches to the Greenbelt Expansion 4
4.1 Oakville 4
4.2 Toronto 5
4.3 York Region 5
4.4 City of Brampton 6
5.0 Implications for Mississauga 6
5.1 Status of the Credit River and Etobicoke Creek Corridors 6
5.2 Pros and Cons of Extending the Greenbelt 8
5.3 Criteria to Expand the Greenbelt 10
6.0 Conclusion 11

Appendix A: Ownership breakdown on Public lands

1.0 INTRODUCTION

1.1 PURPOSE OF THIS PAPER

This paper discusses the feasibility and implications for expanding the Provincial Greenbelt Plan Area into the Credit River Valley in the City of Mississauga. The purpose of this paper originates from a recommendation by the Environmental Advisory Committee to undertake such study. This recommendation was subsequently included in the Terms of Reference for the Natural Heritage and Urban Forest Strategy.

On April 28, 2010 Mississauga City Council adopted the following resolution:

1. That City Council support, in principle, the addition of public lands in the Credit River Valley to the Provincial Greenbelt to ensure these valuable lands are preserved and protected.

2. That prior to requesting the Region to make application to the Province of Ontario for Growing the Greenbelt, staff, in consultation with Region of Peel and Credit Valley Conservation (CVC), carry out a feasibility analysis of Growing the Greenbelt and report back to the Environmental Advisory Committee; and the report should specifically include:
   a. the location of City and CVC owned lands within the Credit River valley in the City of Mississauga that may be suitable for Provincial Greenbelt designation; and
   b. an analysis of the implications of the Provincial Greenbelt designation for City and CVC owned lands with respect to recreational uses, facilities and infrastructure.

Since the upper reaches of the Etobicoke Creek extends into Caledon and is included within the Greenbelt Plan Area, this report also assesses the implications of extending the Provincial Greenbelt Plan along this river valley in addition to the Credit River valley.

2.0 THE GREENBELT PLAN

2.1 GREENBELT PLAN OVERVIEW

The Greenbelt Plan identifies "where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions". It applies not only to large areas of farmland and countryside, but also to significant natural heritage features and areas.

The vision of the Greenbelt plan is for a band of permanently protected land which:
- Protects against loss of agricultural land;
- Gives protection to the natural heritage and water resources; and
- Provides for a diverse range of economic and social activities associated with rural communities, agricultural, tourism, recreation and resource uses.

Within the Greenbelt Plan, the significant natural heritage features and areas are protected from development through policies on key natural heritage features (KNHFs) and key hydrologic features (KHFs).

The Greenbelt Plan also identifies a Natural Heritage System, which is intended to include areas within the Protected Countryside with the highest concentration of the most significant natural features and functions. The intent is further to manage this area as a connected and integrated natural heritage system. However, outside of the KNHFs and KHFs the full range of existing and new agricultural, agricultural related, and normal farm practices are permitted, as well as non-agricultural uses with limitations on coverage and the proportion of the developable area on a site.

Within Peel Region, the Greenbelt Plan Area encompasses a large swath of land in the northern half of the Town of Caledon. It then extends as "fingers" south along a series of stream corridors in the rural part of the Town of Caledon and the City of Brampton to the limits of the existing urban area boundaries. From that point south, through the existing urban area, it is shown in dotted lines as "River Valley Connections (outside the Greenbelt)" along the Etobicoke Creek, and Credit River corridors (as shown in **Figure 1**).

These River Valley Connections are discussed in Section 3.2.5 of the Greenbelt Plan. This section states that,

"The river valleys that run through existing or approved urban areas and connect the Greenbelt to inland lakes and the Great Lakes are a key component of the long-term health of the Natural System. In recognition of the function of the urban river valleys, municipalities and conservation authorities should:

1. *Continue with stewardship, remediation and appropriate park and trail initiatives which maintain and, to the extent possible, enhance the ecological features and functions found within these valley systems;*
2. *In considering land conversions or redevelopments in or abutting an urban river valley, strive for planning approaches that:*
   a) *Establish or increase the extent or width of vegetation protection zones in natural self- sustaining vegetation, especially in the most ecologically sensitive areas (i.e. near the stream and below the stable top of bank);*
   b) *Increase or improve fish habitat in streams and in the adjacent riparian lands;*
   c) *Include landscaping and habitat restoration that increase the ability of native plants and animals to use valley systems as both wildlife habitat and movement corridors; and*
   d) *Seek to avoid, minimize and/or mitigate impacts associated with the quality and quantity of urban run-off into the valley systems; and*
3. *Integrate watershed planning and management approaches for lands both within and beyond the Greenbelt."*

2.2 GROWING THE GREENBELT

In 2008, the Province released criteria to be used in considering municipal requests for expanding the Greenbelt Plan. The report, *Growing the Greenbelt*, establishes the process and criteria under which the Greenbelt Plan can be expanded. Municipalities can request the Province to expand the Greenbelt Plan, but the authority to amend the Greenbelt Plan lies only with the Lieutenant Governor, who can approve amendments to the plan, on the recommendation of Cabinet, that have been proposed by the Minister of Municipal Affairs and Housing.

The criteria and the process to consider requests to grow the Greenbelt are based on the following principles:

- *"Reductions or deletion to the Greenbelt area will not be considered.*
- *Land in the Greenbelt will not be swapped or traded for land outside the Greenbelt.*
- *The mandated 10-year Greenbelt Plan review is not replaced. The plan's policies and mapping will be subject to comprehensive review by 2015.*
- *The ability of the Minister to propose other amendments is not affected.*
- *The legislated Greenbelt amendment process remains unchanged, only the Minister of Municipal Affairs can propose amendments, and only the Lieutenant Governor, on the recommendation of Cabinet, can approve amendments."*

The six criteria that a municipality must demonstrate in their submission through a detailed proposal and supporting information (i.e. maps and reports), and that the Ministry of Municipal Affairs and Housing will consider, are:

1. *"The request is from a regional, county or single-tier municipal government and is supported by a council resolution. In a region or county, the lower-tier host municipality (or municipalities) in*

the proposed expansion area supports the request through a council resolution…The municipality documents [s]how it has addressed the Ministry of Municipal Affairs and Housing's expectations for:

- *Engagement with the public, key stakeholders, and public bodies such as conservation authorities, including notification of affected landowners.*
- *Engagement with Aboriginal communities."*

2. *"The request identifies an expansion area that is adjacent to the Greenbelt or demonstrates a clear functional relationship to the Greenbelt area and how the Greenbelt policies apply."*
3. *"The request demonstrates how the proposed expansion area meets the intent of the visions and one or more of the goals of the Greenbelt Plan."*
4. *"One or more of the Greenbelt systems (Natural Heritage System, Agricultural System and Water Resource Systems) is identified and included in the propose expansion area and their functional relationship to the existing Greenbelt system is demonstrated."*
5. *"The proposed area for expansion cannot impede the implementation of the Growth Plan. The municipalities must demonstrate how the expansion area supports the goals, objectives and targets of the Greenbelt Plan and Growth Plan. Expansions to the Greenbelt plan will be considered for areas that are outside existing settlement areas. An exception may be considered for major natural heritage systems that are located within the existing urban settlement areas. The natural heritage system must be designated within the municipal official plan."*
6. *"A municipality's request to expand the Greenbelt may be considered by the Ministry of Municipal Affairs and Housing while complementary provincial initiatives area being developed. The request has to demonstrate that the proposed expansion area will not undermine provincial interests, or the planning or implementation of complementary provincial initiatives (e.g. Source Protection Plan under the Clean Water Act, 2006, Metrolinx's Regional Transportation Plan, proposed lake Simcoe Protection Strategy)."*

With regards to the fifth criteria, the report states that lands designated for public parks and recreation uses, such as sports fields, that make up part of the urban community would not be considered part of the natural heritage system that could be incorporated into the Greenbelt Plan area. This point however seems to be contradicted by Amendment #1 for the new Urban River Valley designation, which indicates that the policies of Section 3.3 of the Greenbelt Plan would apply. Section 3.3 applies to parkland, open space and trails and states that municipalities should provide for a full range of publicly accessible built and natural settings for recreation. Provincial staff have clarified that active recreational uses such as sports fields are permitted in the Urban River Valley designation of the Greenbelt Plan if the municipality's Official Plan permits the use. However, the Provincial staff cautioned that the City may not want to include lands used for active recreation where the City may want to intensify those active recreational uses as such intensive uses may not be compatible with long term vision for the Greenbelt Plan Area

2.3 GREENBELT PLAN AMENDMENT #1

Greenbelt Plan Amendment #1 was approved on January 9, 2013. The intent of the Amendment is to allow for the inclusion of publicly owned lands in the urban river valleys into the Greenbelt Plan Area. Urban river valleys are valleys that traverse the existing urban areas generally south of the Greenbelt Plan Area and link to river valleys that are located generally north of the existing urban area. This would appear to apply to those areas referenced above as "River Valley Connections". In Mississauga, this would include the Credit River and Etobicoke Creek.

The Greenbelt Plan is not clear on what "publicly owned lands" can and cannot be included in the Urban River Valleys. The only publically owned lands that are currently designated as "Urban River Valley" within the Greenbelt Plan are Provincially owned lands in North Oakville within and adjacent to Bronte Creek north of Dundas Street and south of Highway 407. Since the Oakville lands are all Provincially owned lands, it would appear that any publicly owned lands could be included if the agency responsible

for the lands is willing. Provincial staff confirmed that any publicly owned lands can be included in the Urban River Valley designation provided the government or agency responsible for the lands is agreeable.

Greenbelt Plan Amendment #1 adds a new Section 6.0 to the Greenbelt Plan which sets the policy framework for the new designation of Urban River Valley. The lands within the Urban River Valley are to be governed by the applicable municipal official plan policies provided they have regard to the objectives of the Greenbelt Plan. Infrastructure is permitted subject to the Environmental Assessment Act. The use and operation of existing municipal infrastructure in the urban river valleys including stormwater management ponds would continue to be governed by municipal official plan policies and current municipal practices.

The Amendment also states that the Protected Countryside policies of the Greenbelt Plan do not apply except for the policies on external connections in Section 3.2.5 and the policies on parkland, open space and trails in Section 3.3.

The policies in Section 3.2.5 have been described above. The policies in Section 3.3 are rather general and are largely encouraging rather than prescriptive policies and encourage the development of a system of parkland, open space and trails for recreation and to support the connectivity of the Natural Heritage System, and set out policies to encourage municipal parkland and open space strategies and municipal trail strategies.

Other than the lands in North Oakville added through Amendment #1, additional lands would have to be added through further amendment and regulation.

3.0 ONTARIO GREENBELT ALLIANCE REPORT

The Ontario Greenbelt Alliance prepared a report on the Greenbelt expansion titled *Good Things Are Growing in Ontario – Expanding Ontario's Greenbelt Through Urban River Valleys* (February, 2013). The report recommends that the process be initiated to include the areas around the urban river valleys in Toronto, Mississauga, Brampton, Oakville, Guelph, Markham, and Hamilton as Greenbelt under the Urban River Valley Designation on the basis that it provides "*connect[*ion*] to the natural spaces and working farmland that are essential to the environmental social and cultural health of the communities across the Greater Golden Horseshoe*." (p. 34). Specific to Mississauga, the reports identifies two benefits of designating the Credit River as part of the Greenbelt. Doing so would "*bridge a connection between southern Ontario's green space and agricultural lands and one of Canada's fastest growing and most diverse populations"* (p.16) and "*encourage residents to see their city in a new light, not just as a growing urban center but one that is connected to the natural world through a river in need of protection"* (p.16). The report is vague in its approach, does not discuss the specific Greenbelt policies in any detail nor outline any precise benefits or any possible downfalls to adding the Credit River Valley or the other major river valleys in Mississauga to the Greenbelt Plan. However, as discussed later in this report, including lands in Mississauga in the Greenbelt Plan may help to raise the profile of the urban river valley and public awareness of their importance.

4.0 OTHER MUNICIPAL APPROACHES TO THE GREENBELT EXPANSION

4.1 OAKVILLE

The Town of Oakville explored the issue of expanding the Greenbelt Plan into the urban area in a report dated October 11, 2011 (PD-040-11). They found that there is merit in maximizing the protection of natural environmental areas but that the Greenbelt Plan was not the right tool at that time for the following reasons:

- *At a fundamental level, the Greenbelt policies are suited to a rural agricultural context and not*

appropriate for the urban area;

- *Oakville's vision for environmental protection and orderly urban development does not meet the intent of the rural and agricultural vision of the Greenbelt Plan;*
- *The Greenbelt policies could permit the introduction of agricultural land uses and aggregate operations within the urban area which could result in diminished environmental protection for Oakville's natural environment;*
- *If agricultural land uses and aggregate operations were permitted to establish, the town might not be able to regulate these uses adequately in order to maintain the existing levels of environmental protection provided by current land use policy and regulation; and*
- *There would be inflexibility, conflict and inconsistency implementing existing local official plan policies if Greenbelt policies were introduced.*

However, the report noted that the matter should be re-examined if policies appropriate for an urban context area were introduced into the Greenbelt Plan. One of the report recommendations was that,
"the Minister of Municipal Affairs and Housing be requested to amend the Greenbelt Plan to introduce policies that address the urban context including limitations on the full range of existing and new agricultural, agricultural-related, secondary uses, normal farm practices and mineral aggregate operations."

The Province's subsequent Amendment #1 to the Greenbelt Plan, which was passed on January 9, 2013, would appear to have addressed the Town's concerns.

4.2 TORONTO

Prior to the introduction of the Greenbelt Plan Amendment #1, the City of Toronto investigated the possibility and suitability of designating portions of the Don and Humber River Valleys as part of the Greenbelt Plan. Although portions of these river's valleys met the criteria to be designated as such, it was concluded that this would be inappropriate as the policies were designed for rural areas not valleys in urban areas. For example, additional infrastructure costs would have been required as some of the storm water management ponds planned for these areas could not be built, and more costly alternatives would be required. It was concluded that it was unsuitable to designate the river valleys in the Greenbelt Plan but that clarity should be sought during the 2015 Greenbelt Plan review as to "*how the* [Greenbelt Plan Policies] *apply to external river valley connection and the role that municipalities can play in protecting these important connections".*

According to the Province, the multiple requests received for a mechanism to protect river valleys in urban settings, initiated by the City of Toronto and the Town of Oakville, prompted the Greenbelt Plan Amendment to introduce the Urban River Valley Designation.

4.3 YORK REGION

In a letter to the Ministry of Municipal Affairs and Housing dated January 4, 2013, York Region provided a coordinated response (on behalf of itself and many of its lower tier municipalities) to the then proposed amendment to the Greenbelt Plan to create the new "Urban River Valley" designation. The following concerns with the amendment were addressed:

- *"There is confusion about what lands are intended to be included in the proposed amendment.*
- *The proposed amendment does not include detailed protection policies, and creates uncertainty about the future of the municipal role in the protection.*
- *The proposed amendment does not protect the 'system'.*
- *The proposed amendment could be perceived to diminish the importance of the protection of other lands currently protected by municipal policy.*
- *The Province has not committed funding to the long-term protection of these lands nor justification for the costs required to designate these lands."*

The letter requested that the amendment not be approved but further revisited during the 2015 Greenbelt Plan Review; however, the Province approved the proposed amendment to the Greenbelt Plan on January 9, 2013 without changes to address the above noted concerns.

4.4 CITY OF BRAMPTON

On December 27, 2012, the City of Brampton staff provided preliminary comments to the Ministry of Municipal Affairs and Housing on the Proposed Amendment #1 to the Greenbelt Plan. Their comments raised the following issues with the proposed amendment:

- "Adopting the Protected Countryside designation and policies, including those of the Natural Heritage System, in an urban area may not be appropriate. The Protected Countryside designation and policies are intended for rural areas would permit uses (i.e. agriculture and aggregate operations) that are not permitted by current Official Plan policies, and may also affect the provision of municipal infrastructure and services necessary to support a growing city. [Staff is] concerned that if the Greenbelt polices are not clarified, urban municipalities would not be able to regulate land uses in accordance with existing Official Plan policies."
- "More detail on what policies and/or technical criteria, including requirements to delineate [Urban River Valley] lands, would be recommended prior to the adoption of the amendment."
- "It would be appropriate to consider amending the 2008 Greenbelt expansion criteria #2 and #4, and include criteria specific to [Urban River Valleys] to clearly identify that for urban areas the Protected Countryside policies do not apply."
- "[Staff] questions[s] the land use planning merits of adding the jurisdiction of a Provincial plan to the urban area of the City. Currently Brampton's Official Plan, comprehensive zoning by-law and conservation regulations, combined with the Region of Peel Official Plan and conservation authority regulations ensure protection of the ecological features and functions found within the valley systems, both within and outside of the Greenbelt."
- "City staff questions whether it is necessary to proceed with a limited and scoped amendment to the Greenbelt Plan at this time in advance of the more comprehensive review in 2015."

A staff report to the Planning, Design and Development Committee dated January 25th, 2013, discussed the Greenbelt Plan Amendment and the staff comments to the Ministry of Municipal Affairs and Housing. In the staff report, staff highlighted that "each time an Urban River Valley designation is considered in the City, there will be a cost to map the entity and present the proposal to the public. Furthermore, because the Urban River Valley designation applies only to publically owned lands, this will result in fragmented mapping to demonstrate the external valley connections in the Greenbelt." The staff report also indicated that the City of Brampton is currently preparing a Natural Heritage and Environmental Management Strategy, and as part this ongoing process, the viability of growing the Greenbelt through the Urban River Valley designation will be considered.

5.0 IMPLICATIONS FOR MISSISSAUGA

5.1 STATUS OF THE CREDIT RIVER AND ETOBICOKE CREEK CORRIDORS

As shown on Schedule 1, Urban System, of the Mississauga Official Plan (MOP), the entirety of the Etobicoke Creek and Credit River corridors are identified as part of the Green System (see **Figure 2** of this report).

As shown on Schedule 3 of the MOP, the Green System along these corridors is composed of lands in the City's Natural Areas System, and Natural Hazards (see **Figure 3** of this report). Within the Natural Areas System, the majority of the lands along the valleys are comprised of Natural Areas along with two large Provincially Significant Wetlands.

The Natural Areas and Natural Hazard policies in the MOP ensure that, for the most part, development will not be permitted within the Credit River and Etobicoke Creek valleys. The policies in the MOP (section 6.3.1) state that development and site alteration will not be permitted within or adjacent to lands in the Natural Areas System unless it is demonstrated, through an Environmental Impact Study, that there will be no negative impacts on natural features or their ecological functions. The Natural Hazard Lands policies in the MOP (section 6.3.2) indicate that development and site alteration will generally not be permitted, and that these lands will be designated Greenbelt in the MOP.

Schedule 4 further illustrates that a significant proportion of the corridors are recognized as Public and Private Open Space (see **Figure 4** of this report). The Public Open Space designation provides an illustration of some of the public lands that could be included in the Urban River Valley designation of the Greenbelt Plan.

Schedule 10 of the MOP **(see Figure 5** of this report) illustrates the land use designations along the Credit River and Etobicoke Creek corridors. As shown on the map, the majority of the stream corridors are designated Greenbelt in the MOP. Other land use designations include Private and Public Open Space, Parkway Belt West and Institutional. These land use designations, for the most part, provide for a narrow range of permitted uses such as conservation, passive recreation, municipal infrastructure and parks.

In addition to the policy protection for the valley lands within the MOP, the Region of Peel Official Plan identifies regionally significant Core Valley and Stream Corridors in Peel. Both the Credit River valley and the Etobicoke Creek valley are Core Areas in the Region's Greenlands System. The Region of Peel Official Plan prohibits development and site alteration within Core Areas, which provides for another layer of policy protection for lands within these valleys.

Figure 6 of this report identifies the amount of lands within these two stream corridors that are currently publicly owned. Since there is no definition in the Greenbelt Plan of what the boundary of an Urban River Valley should be, the crest of the valley slope was used as a determinative of the boundary of the river valleys. Provincial staff have confirmed that it is up to each local municipality to determine what the extent of the Urban River Valley designation should be on either side of the valley. **Figure 6** identifies all City, Peel Region, CVC, TRCA and Provincial owned lands within that area. Publicly owned lands within the Credit River valley total 466 ha with an additional 116 ha of publicly owned lands abutting the Credit River valley. Within the Etobicoke Creek valley (within Mississauga), publicly owned lands total 146 ha with an additional 99 ha of publicly owned lands abutting the Etobicoke Creek valley. A breakdown of ownership of these lands is contained in Appendix A.

As noted in Section 2.3 of this report, Amendment #1 only facilitates the addition of publicly owned lands. As one can see on this map, the publicly owned lands along the Credit River and Etobicoke Creeks are not continuous and thus any resulting Urban River designation will be scattered and not continuous. The Council direction for this study was to assess the City and CVC owned lands for inclusion into the Provincial Greenbelt. Figure 6 also shows Peel Region owned lands in the Credit River valley and TRCA owned lands in the Etobicoke Creek valley. If the City were to recommend inclusion of the publicly owned land within the Greenbelt Plan Urban River Valley designation, it would be advantageous to include as much publicly owned land as possible in order to move towards a connected designation.

Where the Credit River crosses Highway 403, there are lands within the Credit River Valley that are part of the Parkway Belt West Plan. There are Provincially owned lands within the Parkway Belt West Plan. The Greenbelt Plan states, in Section 2, that it encompasses the lands within the Oak Ridges Moraine area and the Niagara Escarpment Plan area and the Parkway Belt West Plan Area. Where lands are within the Parkway Belt West Plan Area and the Greenbelt Plan area, the requirements of the Parkway Belt West Plan Area continue to apply with the exceptions of Sections 3.2 (Natural System) and 3.3 (Parkland Open Space and Trails) of the Greenbelt Plan, which would apply. As such, the lands in the Parkway Belt West Plan Area could also be included in the Urban River Valley designation in the Greenbelt Plan.

However, the Province has indicated that some or all of these Provincial owned lands may be required for infrastructure purposes.

5.2 Pros and Cons of Extending the Greenbelt

A number of municipalities have previously identified valid planning issues with expanding the Greenbelt Plan into the urban areas due to the rural focus of the Greenbelt Plan. The Province has attempted to address those shortcomings with the new Urban River Valley designation in the Greenbelt Plan.

The implications and benefits of this new Urban River Valley designation for the City include:

- ***No policy duplication.***
  With this Urban River Valley designation, there would be no duplication in policy as the City's Official Plan policies and the City's zoning would govern the use of the lands.

- ***No rural bias.***
  The original concerns by many municipalities that a largely rural based policy structure inherent in the policies of the Greenbelt Plan would not be appropriate in an urban system, is no longer an issue as none of the Countryside policies would apply in the Urban River Valley designation.

- ***Effect on operations or maintenance of City properties***
  Since the Urban River Valley designation in the Greenbelt Plan will rely on the City's official plan policies and designations, no additional restrictions will be placed on the City's use of their lands. However, the City's actions will have to be in conformity with Section 3.3 of the Greenbelt Plan on parkland, open space and trails. The most significant implication will be on the preparation of municipal parkland and trail strategies, which will have to have regard for the consideration of Section 3.3.3.3 and 3.3.3.4. However, many of these considerations would be addressed in municipal parkland and trail strategies in any event.

- ***Effect on infrastructure in the river valleys.***
  Policy 6.2.2 of the Greenbelt Plan addresses infrastructure in the Urban River Valley designations and states that all existing, 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.

- ***Effect on other City Strategies.***
  Since the use and development of the lands in the Urban River Valleys are to be governed by the policies of the Mississauga Official Plan while having regard to the policies of Section 3.3 of the Greenbelt Plan, there is unlikely to be an effect positively or negatively on the City strategies including natural heritage strategy, infrastructure or parks planning.

Including parts of the Credit River and Etobicoke Creek Valleys in the Greenbelt Plan would have some benefits to the City (although these would be more related to promotion and outreach than planning) 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;
- 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; and
- Promoting the City as the first municipality to request a Greenbelt expansion in the urban area.

However, simply including the lands on a map as part of a Provincial Plan will not increase the profile or raise awareness, it would also require promotion by the City or other public or non-governmental organizations. Additional efforts at public education will be needed to increase the profile and raise awareness, but the inclusion of the lands in the Provincial Plan could provide the rationale to do so. Provincial staff indicated that there are no financial resources available from the Province to assist in promotion or education. However, the Greenbelt Foundation may be able to assist in such promotion and outreach..

Despite these benefits, there are a number of weaknesses with the new Urban River Valley designation. These include:

- ***There are no changes to the level of policy protection;***
  The permitted uses and level of protection defers to the local official plan polices other than the general Parkland, Open Space and Trail policies of Section 3.3 of the Greenbelt Plan. From the City's operational perspective, however, there appears to be no implications for or infringements on the City's use and management of their parks, open spaces and infrastructure as they are to be governed by the policies in the current municipal official plan.

- ***It only applies to publicly owned lands;***
  In Mississauga, the publicly owned river valleys are already protected through public ownership and zoned as either Greenbelt or Open Space. Nothing is gained from the perspective of increasing the amount of protected lands as no additional lands would be protected in public ownership.

- ***The lands to be protected will be scattered and non-contiguous;***
  By excluding privately owned lands and only including publicly owned lands, the lands protected in the Urban River Valley designation will be scattered and non-contiguous. Although this non-contiguous approach will not address ecological connectivity through the Greenbelt Plan alone, the non-publicly owned river valley lands are otherwise protected through the Region's and the City's Official Plans and thereby the ecological connectivity would be achieved.

- ***Survey Details are Required to bring Parcels into the Greenbelt Plan at a cost to the City;***
  The boundary of all lands within the Greenbelt Plan are surveyed so that the exact boundaries are known. The Urban River Valley addition to the Greenbelt Plan Area in North Oakville was added through regulation with a surveyed line. The Province has confirmed that any future lands added to the Urban River Valley designation will need to follow a similar process with a surveyed line. However, the Province indicated that existing survey PINS and detailed GIS meets and bounds may suffice. However, if the City chose to include only a portion of a property into the Urban River Valley designation in the Greenbelt Plan, the dividing line between the two portions would need to be surveyed. The cost of providing the survey details will be a cost to the City, but due to the number of properties involved, it is not possible, at this time, to determine the extent of that cost.

  The Province clarified that the boundaries of the Greenbelt Urban River Valley designation on either side of the River Valleys are up to the municipality. The City could chose to include only that portion of their public lands that fall below the top-of-bank, or the City could chose to also include the adjacent table land portion of their public lands. The Province, however, cautioned that the City may not want to include publicly owned lands that are used for active recreation and where the City may want to intensify those active recreational uses as such uses may not be compatible with the future vision for the Greenbelt Plan Area.

- ***Additional lands purchased by public authorities can be brought into the Greenbelt Plan but through a new Amendment Process.***
  Additional lands purchased by the public authorities would further enhance the connectivity of the urban river valleys. However, the Province has indicated that any future expansions to include additional public lands would have to go through the same process with an amendment required to the Greenbelt Plan boundary. Undertaking repeated requests by the Region to the Province would be onerous and time consumptive of staff resources.

5.3 CRITERIA TO EXPAND THE GREENBELT

To include the lands within the Greenbelt Plan, the request must come from the Region of Peel based on a demonstration that the Province's six criteria for expanding the Greenbelt can be met.

Criteria 1: The request must be made by the Region of Peel and must demonstrate that the municipality has undertaken appropriate consultation with key stakeholders, public bodies, and Aboriginal communities.
This engagement process would need to be undertaken and documented, and would be a cost to the City and Region.

Criteria 2: The expansion is to be located adjacent to the Greenbelt or demonstrates a clear functional relationship.
By selecting only publicly owned lands, a patchwork will be created and as a result, many of the parcels will not be located adjacent to the Greenbelt. However, they would have functional relationship to the Greenbelt by virtue of being within a stream corridor that connects north to the Greenbelt Plan Area. As well, coordination with the City of Brampton and the City of Toronto (along Etobicoke Creek) would be needed to ensure a fully connected Urban River Valley designation. However, Provincial staff have indicated that the City of Mississauga could bring their publicly owned lands into the Urban River Valley designation without the need for either the City of Brampton or the City of Toronto to include their publicly owned lands.

Criteria 3: The request is to show how it meets the intent of the visions and one or more goals of the Greenbelt Plan.
The vision of the Greenbelt Plan is to give permanent protection to the natural heritage system and the goals are to protect and restore connections between Lake Ontario, the Oak Ridges Moraine, the Niagara Escarpment and the major river valleys. While in theory this vision and the goals will be furthered, this vision and the goals are being achieved today as the lands are already protected in public ownership and are protected through Official Plan policies and zoning by-laws associated with the green system, including the existing natural heritage system (and enhanced by the proposed recommendations of the ongoing NH&UFS). However, Provincial staff indicated that a further benefit is the permanence of the Greenbelt Plan designation.

Criteria 4: One or more of the Greenbelt systems are identified.
The lands along the Credit River and Etobicoke Creek would be part of the Greenbelt Natural Heritage System, but it is important to recognize that a continual natural heritage system would not be created through this designation, as privately owned lands in the river valleys would not be included.

Criteria 5: The proposed area for expansion cannot impede the implementation of the Growth Plan.
The lands are already designated for environmental protection and are in public ownership so there should be no impact on the Growth Plan.

Criteria 6: The request cannot undermine provincial interests or other provincial initiatives.
Since the Urban River Valley designation applies only to public owned lands that are already protected from development, it is unlikely that it would affect any other provincial initiatives.

6.0 CONCLUSION

The Province, in 2008, set out a process and criteria for expanding the Greenbelt Plan Area. A number of largely urban municipalities investigated the potential. The City of Mississauga supported in principle the addition of publicly owned lands in the Credit River Valley subject to staff undertaking a feasibility analysis of adding public lands in the Credit River Valley to the Greenbelt.

Other municipalities found that the policy framework in the Greenbelt Plan was not conducive to being applied in an urban setting. The Province responded with Amendment #1 to the Greenbelt Plan approved in January 2013. This amendment was intended to address some of the short-comings of applying the Greenbelt Plan to urban areas as identified by other municipalities and introduced a new Urban River Valley designation in the Greenbelt Plan.

From our review of the new Urban River Valley designation, there would appear to be no policy-related benefits from expanding the Urban River Valley designation into Mississauga and including publicly owned lands into this designation as it will not result in any increased protection of natural heritage features. There may also be costs associated with implementing the designation including potential survey requirements and the costs of consultation and report preparation, although these costs are not certain at this time. However, including parts of the urban river valleys into the Greenbelt Plan would offer benefits including elevating the profile of the lands through their inclusion in a Provincial Plan, and raising awareness of the role of the urban river valleys in supporting connection to a larger, regional natural heritage system.

This discussion paper concludes that it is feasible to expand the boundaries of the Greenbelt Plan into the City of Mississauga using the new Urban River Valley designation of the Greenbelt Plan. It is recommended that, with the benefit of this Discussion Paper on the feasibility analysis, the City make a final decision on whether it is desirable to expand the Greenbelt Plan into the City.

If the City chooses to request the Greenbelt Plan expansion, the Provincial process for including publicly owned lands in the Urban River Valley designation entails consultation with the public, agencies and Aboriginal groups. It is recommended that the City, Region and Province agree on the scope and extent of that consultation before proceeding. The Province also requires the City to complete, and provide to the Region of Peel, a detailed justification report, demonstrating that the 6 criteria, outlined in Section 5.3 above, can be met,. The Province further requires a resolution from both the City and Regional Councils requesting the Greenbelt Plan expansion. Allocation of City of Mississauga resources (staff costs) will be necessary to carry out the appropriate consultation and required reporting.

Figure 1: Greenbelt in Peel Region

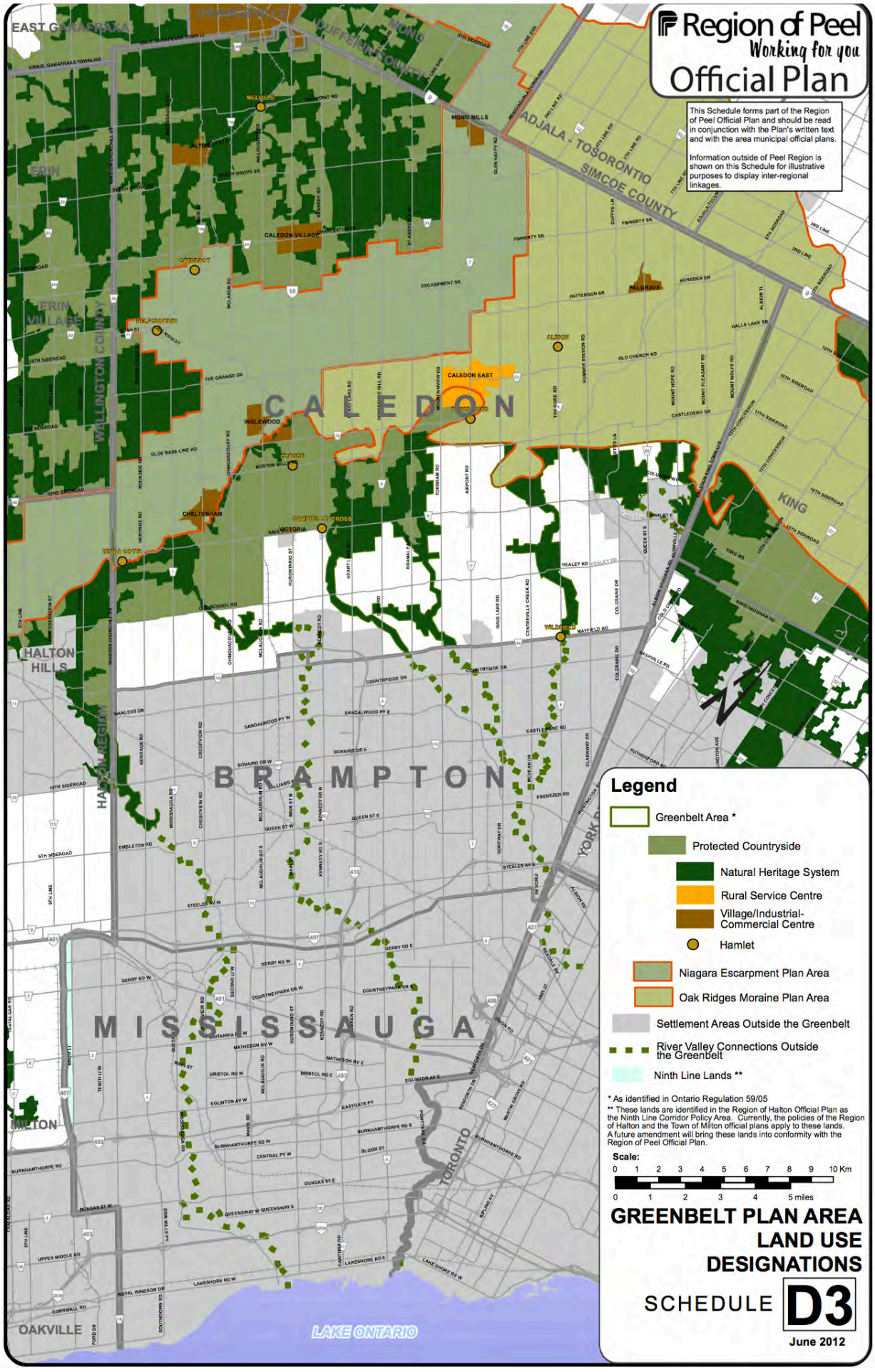


Figure 2: Mississauga Official Plan Schedule 1 – Urban System

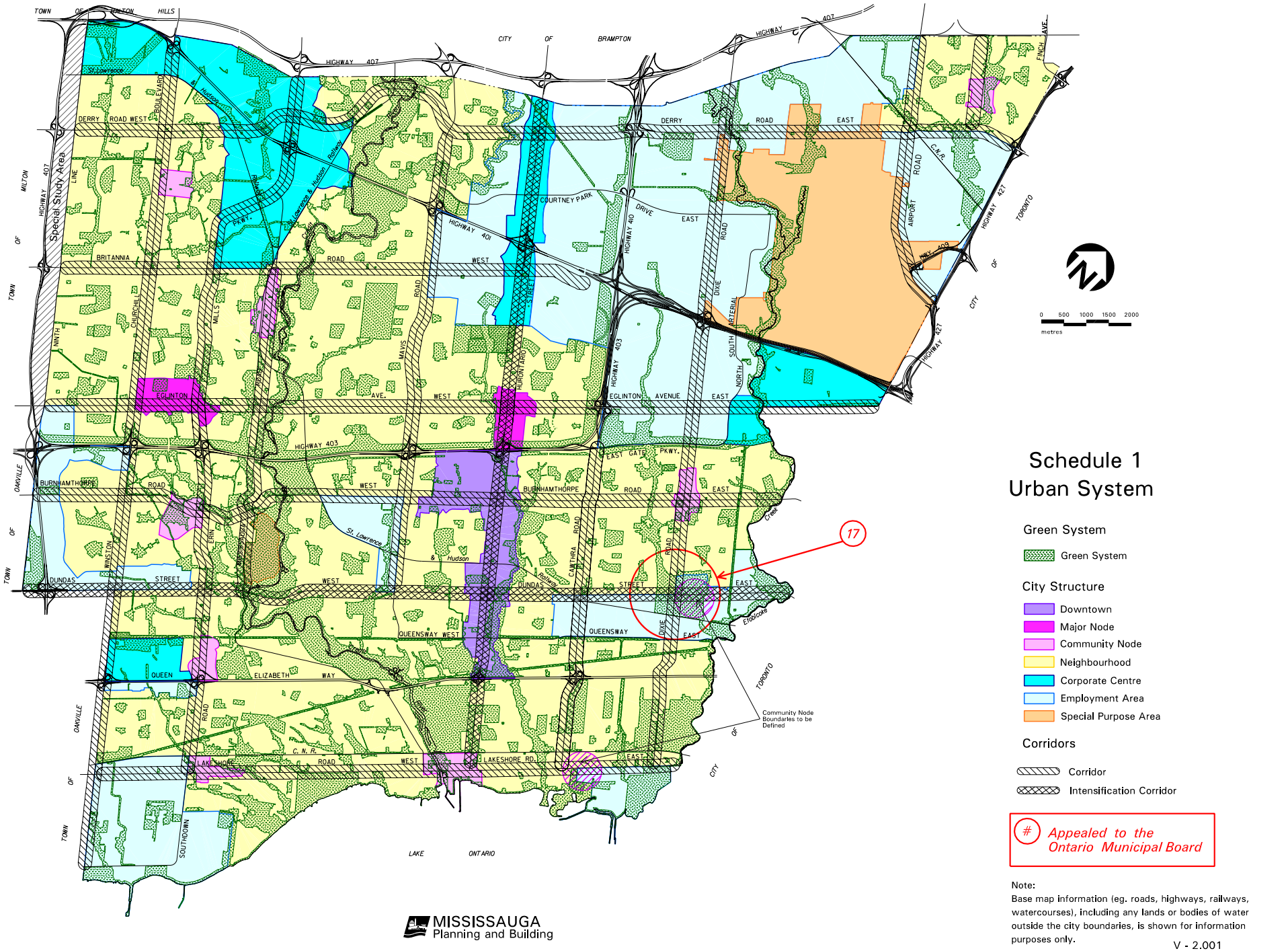
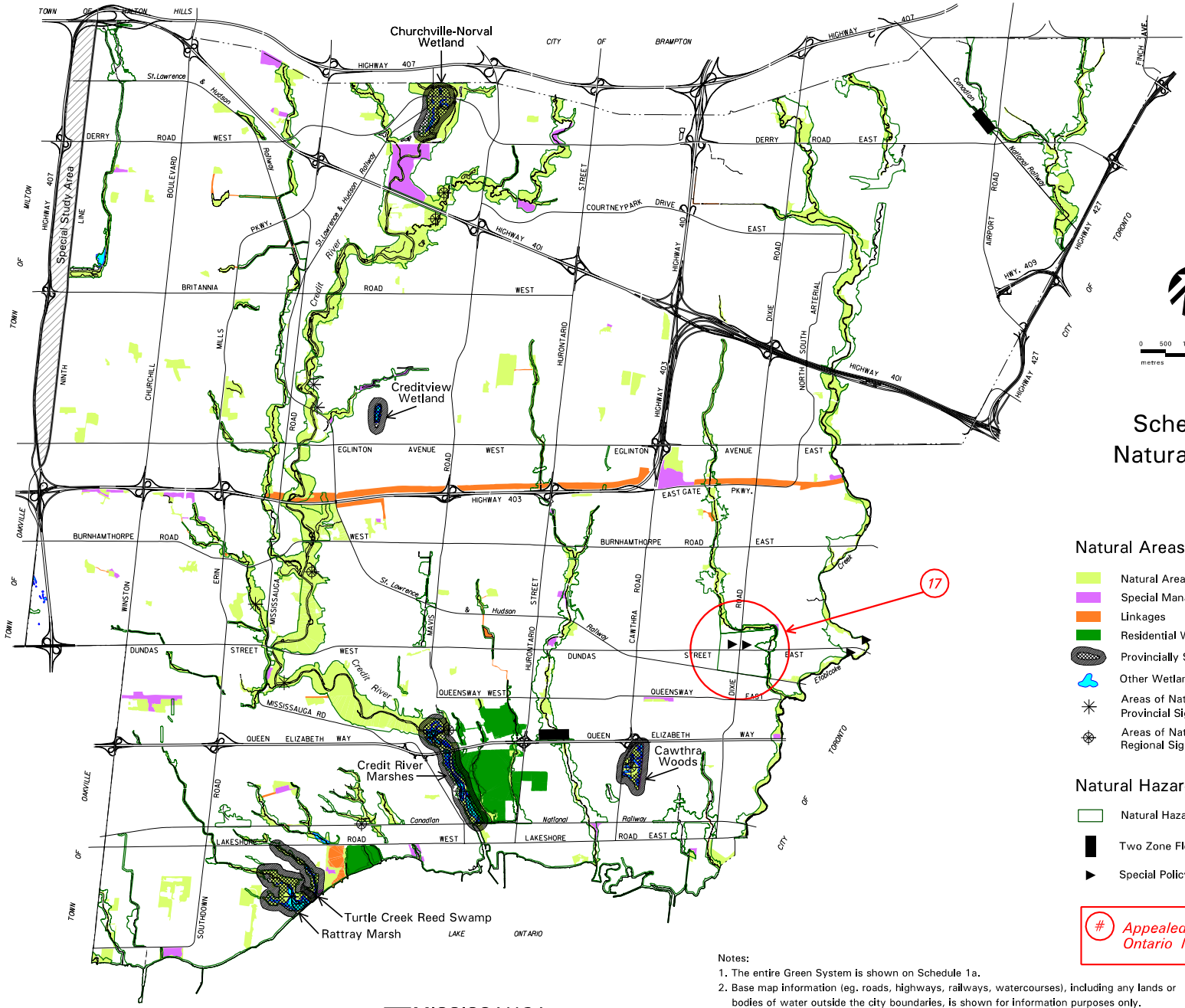


Figure 3: Mississauga Official Plan Schedule 3 – Natural System



Schedule 3
Natural System

Natural Areas System:

- Natural Areas
- Special Management Areas
- Linkages
- Residential Woodlands
- Provincially Significant Wetlands
- Other Wetlands
- Areas of Natural and Scientific Interest - Provincial Significance
- Areas of Natural and Scientific Interest - Regional Significance

Natural Hazards:

- Natural Hazards
- Two Zone Floodplain Regulations
- Special Policy Area Floodplain

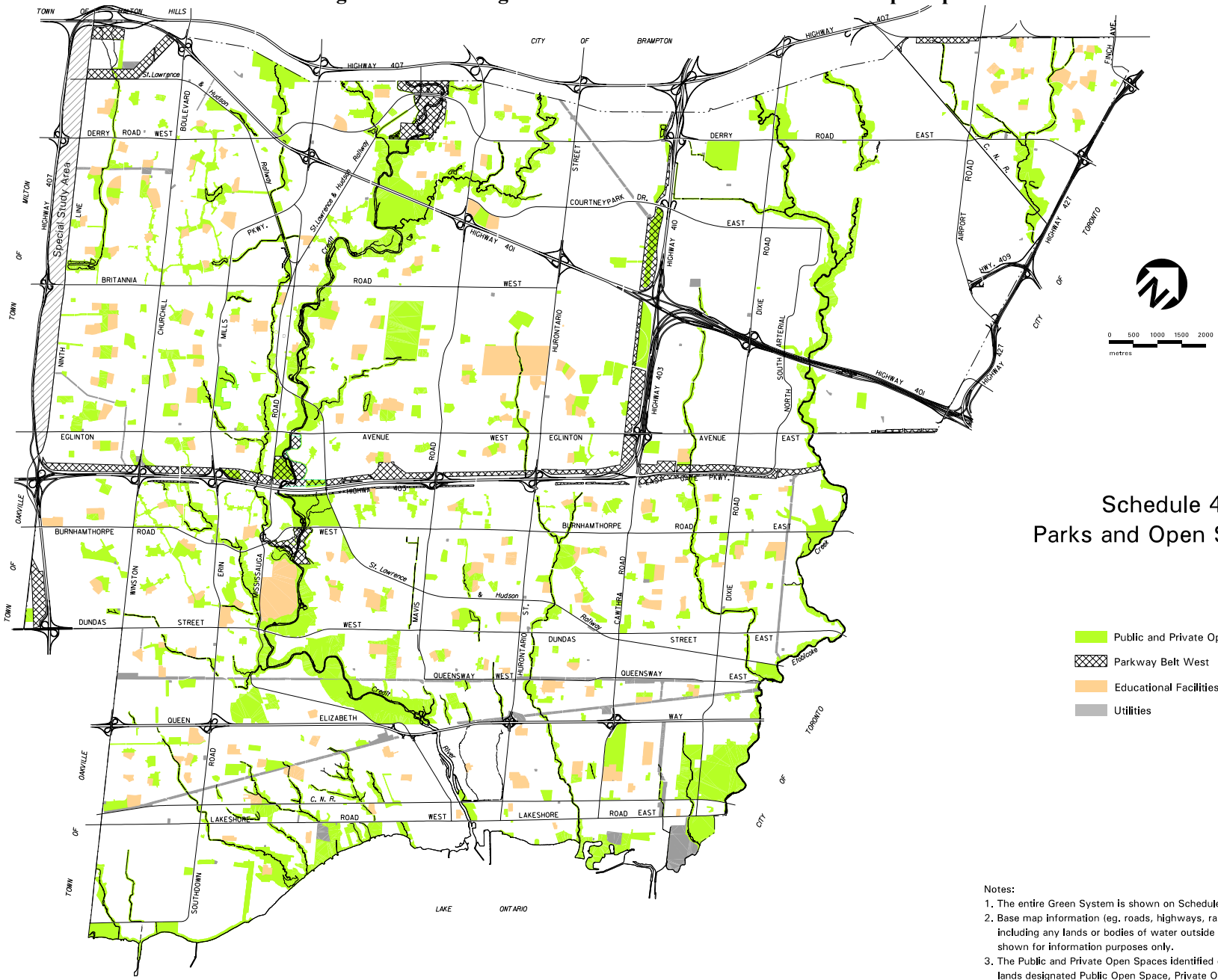
(#) *Appealed to the Ontario Municipal Board*

MISSISSAUGA
Planning and Building

Notes:
1. The entire Green System is shown on Schedule 1a.
2. Base map information (eg. roads, highways, railways, watercourses), including any lands or bodies of water outside the city boundaries, is shown for information purposes only.
3. The limits of the Natural Hazards shown on this Schedule are for illustrative purposes only. The appropriate Conservation Authority should be consulted to determine their actual location.

V - 2.001

Figure 4: Mississauga Official Plan Schedule 4 – Parks and Open Space



Schedule 4
Parks and Open Spaces

- Public and Private Open Spaces
- Parkway Belt West
- Educational Facilities
- Utilities

MISSISSAUGA
Planning and Building

Notes:
1. The entire Green System is shown on Schedule 1a.
2. Base map information (eg. roads, highways, railways, watercourses), including any lands or bodies of water outside the city boundaries, is shown for information purposes only.
3. The Public and Private Open Spaces identified on this Schedule include lands designated Public Open Space, Private Open Space and Greenbelt as shown on Schedule 10.

V - 2.001

Figure 5: Land Use Designations

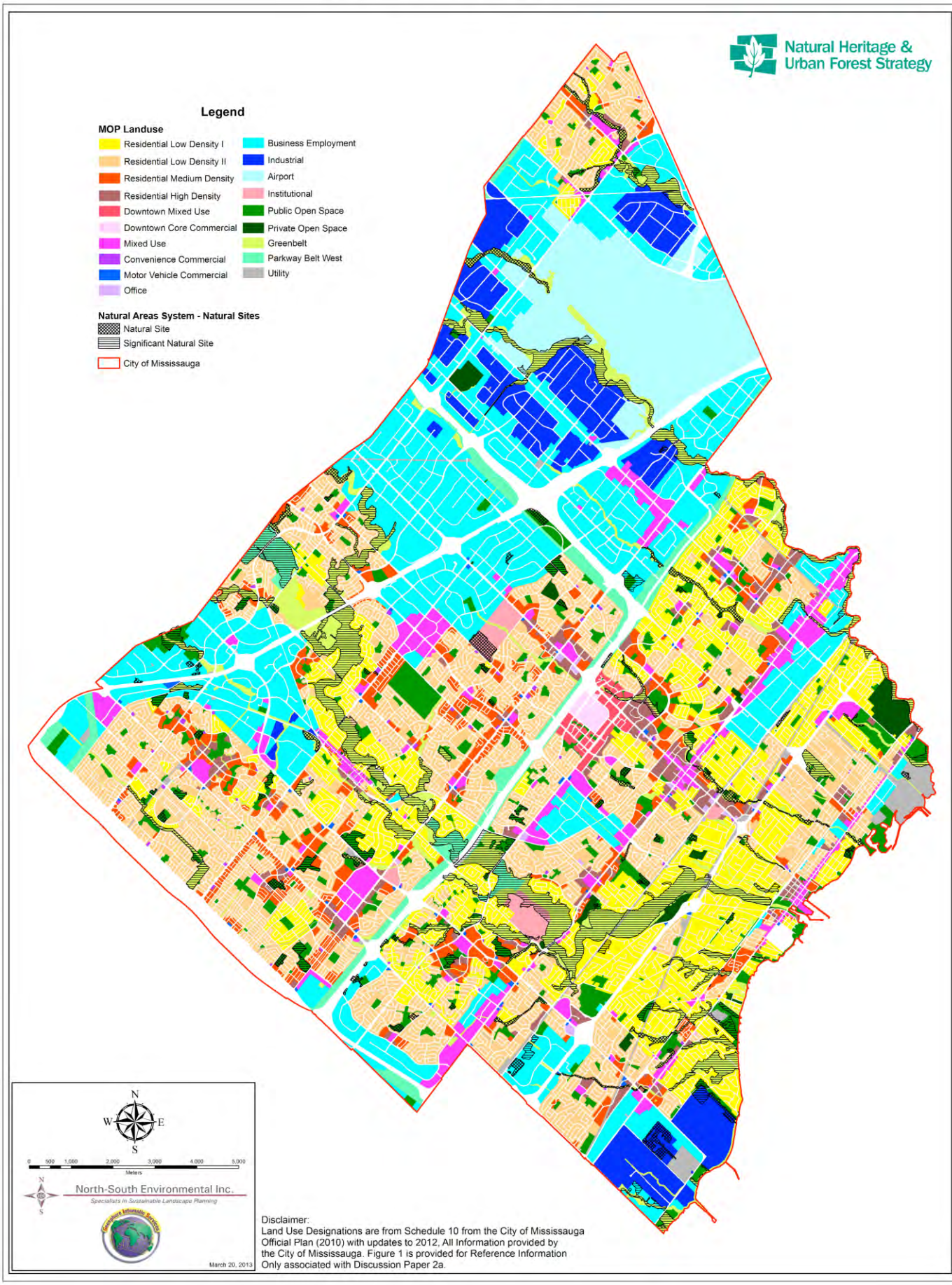
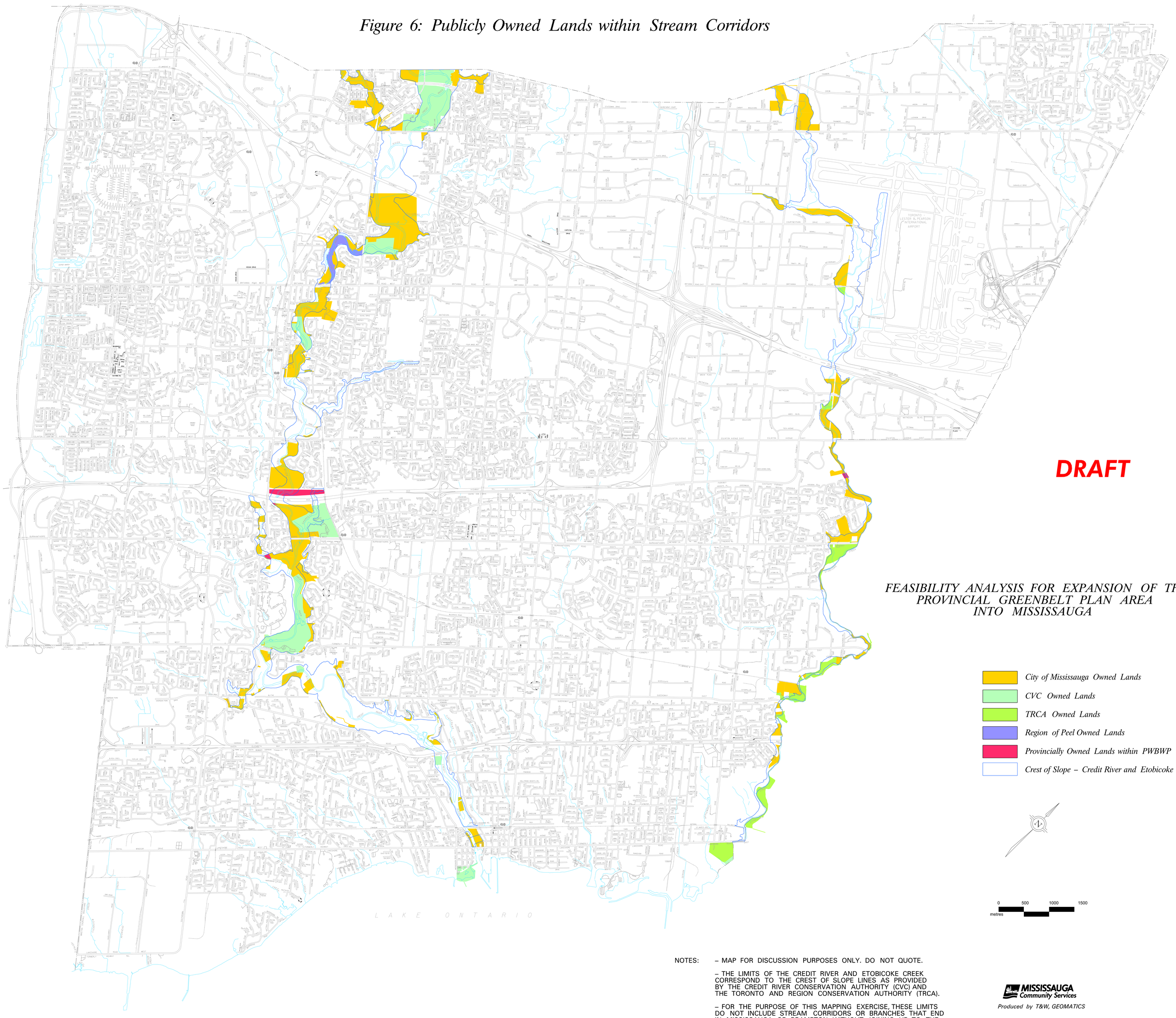


Figure 6: Publicly Owned Lands within Stream Corridors



DRAFT

FEASIBILITY ANALYSIS FOR EXPANSION OF THE PROVINCIAL GREENBELT PLAN AREA INTO MISSISSAUGA

- *City of Mississauga Owned Lands*
- *CVC Owned Lands*
- *TRCA Owned Lands*
- *Region of Peel Owned Lands*
- *Provincially Owned Lands within PWBWP*
- *Crest of Slope – Credit River and Etobicoke Creek*

0 500 1000 1500
metres

NOTES:

– MAP FOR DISCUSSION PURPOSES ONLY. DO NOT QUOTE.

– THE LIMITS OF THE CREDIT RIVER AND ETOBICOKE CREEK CORRESPOND TO THE CREST OF SLOPE LINES AS PROVIDED BY THE CREDIT RIVER CONSERVATION AUTHORITY (CVC) AND THE TORONTO AND REGION CONSERVATION AUTHORITY (TRCA).

– FOR THE PURPOSE OF THIS MAPPING EXERCISE, THESE LIMITS DO NOT INCLUDE STREAM CORRIDORS OR BRANCHES THAT END IN MISSISSAUGA OR BRAMPTON WITHOUT JOINING UP TO THE EXISTING GREENBELT.

MISSISSAUGA Community Services

Produced by T&W, GEOMATICS

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Appendix A: Ownership breakdown on Public lands

Credit River

Owner	Within Credit River (ha)	Abutting Credit River (ha)
City of Mississauga	277.17 ha	73.60 ha
Credit Valley Conservation Authority (CVC)	166.46 ha	36.67 ha
Toronto and Region Conservation Authority (TRCA)	0	0
Region of Peel	15.11 ha	0.08 ha
Lands in Provincial PWBWP	7.44 ha	5.24 ha
TOTAL	**466.18 ha**	**115.59 ha**

Etobicoke Creek

Owner	Within Etobicoke Creek (ha)	Abutting Etobicoke Creek (ha)
City of Mississauga	103.22 ha	32.81 ha
Credit Valley Conservation Authority (CVC)	24.62 ha	17.98 ha
Toronto and Region Conservation Authority (TRCA)	17.62 ha	47.35 ha
Region of Peel	0	0
Lands in Provincial PWBWP	0.40 ha	0.55 ha
TOTAL	**145.86 ha**	**98.69 ha**

Source: City of Mississauga, CVC, TRCA, Region of Peel.

Important Note: Area calculations are preliminary and approximate. Data are provided for discussion purposes only.

Corporate Report

Clerk's Files

Originator's Files

DATE: November 15, 2013

TO: Chair and Members of Environmental Advisory Committee
Meeting Date: December 10, 2013

FROM: Paul A. Mitcham, P.Eng., MBA
Commissioner of Community Services

SUBJECT: **Gasoline Pump Warning Labels**

RECOMMENDATION: That the City of Mississauga not pass a by-law that requires gasoline retailers to place climate change warning labels on the handles of gasoline pump nozzles.

REPORT HIGHLIGHTS:

- In February 2013, and again in May 2013, a number of Councillors received emails from Mississauga residents containing a form letter lobbying Councillors to pass a by-law that requires gasoline retailers to place climate change warning labels on the handles of gasoline pump nozzles.
- The form letters are part of a "warning labels on gas pumps" campaign developed by Our Horizon. Our Horizon claims that municipalities across Canada are in a position to create by-laws requiring these warning labels and will be releasing their legal research to that effect.
- According to staff from Legal Services, City Manager's Department, the campaign does not appear to have the required municipal purpose for a by-law to be authorized under the powers listed in section 11 of the *Municipal Act, 2001*.

BACKGROUND:

In February 2013, and again in May 2013, a number of Councillors received emails from Mississauga residents containing a form letter lobbying Councillors to pass a by-law that requires gasoline retailers to place climate change warning labels on the handles of gasoline pump nozzles. The form letter was created by an environmental not-for-profit organization named Our Horizon. The website ourhorizon.org encourages residents to send this form letter to their municipal representatives.

Correspondence on this item was referred to the Environmental Advisory Committee (EAC). At the March 5, 2013 EAC meeting, EAC passed a motion that the matter be referred to staff for further review.

PRESENT STATUS:

The form letters are part of a "warning labels on gas pumps" campaign developed by Our Horizon. The campaign encourages municipalities to pass a by-law making it mandatory for gasoline retailers to place warning labels on their gas pumps. These warning labels will display messaging regarding the use of fossil fuels and the impacts on climate change similar to warning labels on cigarette packages regarding the hazards of smoking. The labels would be created by local school children. Our Horizon believes that the labels will change behaviour and drivers will opt for more fuel-efficient vehicles or take other modes of transportation.

Our Horizon claims that municipalities across Canada are in a position to create by-laws requiring these warning labels and will be releasing their legal research to that effect. According to the Our Horizon website, release of their legal research specific to Ontario was to be released on September 6, 2013. At the time of writing this report, the legal research has not been released for Ontario or any other province or territory.

Our Horizon has made presentations to many municipalities and organizations including the Greater Toronto Area Clean Air Council of which the City of Mississauga is a member. A number of organizations have endorsed the campaign by supporting the following statement "Our burning of fossil fuels contributes to climate change. We support the idea of putting warning labels on gasoline pump

nozzles." Staff is not aware of any municipalities that have endorsed the campaign or that have passed by-laws requiring warning labels on gasoline pump nozzles.

Our Horizon is currently on a cross-Canada tour to present the campaign to elementary schools, high schools, universities and community organizations. Their goal is to return to Toronto near the end of 2013 with thousands of labels designed by school children and to present these to City Councils.

COMMENTS:

Staff from Legal Services, City Manager's Department, was consulted and provided the following comments.

The City must have statutory authority to pass a by-law. Legal research did not find any specific statutory authority authorizing municipalities to pass a by-law relating to warning labels on gas pumps.

There are areas of broad powers under section 11 of the *Municipal Act, 2001* that a gas pump by-law may arguably be classified. However, the broad powers are not to be interpreted as open and limitless. The Supreme Court of Canada has set limits on how broadly these provisions can be interpreted and, at its core, the provisions must be read in light of a municipal purpose. In other words, there must be a particular issue that relates to the municipality as a local entity and not as a member of the broader polity.

While the issue of climate change has a local aspect to it, that alone is not determinative of whether the matter has a municipal purpose. There must be an identifiable benefit to the inhabitants of the municipality and be closely related to the immediate interests of the community within the boundaries of that municipality.

The City already encourages other behaviour changes to mitigate the effects of climate change including promotion of the use of alternative transportation, energy and water conservation, and enforcement of the Idling Control By-law. The City also makes it easy for residents to get involved in environmental action through campaigns such as Let Your

Green Show, information provided through the Living Green website and Twitter channel and presence at community events.

FINANCIAL IMPACT: Not applicable.

CONCLUSION: A gas pump labelling by-law will likely be construed by the court as an attempt by the City to address climate change issues, which is a matter of a national and international nature rather than one that directly affects the local nature of a municipality. As worthy a goal as the campaign may be, it does not appear to have the required municipal purpose for a by-law to be authorized under the powers listed in section 11 of the *Municipal Act, 2001.*

In response to EAC's motion to further review the emails received by Councillors encouraging the City of Mississauga to pass a by-law making it mandatory for gasoline retailers to place warning labels on their gas pumps, staff do not recommend this as a method to encourage behaviour change related to climate change.



Paul A. Mitcham, P.Eng., MBA
Commissioner of Community Services

Prepared By: Andrea J. McLeod, Environmental Specialist

Corporate Report

Clerk's Files

Originator's Files

DATE: November 22, 2013

TO: Chair and Members of Environmental Advisory Committee
Meeting Date: December 10, 2013

FROM: Paul A. Mitcham, P.Eng., MBA
Commissioner of Community Services

SUBJECT: **Bottled Water in City Facilities**

RECOMMENDATION:

1. That the City of Mississauga continue with its existing practices to increase access to tap water in City facilities and at events on City property; support the Region of Peel's tap water promotion campaign; participate in the Blue W Program; and encourage staff to use reusable beverage containers.

2. That the City of Mississauga not pursue a ban on single-use bottled water in City facilities at this time.

REPORT HIGHLIGHTS:

- Mississauga Council received a deputation on July 3, 2013 regarding a municipal ban on the use of bottled water and referred the matter to the Environmental Advisory Committee.
- The City of Mississauga supports reduced use of single-use bottled water by: participating in the Blue W Program; increasing access to tap water in City facilities by installing water filling stations; and implementing as corporate practice, staff use of reusable containers for water.
- Municipalities implement a wide variety of approaches to reducing water bottle use.
- The City takes a balanced approach to reducing water bottle use.

BACKGROUND:

On July 3, 2013, City of Mississauga Council received a deputation regarding a municipal ban on the use of single-use plastic bottled water. Council referred the matter to the Environmental Advisory Committee for further discussion.

The deputants, on behalf of the Council of Canadians, requested:

- "That Council ban the sale and endorse initiatives to minimize use of bottled water at all municipal administrative offices; and
- That the City of Mississauga follow through with an educational campaign to increase public awareness, and to promote the quality and accessibility of municipal tap water, as healthy and economical and as a sustainable consumer choice."

The deputants outlined the benefits of banning the use and sale of bottled water at municipal administrative offices as follows:

- Decrease waste in the Region;
- Save taxpayer dollars;
- Decrease the City's carbon footprint;
- Decrease consumption of non-renewable resources; and
- Promote Region of Peel tap water.

PRESENT STATUS:

The City of Mississauga supports reduced use of single-use bottled water by:

1. Participating in the Blue W Program - The Region of Peel has an extensive tap water initiative to increase residents' confidence in its quality, knowledge of the benefits of choosing tap water, and increasing access to tap water. The Region of Peel tap water initiative includes the Blue W Program, which is a national, non-profit network of restaurants, businesses and municipal facilities willing to let visitors refill a reusable bottle with tap water for free. Participating locations are found by searching an online map and Blue W locations are marked with a window decal. City of

Mississauga community centres, libraries and the Civic Centre are registered Blue W sites.

2. Providing water fountain/water filling stations at the Civic Centre (main floor), Central Library, seven community centres and arenas and six pools. The water filling stations contain a drinking fountain, a tap to fill reusable containers and a counter. As water fountain replacements are required through lifecycle replacement or as capital funds come available, additional combination water fountain/water filling stations will be installed at City facilities.

3. Implementing as corporate practice, staff use of reusable containers. Water pitchers and glassware are available for use in the Council Chamber, committee rooms and meeting rooms. In addition, staff is encouraged to use reusable containers at their work stations and in meetings.

Single-use plastic water bottles, along with other healthy choices such as juice, are presently sold in City facilities, primarily in vending machines or concessions, as well as restaurants such as the CCafe. The City has made a concerted effort to ensure healthy choices are available for sale, including juice and water.

The City provides recycling containers in all facilities and parks in order to ensure there are appropriate receptacles available for recyclables, including beverage containers.

At events on City property, event organizers are encouraged to rent water filling stations where potable water is not available. In addition, the City has rented water filling stations for large City events such as Canada Day and Bike to Work Day.

COMMENTS:

Municipal Scan

There is a wide range in the approach municipalities have taken with respect to single-use bottled water. Appendix 1, Bottled Water Bans in Ontario Municipalities – November 2013, is a scan of 28 Ontario municipalities.

Sixty per cent of the municipalities surveyed have chosen not to impose a ban or restriction on water bottles, but rather implement

campaigns to promote tap water and provide access to tap water by installing water filling stations, providing water wagons at events and participating in Blue W.

Forty per cent of the municipalities surveyed have varying degrees of bottled water bans or restrictions. Most restrict the sale of bottled water in facilities where tap water is readily available. Even with bottled water bans, some municipalities have found they have the same or, in one case, increased water bottles in their waste stream.

Whether municipalities have chosen to ban/restrict bottled water or not, all municipalities have taken steps to educate residents and staff about tap water as a safe and economical choice and most municipalities are increasing access to tap water either by installing water bottle filling stations, providing water wagons at events or participating in Blue W.

Tap Water Promotion

Research conducted in 2010 by PROBE Research Inc. shows that Peel residents have poor knowledge about the source of their tap water and lack confidence in its quality. The research also identified that only 14 per cent of all Canadians drink mostly bottled water. The results of the PROBE research have informed the Region of Peel "Love My Tap Water" campaign (www.peelregion.ca/pw/water/tapwater/). The City of Mississauga supports the Region's tap water promotion and participates in the Blue W Program. It should be noted that the Region of Peel does not have a water bottle ban, but rather focuses on promoting tap water as a safe and reliable source.

Living Green Master Plan

The Living Green Master Plan recognizes that the City of Mississauga has a responsibility to conduct its operations in a manner that reduces waste and diverts as much waste as possible from landfill. By supporting the Region's tap water campaign, participating in the Blue W Program, providing opportunities to fill reusable bottles and providing recycling opportunities in City facilities and parks, the City is reducing waste and increasing diversion rates from landfill.

STRATEGIC PLAN: The Living Green Strategic Pillar for Change contains the principle that "Mississauga is a city that values its shared responsibility to leave

a legacy of a clean and healthy natural environment." One of the Strategic Goals is "to lead and promote the utilization of technologies and tactics to conserve energy and water, reduce emissions and waste, improve our air quality, and protect our natural environment."

Reducing the use of bottled water in City facilities contributes to the Strategic Plan goal to reduce waste.

FINANCIAL IMPACT: Funding for life-cycle replacement and additional water filling stations at City facilities will continue to be through the Business Planning and Budget Process.

CONCLUSION: The City of Mississauga takes a balanced approach to reducing water bottle use by supporting the Region of Peel's tap water campaign, participating in the Blue W Program, installing water filling stations in City facilities and promoting the use of reusable containers. The City sells beverages in vending machines, concessions and restaurants and has made a concerted effort to offer healthy choices. In addition, recycling opportunities are provided in all City buildings, facilities and parks.

Based on the experiences of other municipalities and in light of the City's existing practices to reduce water bottle use and recycle beverage containers, staff does not recommend a ban on single-use bottled water in City facilities.

ATTACHMENTS: Appendix 1: Bottled Water Bans in Ontario Municipalities – November 2013

Paul A. Mitcham, P.Eng., MBA
Commissioner of Community Services

Prepared By: Mary Bracken, Environmental Specialist

4

Appendix 1

Bottled Water Bans in Ontario Municipalities – November 2013

Municipality	Tier	Bottled Water Ban or Restriction	Where Banned, Restricted or Discouraged	Other Measures
Ajax	Lower	Yes	• Sale at Town owned facilities • Sale at events • Public meetings	• Public education campaign • Water fountains in community centres fitted with bottle filler attachment
Aurora	Lower	No		
Brampton	Lower	No	• Discouraged at meetings and functions	• Promote awareness about tap water in partnership with Region, Brampton Clean City and other organization • Installing water filling stations in facilities
Burlington	Lower	Yes	• Restrict sale at city facilities • Performing arts centre • Sports teams not permitted to sell bottled water (including fundraising on city property) • Council and staff meetings	• Awareness campaign promotes city water and the restriction on the sale of bottled water at city facilities • Water filling stations being installed • Two water bars for outdoor city events
Caledon	Lower	No specific ban	• Don't sell at Town Hall • Council meetings	• Promote Peel Water Smart initiatives • Replaced plastic water bottle coolers with dispensers that use municipal tap water • Installing water filling stations • Blue W • Staff provided with refillable stainless steel carafes • Use (rent) quench buggy at City events, where possible
Clarington	Lower	No formal ban	• No water bottles at Council and committee meetings • Municipally operated buildings • Recreation facilities	• Communications Plan to promote tap water • Install/upgrade water fountains
Durham Region	Upper	No	• Committee meetings	

Municipality	Tier	Bottled Water Ban or Restriction	Where Banned, Restricted or Discouraged	Other Measures
Guelph	Single	No formal ban	• City Hall – bottled water free facility • Not sold in City facilities • Vendors cannot sell bottled water at events where quench buggy is present	• Campaign to promote tap water • Blue W • Have quench buggy • Bottled water coolers replaced by chilled water fountains
Hamilton	Single	No		• Communication and public education campaigns • Water filling stations in facilities
Kingston	Lower	Yes	• City owned/operated facilities (except major hockey rink/concert venue) • City events	• Public awareness campaign • Water filling stations installed in all buildings and theatre • In theatre – sell reusable bottles at cost • Water wagon provided by Utilities Kingston at no cost
London	Single	No formal ban	• Don't sell in City facilities unless no access to tap water	• Tap water and water conservation campaign • Have water bar • Blue W
Markham	Lower	No	• Civic Centre • Meetings	• Promote tap water • Have WOW (water on wheels) trailer • Getting portable refilling stations
Newmarket	Lower	Yes	• Use and sale in town hall	• Promote tap water to employees and residents
Oakville	Lower	Yes	• No sale at all Town facilities • Town hall	• Tap water promo campaign • Retrofitting indoor water fountains • Three water bars for town and community events (free Water Bar Lending Program) • Selling reusable bottles at the performing arts centre and recreation centres
Oshawa	Lower	No	• Council Chamber and Committee Room	• Fully accessible water fountain/filling station located outside Council chambers • Most floors in City Hall have access to filtered drinking water tap sized to facilitate filling of reusable water bottles
Peel Region	Upper	No	• Regional meetings • Functions where reasonable access to tap water exists	• "Love My Tap Water" campaign • Fund "Blue W" to create local network • Have water fountains • Internal Policy for employees to promote tap water and minimize use of bottled water in Regional facilities • No longer bottle Peel water
Pickering	Lower	No	• Meetings	

4

Municipality	Tier	Bottled Water Ban or Restriction	Where Banned, Restricted or Discouraged	Other Measures
Richmond Hill	Lower	No		• Awareness of municipal water as safe, healthy, economical and sustainable choice • Increase availability
St. Catharines	Lower	Yes	• Use in City facilities	
Thorold	Lower	Yes	• All city facilities	
Thunder Bay	Lower	No		• Promote use of tap water

Toronto	Single	Yes	• Sale and distribution at:
			  • City Hall
			  • Civic Centres
			  • City owned facilities
				• Promote tap water
				• Water wagon
				• Blue W

Uxbridge	Lower	No		• Drinking water fountains at our major facilities
Vaughan	Lower	Yes	• Sale at City facilities • Civic centre • Meetings	• Water bottle filling stations in all municipal buildings • All city members provided with a stainless steel refillable water bottle
Waterloo Region	Upper	Yes	• Regional facilities • Regional functions	• Public education program promoting benefits of using municipal tap water • Water trailer for use at public events
Whitby	Lower	No		
Whitchurch-Stouffville	Lower	Yes	• Municipal offices	
York Region	Upper	No		• Campaign to promote tap water • Mobile water trailer at public events

Region of Peel
Working for you

REPORT
Meeting Date: November 7, 2013
Waste Management Committee

DATE: October 8, 2013

REPORT TITLE: **REGION OF PEEL'S RESPONSE TO THE POTENTIAL BAN OF PLASTIC SHOPPING BAGS IN MISSISSAUGA**

FROM: Dan Labrecque, Commissioner of Public Works

RECOMMENDATION

That the Region of Peel not support a ban of plastic shopping bags at this time.

REPORT HIGHLIGHTS

- In 2008, the City of Toronto mandated that Toronto retailers charge a 5 cent fee for each bag effective June 1, 2009.
- Retailers across Ontario implemented the same per bag fee as Toronto as a waste reduction initiative and source of revenue to be shared with environmental groups.
- The fee was rescinded by Toronto in 2012 and a proposed mandatory ban of plastic shopping bags was to come into effect January 1, 2013.
- A court challenge by Ontario Convenience Stores Association (OCSA) and the Canadian Plastics Industry Association (CPIA) forced Toronto Council to rescind the ban.
- Plastic shopping bags provide convenience and are used as a food safety measure.
- Peel accepts plastic bags in its Blue Box program and plastic bags do not significantly contribute to litter.
- Peel also promotes the use of reuseable bags.
- Dozens of companies that produce plastic shopping bags are located within Mississauga and employ local people.
- Staff recommends that the use of plastic shopping bags not be banned in any of the local municipalities and that the recycling of plastic shopping bags in the blue box continue be supported through public education.

DISCUSSION

1. Background

In 2007, Toronto City Council approved their "Target 70" plan that outlined a series of waste diversion initiatives to divert waste from landfill based on a 3Rs hierarchy. As part of their plan, Toronto staff looked at measures to reduce in-store packaging items, including plastic shopping bags.

5

October 8, 2013

REGION OF PEEL'S RESPONSE TO THE POTENTIAL BAN OF PLASTIC SHOPPING BAGS IN MISSISSAUGA

In 2008, under the authority of the *City of Toronto Act*, Toronto required retailers within the boundaries of the City of Toronto to charge a fee of 5 cents for each plastic shopping bag requested by the consumer, effective June 1, 2009.

That same year, grocery retailers like Weston Group, Metro and Sobeys recognized an opportunity to sell shopping bags while promoting the value of waste reduction outside of the City of Toronto and began charging a plastic bag fee across the province.

The introduction of the 5 cent fee reduced the number of bags used. The City of Toronto's mandatory plastic bag fee was rescinded effective July 1, 2012 and City Council approved a ban of plastic shopping bags effective January 1, 2013. This proposed ban caused considerable backlash from the Ontario Convenience Stores Association (OCSA) and the Canadian Plastics Industry Association (CPIA) who collectively brought a court action against the City.

The City of Toronto entered into a court-approved Agreement with OCSA and CPIA that led to the removal of the proposed ban on November 28, 2012.

On July 26, 2012 the City of Mississauga Environmental Advisory Committee provided a comprehensive Corporate Report on the "Potential Ban of Plastics Shopping Bags in Mississauga" dated July 26, 2012 which reported a number of Council considerations and responses from different stakeholders that have been revisited due to the City of Toronto's Council decision to rescind the plastic shopping bag ban. The report recommended that a potential ban of plastic shopping bags in Mississauga be referred to the Region's Waste Management Committee to undertake further research and to provide recommendations to Regional Council and City of Mississauga Council.

On November 22, 2012 Regional Council referred this request to Waste Management staff for review and consideration (Resolution 2012-1358).

2. Findings

It is widely acknowledged that the plastic bag fee along with public environmental education is effective in reducing plastic shopping bag usage across the province. Within the Region of Peel, some retailers ask their customers if they would like to purchase bags at the checkout; many large retailers have publicly stated that they will not charge customers for shopping bags as part of their marketing strategy; other retailers offer reusable bags at discounted prices or include the price of the plastic shopping bag in the price of their products.

The voluntary fee charged by retailers for plastic shopping bags is now common practice and consumers will continue to make personal choices related to the bag fees (e.g. where they shop; whether they bring their own reusable bags; pay the fee; use store packaging cardboard boxes or carry out their purchases in reusable baskets and/or bins). Staff supports the retailer's choice of sharing of the fee revenues with environmental groups as not only a goodwill gesture but as an enhanced opportunity for funding of non-profits to continue with their efforts to protect, enhance and restore the environment.

Staff concur that the fee reduces the amount of plastic bags used by consumers, as demonstrated in a 2008 Toronto waste composition audit that indicates a 53% reduction between 2008 (before the 5 cent charge) and 2012 (when the fee was in effect). Further, the fee has a two pronged environmental benefit: consumers are encouraged to utilize

reusable bags thereby reducing waste and the fee generates revenue for the retailer which can be shared with provincial environmental groups.

Like the City of Toronto, residents of Peel have reduced their consumption of single use shopping bags and those residents that are using plastic shopping bags often re-use them for containing waste for disposal or place them in the blue box for recycling. Of note, the Region of Peel has been accepting film plastic in the Blue Box program since 2006 and 862 tonnes of film plastic was recovered and sold in 2012.

Plastic bags are accepted in the Blue Box program and residents of Peel, to their credit, are putting their waste in right place. Staff has determined through litter audits that plastic bags still makes up less than 1% of litter by volume and film plastic makes up 0.9% of waste sent to landfill by weight.

3. Impacts of a Plastic Shopping Bag Ban

A mandatory plastic shopping bag ban would have an impact on residents, retailers and the plastics industry:

The major impacts of a plastic bag ban are:

- Reduce of convenience and choice for shoppers
- Eliminate one tactic for food safety as shopping bags are often used to separate food from detergent/cleansers etc.
- Potentially affect 180 bag companies located in Ontario that employ 11,000 people
- Introduce a potential court challenge to the ban by the OCSA and CPIA similar to that experienced by the City of Toronto.

Due to the inclusion of plastic bags in Peel's Blue Box program, very little plastic film goes to landfill. As a result, the environmental benefit of a plastic bag ban appears to be outweighed by its associated employment related economic risks and potential litigation.

4. Proposed Direction

Since the environmental benefits of a plastic bag ban are small in comparison to the potential financial and litigation impacts, staff recommends that the use of plastic bags continue to be permitted.

Staff also recommends that Peel continue with its public education/communication campaign to reduce the use and disposal of plastic shopping bags and to encourage reuse and recycling of these bags whenever possible through the following measures:

- Promote the usage of reusable shopping bags or plastic bins through reminders at every point of contact with residents (e.g. Annual Guide; Peel's website; Regional Ads; Public Events; Waste Education Curriculum Strategy etc.) and highlight the environmental and economic benefits of reusable shopping bags
- Encourage the reuse of corrugated cardboard boxes to carry home consumer goods as cardboard boxes are also accepted in Peel's Blue Box program.
- Encourage the recycling of plastic shopping bags in the blue box
- Work with Community Partners to promote waste management behaviour and attitudes through campaigns such as Litter Not.

5

FINANCIAL IMPLICATIONS

The cost for the public education and communications campaign is already accounted for in the 2013 Operational budget in Cost Centres WW00110 and WW70000. No additional funding is required.

Dan Labrecque
Commissioner of Public Works

Approved for Submission:

D. Szwarc, Chief Administrative Officer

For further information regarding this report, please contact Norman Lee at extension 4703 or via email at norman.lee@peelregion.ca

NL *Authored By: D. Trevor Barton, Supervisor, Waste Program Planning*

c. Legislative Services

Upcoming Agenda Items and Environmental Advisory Committee (EAC) Role
EAC Meeting Date: December 10, 2013

Legend: Potential Role for EAC	
Comments (Provide feedback for consideration.)	**Leadership** (Participate in event or lead external group participation.)
Community Engagement (Champion LGMP awareness campaign, promote Living Green blog, etc.)	**Receive** (For information.)
Direction (Provide direction to staff.)	**Recommendation** (To General Committee.)
Deputation (Present to General Committee, Council, other.)	**Sub-committee** (To further develop or research initiative.)

Year | Quarter	Item	Description	Potential EAC Role
2014 | Q2	Earth Days	An update on Earth Days 2014.	Community Engagement
	Community Recognition	An update on community recognition for environmental action.	Leadership

Future Anticipated Items	
Item	**Description**
Nuisance Weed and Tall Grass Control By-law	The City's Nuisance Weed and Tall Grass Control By-law is scheduled to be revised as per the NH&UFS.
Green Development Strategy (GDS)	An update on GDS implementation.
Waste Management	An update on various waste-related initiatives.
Corporate Energy Conservation Plans	The new Provincial *Green Energy Act* (2009) requires municipalities to provide corporate energy conservation plans for all municipally owned and operated buildings and to report annually on actual performance against plans.
Stormwater Quality Control Strategy Update	Update of the City's strategy for managing and improving the quality of stormwater runoff.
Public Art Project	Update on public art project along Burnhamthorpe Rd.
Let Your Green Show	An update on Phase 3 of the campaign.
Oakville-Clarkson Air Zone Management Advisory Committee	Update on the Oakville-Clarkson Air Zone Management Advisory Committee (OCAZMAC).

STATUS OF OUTSTANDING ISSUES FROM THE ENVIRONMENTAL ADVISORY COMMITTEE (EAC)
Prepared by Mumtaz Alikhan, Legislative Coordinator, for the December 10, 2013 EAC Agenda

EAC MEETING FIRST DISCUSSED	ISSUE	EAC RECOMMENDATION/DIRECTION	STATUS
Feb/12	Transportation Strategy Presentation	Michael DeWit, Vice-Chair, indicated that a presentation on the transportation strategy would be beneficial to the Committee.	**May 1/12 EAC Meeting Update:** Ms. Osborne added that she did not have a specific timeline for the transportation strategy at this time.
Sept/12	Potential Ban of Plastic Shopping Bags in Mississauga	EAC-0039-2012 1. That the Corporate Report dated July 26, 2012 from the Commissioner of Community Services, entitled "Potential Ban of Plastic Shopping Bags in Mississauga," be received; and 2. That the Environmental Advisory Committee recommends that the potential ban of plastic shopping bags in Mississauga be referred to the Region of Peel's Waste Management Committee for further research and recommendations to the Region of Peel's Regional Council and the City of Mississauga's Council.	
Dec/12	Urban Design Awards	Councillor Tovey noted that the Urban Design Awards should include green building and Ms. Bracken noted that the categories and criteria would have to be strengthened. It was suggested that a report could be written to make a recommendation with respect to creating a green award in Urban Design.	**May 7/13 EAC Meeting Update:** In response to Councillor Tovey, Ms. Osborne said that Ms. Bracken is working with Planning and Building Department staff to establish a green development award complementary and linked to the existing Awards and that it may be announced this fall, but will not begin until 2014.

EAC MEETING FIRST DISCUSSED	ISSUE	EAC RECOMMENDATION/DIRECTION	STATUS
Dec/12	Environmental Advisory Committee November 2012 Off-Site Meeting Summary	EAC-0068-2012 1. That the Memorandum, dated November 26, 2012 from Brenda Osborne, Director, Environment Division with respect to the off-site meeting held on November 24, 2012; be received; and 2. That staff work with the Environmental Advisory Committee to develop a recognition program and a community environmental grants program.	**May 7/13 EAC Meeting Update:** Ms. McLeod gave an update, noting that this matter was discussed at the Committee's December 2012 meeting. She said that three existing award programs were reviewed and associated organizations were consulted regarding the Committee's recommendation. Ms. McLeod said that modifying the current award processes or adding a new "Living Green" award is not advisable for various reasons. She noted that Streetscape Mississauga has renamed the Alternative Gardens class of their contest the "Mississauga Living Green Ecogardens" class. Ms. McLeod said that the Committee could help promote the existing award programs and, beginning in 2014, host an annual celebration and networking event in the spring to coincide with the annual reporting out of the Living Green Master Plan.
Feb/13	Stormwater Financing Study (Phase 1)	EAC-0003-2013 1. That the PowerPoint presentation by Lincoln Kan, Manager, Environmental Services, entitled "Stormwater Financing Study (Phase 1)," to the Environmental Advisory Committee on February 5, 2013 be received; and 2. That staff be directed to prepare an update regarding the Stormwater Financing Study (Phase 1) for consideration at a future Environmental Advisory Committee meeting.	
Mar/13	Our Municipality Can Help Stop Climate Change	EAC-0011-2013 That the email message dated February 1, 2013 from Danish Sarwar, Ward 5 resident, with respect to how our municipality can help stop climate change, be received and referred to staff for further review and returned to a future Environmental Advisory Committee meeting for consideration.	

EAC MEETING FIRST DISCUSSED	ISSUE	EAC RECOMMENDATION/DIRECTION	STATUS
Sept/13	Municipal Ban on the Use of Bottled Water at Government Administrative Offices	EAC-0037-2013 That the presentation dated June 2013 entitled Municipal Ban on the use of Bottled Water at Government Administrative Offices by Dominika Sekula and Marsha Smith on behalf of the Council of Canadians, referred by Council at its July 3, 2013 meeting to the Environmental Advisory Committee, be received.	**September 10/13 EAC Meeting** Brenda Osborne, Director, Environment Division, noted that Council, at its July 3, 2013 meeting had referred this matter to the Committee. She advised that a report on this matter will be brought back to the Committee for direction.