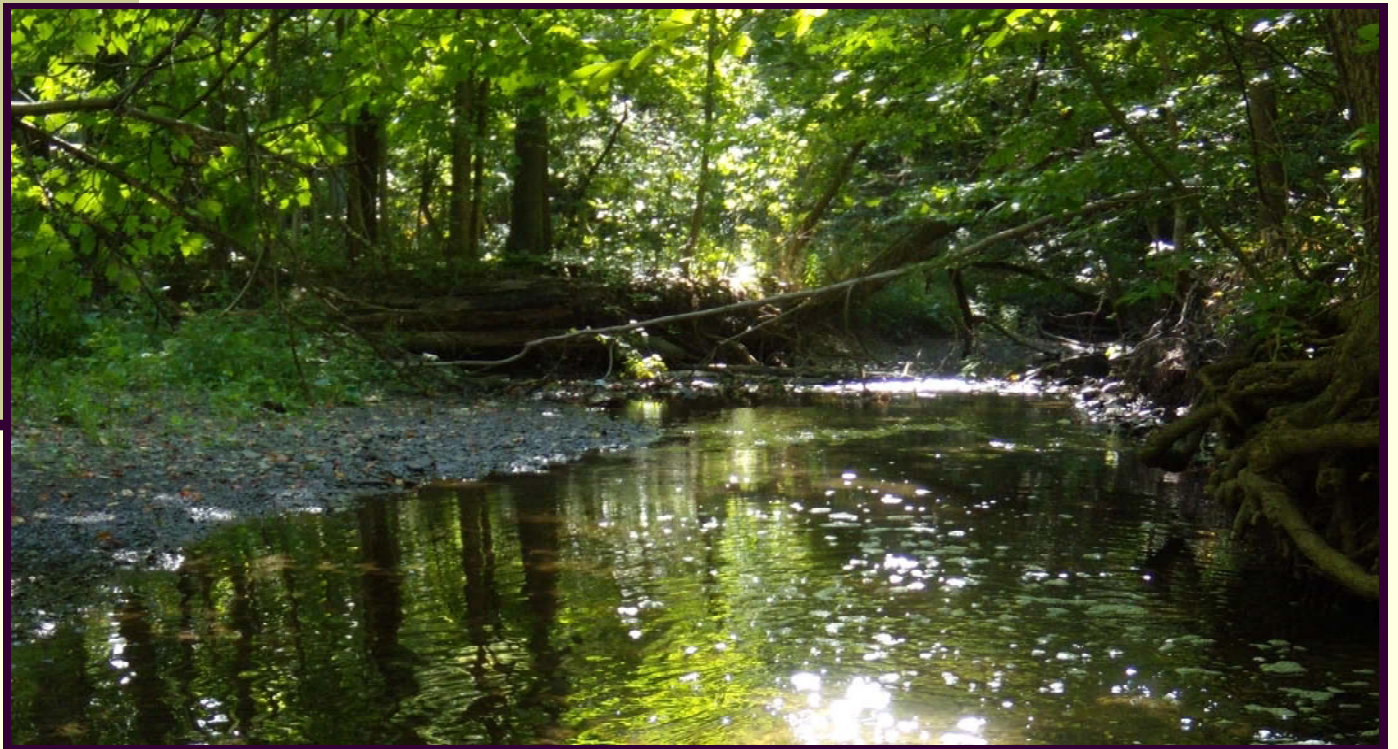


City of Mississauga

**N**atural  
**A**reas  
**S**urvey

**2011 Update**





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## EXECUTIVE SUMMARY

The Natural Areas Survey for the City of Mississauga (Geomatics 1996) identified the City's natural areas system which included 144 sites that represented the best remaining natural features in the City. Of these 144 sites, 141 were classified as natural areas (Significant Natural Sites, Natural Sites, or Natural Green Spaces), and three were classified as Residential Woodlands. Also identified were 55 Special Management Areas and 40 Linkages.

The intent of updating the Natural Areas Survey (NAS) is to provide the current status of natural areas and updated information on flora, fauna, impacts, boundary changes and management needs. Approximately 25% of the City's NAS sites are updated each year, thus the update of the entire NAS is completed in a cycle of four years. The 2010 update completed the third round of reviews of the City Wards. The 2011 update initiated the fourth round of updates and comprises a total of 40 natural areas in Wards 5, 6, and 11.

In 1996, the 141 natural areas comprised 7.10% of the total area of the City. The total number of natural areas had decreased to 136 by 2004, increased to 138 by 2008, and has since decreased to 137 in 2011 (excluding the three Residential Woodlands). These 137 sites now represent 7.29% of the total area of the City. This decrease in the number of natural areas and alterations to natural sites equated to a loss of approximately 159.26 ha from 1996 to 2006. However, between 2006 and 2011 there has been an increase 199.06 ha. Thus since its inception in 1996, the overall area of natural areas in the natural areas system is 39.80 ha larger. The recent increases can be attributed to the inclusion of additional City-owned areas in the natural areas system and to property boundary adjustments or minor changes in natural area boundaries. There has also been a reduction in the number of Special Management Areas and Linkages to 44 and 29, respectively, as many of these have been converted to natural areas.

The natural areas in the City are grouped into three major landform types (valleyland, tableland, and wetland). Since 1996, the area of natural areas associated with valleylands in the natural areas system has increased slightly (1626.30 ha, 78.3% in 1996 to 1724.33 ha, 80.70% in 2011). In contrast, tablelands only account for 313.52 ha, which is 14.67% of the total natural areas system in 2011; a decrease from 339.90 ha, or 16.40% in 1996. From a City-wide perspective, there were steady decreases from 1.16% of City in 1996 to 1.07% of City in 2011 of the land base represented in tableland natural areas. Tableland natural areas (which are mainly wooded) tend to be discrete islands that have limited connections to other remnant natural features. Valleylands are better connected by virtue of the linearity of the landform and because they have historically been better protected from development. This reinforces the need to place a high priority on the protection of the remaining tableland features present within the City, and an emphasis on their management to maintain or improve their quality. The area of natural areas associated with wetlands in the natural areas system has remained more or less constant from 1996 with only a slight decrease from 103.70 ha (5.0% of NAS) to 98.84 ha (4.63% of NAS) in 2011. The proportion of the City that is classified as wetland decreased marginally from 0.36% in 1996 to 0.34% in 2011.

Generally, the natural areas within the City that were surveyed in 2011 continue to be in "fair" condition. Natural areas evaluated as in fair condition have moderate disturbances (few trails,

limited dumping, some trampling, *etc.*) and an average number of non-native floral species, typical of what can be expected in an urban natural area. The overall condition of the natural areas visited in 2011 remained largely unchanged from previous studies. As indicated in all the other survey updates, the most common disturbances within natural areas are those associated with an increase in uncontrolled human use of natural areas following development in adjacent areas. Disturbances are prevalent in almost all of the natural areas surveyed in 2011. Deterioration of the quality of Mississauga's natural areas can be expected to continue unless there is a substantial effort to manage natural areas through site specific management plans (Conservation Plans) and community stewardship initiatives.

After more than ten years of update surveys covering the entire City, two trends continue to emerge. There has been a decrease in the quality of vegetation and there has been a decrease in the area of tableland and wetland habitats. However, the overall total area of natural areas has increased by 39.80 ha from 1996 to 2011. Much of this increase was composed of valleylands, and some associated tablelands. A total of 73 vegetation communities are considered uncommon in the City, occupying less than 1% of the total area of the natural areas system. In addition, 31 communities are "at risk" in the City, occurring in only one natural area each; all but one of these communities are also considered to be uncommon within the City. In addition, a longer-term conversion of vegetation community composition (from wetland pockets to old field) in some natural areas is also occurring. This is likely related to changes in hydrology resulting from development. These trends reinforce the urgent need to maintain and manage (and where possible restore) the remaining natural areas in the City. In general, tableland natural areas (including woodlands, wetlands and successional vegetation communities) continue to be the most seriously threatened by development.

A positive trend is the increase in naturalization projects undertaken by the City. The majority of naturalized areas observed between 1996 and 2011 have involved leaving an area of un-mowed grass adjacent to a watercourse or woodlot feature to regenerate naturally, with the addition of native plantings in some areas. While this approach will increase the overall size of the natural area in question, this initiative could be enhanced by taking an approach that includes long-term management to accelerate succession which will more likely result in a healthy natural area with a diversity of native plant and animal species.



## 1.0 INTRODUCTION

A Natural Areas Survey for the City of Mississauga was initially undertaken during 1995 and 1996 (Geomatics 1996) which identified 144 natural areas representing the best remaining natural features in the City. Of these natural areas, 141 were classified as Significant Natural Sites (SNS), Natural Sites (NS), or Natural Green Spaces (NGS), and three were classified as Residential Woodlands (RW). In 1996 the 141 natural areas comprised 7.10% of the total area of the City. Also identified were 55 Special Management Areas (SMAs) and 40 Linkages. Definitions for these classifications are given in Appendix 1. The natural areas, Residential Woodlands, Special Management Areas and Linkages form the City's natural areas system.

Since the completion of the Natural Areas Survey (NAS) in 1996 many development projects have been initiated within or adjacent to the natural areas originally identified. In order to keep the NAS database current, updates have been undertaken on an annual basis (with one exception) which focused on the areas that may be affected by these developments. In addition, approximately one fourth of the natural areas are reviewed annually with respect to their condition, encroachments, disturbances, *etc.* Thus every four years all natural areas are reviewed at least once and with the completion of the 2010 work, the natural features in all Wards in the City had been updated three times since the initial study in 1996. This update report initiates the fourth round of updates and comprises a total of 40 natural areas in Wards 5, 6, and 11.

Periodically, new candidate natural areas, Linkages, or SMAs are evaluated as part of the annual reviews. Over the course of the NAS and subsequent updates, 156 natural areas have been identified. However as of 2011, 14 sites have been removed from the NAS, eight sites have been combined (MB8/ME8, CC1/MY1, CE12/SV12, and CL1/SD5), and two natural areas have been added (CM25 and ME13); one of which, CM25, was subsequently removed due to development in 2010. Thus at present there are 137 natural areas and three residential woodlands.

The intent of updating the NAS is to provide the current status of natural areas and update information on floristics, fauna, impacts, boundary changes and management needs on a yearly basis. The importance of the NAS is that it serves to identify natural areas in the City that should be protected. The NAS also serves to document changes to natural areas over time and thus provides the means to assess the cumulative impacts of development, the efficacy of mitigation measures and to identify those natural areas that are most at risk. This report documents the methods used and presents the data collected to evaluate the natural areas, summarizes any changes that have occurred, and provides recommendations for the mitigation of threats to natural areas and management considerations.

## 2.0 METHODS

The primary focus of this update was the review of 40 natural areas located in Wards 5, 6, and 11. Appendix 2 provides details on specific methodologies for the background review, fieldwork, data analysis, and mapping conducted each year. Appendix 3 lists documents reviewed during background review. Appendix 4 lists the reasons for fieldwork, and the dates when fieldwork was conducted for each of the natural areas.

Full field visits were made to 32 of the 40 sites included in the NAS review for 2011. Of these 32 sites, five were partially on private property and access permission was not obtained, therefore a full inventory of the entire natural area could only be completed on the public portions of the natural area. Eight natural areas were fully on private lands and did not receive a full field visit because permission to access these sites was not provided. However, these sites received a road side visit or were visited by walking along public areas adjacent to the natural areas (*e.g.*, along stream corridors).

## **2.1 Analysis**

In addition to analyzing the data with respect to provincial rarity lists (further explained in Appendix 2), analysis in 2011 included comparison with the list of Species of Conservation Concern (SCC) developed by Credit Valley Conservation (CVC) in 2010. Previously, the CVC had a Bird Species of Conservation Interest which identified only bird species which were of interest within the watershed. The new SCC lists account for both flora and fauna. CVC developed a ‘tier’ system for these new lists in which Tier 1-3 species are considered to be of conservation concern within the urban areas (*i.e.*, within the City of Mississauga) of the Credit River watershed. The qualifications of each tier are explained in Appendix 5.

## **2.2 Vegetation and Natural Area Classification Scheme**

In 2004, the criteria for classifying the natural areas were updated (section 3.2, North-South Environmental 2004). No updates to the classification scheme are proposed in 2011, and thus the 2004 criteria are considered up to date. These are provided in Appendix 1. Vegetation communities are categorized as “uncommon” and/or “at risk” (see definition in Appendix 2).

The classification of vegetation in natural areas in the 1996 NAS report pre-dates the Ecological Land Classification (ELC) system (Lee *et al.* 1998). At that time a classification system was developed specifically for the NAS project, referred to as the Mississauga vegetation community classification. In 2000, Mississauga vegetation community classes were matched with corresponding ELC units through a desk-top exercise; however the units did not correspond exactly. Therefore over the past 4 years, ELC was undertaken as part of the field work during annual updates and vegetation descriptions were revised in order to accurately complete the conversion from Mississauga vegetation community classifications to ELC. As of the 2011 update, all natural areas have been evaluated using ELC protocols (Lee *et al.* 1998) and now the database, update report, and natural area factsheets conform to provincial standards.

The conversion to ELC in 2011 makes comparisons to previous Mississauga vegetation community classifications difficult because the more detailed fieldwork associated with the ELC resulted in the re-classification of some of the original vegetation units. For example, a small wetland pocket within a larger woodland area would probably have been included as woodland in 1996, but would have been delineated as a separate community in 2011. Thus a comparison of woodland data between 1996 and 2011 would show a decrease in woodland, suggesting it had been removed from the NAS, where as in fact the decrease was a result of more detailed field evaluation associated with the ELC protocols. To avoid reporting trends that would be

misleading, it was decided that the 2011 vegetation community data would not be compared to vegetation community data from previous years. We suggest that in the next annual update of the NAS, or as part of the Natural Heritage Systems Strategy (NHSS) study being initiated in 2012, that an approach to utilize the older data be developed that will avoid any misleading interpretations.

### **3.0 GENERAL TRENDS**

#### **3.1 Changes and Trends in Wards 5, 6 and 11**

Appendix 6 documents the changes that occurred in Ward 5, 6, and 11 natural areas between 1996 and 2011 using the same categories. Some of the changes outlined in Appendix 6 are minor revisions while others are considered significant in the context of the natural areas program. Both major and minor changes are noted in Appendix 6 by increases (↑) or decreases (↓) for each of the categories, from year to year. Significant changes are considered to be:

- a change in the classification of a natural area (*e.g.*, from Significant Natural Site to Natural Site);
- a change in the designation of a natural area (*e.g.*, the removal or addition of ANSI status);
- a change of more than 25% in the original size of a natural area;
- a change in the FQI or CC rank for a natural area (*e.g.*, a rank that goes from a high to medium category);
- the addition of rare floral or faunal species (provincial, local and CVC); or
- the addition or deletion of a vegetation community.

Figure 1 (page 9) shows the location of natural areas, Special Management Areas (SMA), Residential Woodlands (RW), and Linkages. Any additions to the natural areas are proposed based on a visual analysis of digital aerial photographs provided by the City and field investigation. Due to the scale of mapping, Significant Natural Sites (SNS), Natural Sites (NS) and Natural Green Space (NGS) are not discriminated on Figure 1, and are all labeled as “natural area.” However, RWs, SMAs, Linkages and any Proposed Additions, are identified.

Five additions to existing natural areas and twelve additions to SMAs are proposed in this update. These potential additions are considered to be major changes (refer to Section 3.0) to the boundaries of natural areas. The natural area classifications of the potential additions are the same as the existing natural area to which each is proposed to be added. Table 1 provides a summary of the category and classifications of the potential additions. Note that there are no classifications for SMAs and Linkages.

Table 1: Potential Additions to the Mississauga Natural Areas System.

<sup>1</sup> Suffix SMA at the end of natural area designations refers to the Special Management Area (SMA). The letter suffixes (*i.e.* CUM1-1) at the end of the natural area designations refers to the community type. Suffixes correlate to mapping notations on potential additions maps.

Potential Addition (PA)	Natural Area	Natural Area/ SMA/ Linkage	Natural Area Classification of Proposed Addition	Description of Proposed Addition	Reason for Recommendation
1 PA13SMA PA14SMA PA15SMA	ETO2	Special Management Area	N/A	Three areas of cultural meadow.	Continuous habitat similar to existing natural area. Recommended as a SMA because with management the area will provide greater linkage function for wildlife.
2 PA16SMA	ETO1	Special Management Area	N/A	Cultural meadow with trail through.	Continuous habitat similar to existing natural area and decreases the edge to interior habitat ratio. Recommended as a SMA because with management the area will provide greater function for wildlife.
3 PA17 CUM1-1	EC13	Natural Area	Significant Natural Site	Cultural meadow at edge of wetland.	Provides accessory habitat for wildlife within EC13 as well as functioning as a buffer to the natural area.
4 PA18 CUM1-1	MV19	Natural Area	Significant Natural Site	Cultural meadow around SWM pond.	Pond has potential for amphibian breeding habitat. With management, this pond could be further naturalized; increasing function for wildlife habitat.
5 PA19SMA	MB9	Special Management Area	N/A	Cultural meadow around two recently-constructed SWM ponds	Ponds have potential for amphibian breeding habitat. With management, these ponds could be further naturalized; increasing function for wildlife habitat.
6 PA20 FOD5-1	CRR4	Natural Area	Significant Natural Site	Sugar maple forest along creek corridor – drains into Credit River.	Continuous habitat similar to existing natural area.

Potential Addition (PA)	Natural Area	Natural Area/ SMA/ Linkage	Natural Area Classification of Proposed Addition	Description of Proposed Addition	Reason for Recommendation
7 PA21SMA PA22SMA PA23SMA PA24SMA PA26SMA PA27SMA	CRR2	Special Management Area	N/A	Six old fields and one cultural meadow along Creditview Road.	Six old fields which could be re-generated into large meadows and/or planted with trees to provide buffer to the CRR2 forests adjacent. Also includes one cultural meadow along Creditview Road which provides buffer to the Credit River. With management the area could provide greater function for wildlife.
8 PA25CUM1-1 /CUW1 PA29CUM1-1	CRR2	Natural Area	Significant Natural Site	Cultural meadow adjacent to forest and wetland.	Provides a linkage and buffer to natural features within the CRR2 natural area.
9 PA28SMA	CRR1	Special Management Area	N/A	Cultural meadow around SWM pond.	Pond has potential for amphibian breeding habitat. Area also provides linkage function between CRR1 and MV12. With management, this pond could be further naturalized; increasing function for wildlife habitat.

### 3.2 Trends in the Natural Areas System

A detailed summary of the changes to natural area classifications between 1996 and 2011 is provided in Appendix 7. Overall, the number of natural areas (excluding Residential Woodlands) decreased from 141 in 1996 to 136 in 2004. In 2008, the number of natural areas (excluding Residential Woodlands) increased to 138 because of the addition of ME13 and CM25. In 2010, the total number of natural areas decreased to 137 due to the conversion of CM25 from NGS to a SMA. The number of natural areas remains at 137 in 2011.

In 2011, there was an increase of 22.34 ha of natural area within the City since 2010. This change was due to small increases to the SNS, NS, and NGS categories (15.09 ha, 5.39 ha, and 1.86 ha, respectively) which are largely due to refining natural area boundaries. This brings the total area of natural areas in the City to 2368.94 ha (7.29% of the City), an increase from 2329.14 ha (7.10%) in 1996.

Overall, the proportion of SNS in the City has increased from 5.23% in 1996 to 5.81% in 2011. Although there was an increase of 5.39 ha of NS resulting from the 2011 update, overall the proportion of the City occupied by NS has decreased from 1.2% in 1996 to 1.15% in 2011. Likewise, the area of NGS in the City increased during the last update period, but overall decreased from 0.67% of the City in 1996 to 0.33% in 2011.

Table 2: Legend for Figure 1 Natural Areas System for the City of Mississauga (arranged by Planning District). Note several natural sites are listed more than once because they span two or more planning districts).

<p><b>SOUTHDOWN</b> SD1 (Not Yet Named) SD4 SD5 (Meadowwood) SD7 (Lakeside)</p>	<p><b>LAKEVIEW</b> LV3 (Adamson Estate) LV4 (Helen Molasy Memorial) LV5 (Helen Molasy Memorial) LV2 LV1 (Not Yet Named) ETO8 (Orchard Heights) LV14 (Lakeview Golf Course) LV6 LV7 (Cawthra Woods) ETO7 (Valley Park &amp; Etobicoke Valley)</p>	<p><b>WESTERN BUSINESS PARK</b> WB1 (Erin Mills Twin Arena)</p>
<p><b>CLARKSON-LORNE PARK</b> CL52 (Meadowwood) CL1 (Meadowwood) CL9 (Rattray Marsh) CL8 (Gleneven) CL15 CL16 (Jack Darling Park) CL17 (Lorne Park Estates) CL13 (Sheridan Creek Trail) CL43 (Turtle Glen) CL42 (Not Yet Named) CL21 (Birch Glen) CL39 (Whiteoaks) CL22 (Fairbirch) CL30 (Lorne Park Prairie) CL31 (Lornewood Creek Trail) CL24 (Tecumseh) CL26 (Not Yet Named) CRR9 (Credit River Flats)</p>	<p><b>SHERIDAN PARK</b> SP1 SP3</p>	<p><b>ERIN MILLS</b> EM30 (Tom Chater Memorial) EM6 (King's Masting) EM2 (South Common) EM10 (Pheasant Run &amp; McCauley Green) EM14 (Sawmill Valley Trail) EM4 (Sawmill Valley Trail) EM5 (Glen Erin Trail) EM21 (R.F.C. Mortensen) CRR10 (Riverwood)</p>
<p><b>PORT CREDIT</b> PC1 (Rhododendron Gardens) PC2 (Port Credit Memorial)</p>	<p><b>SHERIDAN</b> SH6 (Thornelodge) CRR7 (Loyalist Creek Hollow) CRR8</p>	<p><b>CREDITVIEW</b> CR1 (Deer Run &amp; Deer Wood)</p>
<p><b>MINEOLA</b> CRR9 (Credit River Flats) MI4 MI1 (Not To Be Named) MI17 (Mary Fix) M17 (Credit River Flats)</p>	<p><b>ERINDALE</b> CRR7 (Loyalist Creek Hollow) CRR8 ER6 CRR6 (Erindale) ER7 (Huron)</p>	<p><b>FAIRVIEW</b> FV1 (Grand Park Woods) FV3 (Dr. Martin L. Dobkin)</p>
<p><b>COOKSVILLE</b> CV1 (Iroquois Flats) CV2 (Not To Be Named) CV12 (Richard Jones) CV10 (Cooksville) CV8 (Camilla) CV6 (Stillmeadow)</p>	<p><b>CITY CENTRE</b> CC1 (Bishopstoke Walk)</p>	<p><b>MISSISSAUGA VALLEY</b> MY1 (Mississauga Valley) MY3 (Stonebrook)</p>
<p><b>DIXIE</b> ETO7 (Valley Park &amp; Etobicoke Valley) ETO6 AW1 (Willowcreek)</p>	<p><b>APPLEWOOD</b> AW1 (Willowcreek) AW4 (Applewood Hills) AW3 (Applewood Hills) ETO5 (Fleetwood) ETO6</p>	

Table 2 continued...

**RATHWOOD**

ETO4 (Garnetwood)  
 RW5 (Applewood Hills)  
 RW6 (Applewood Hills)  
 RW4 (Rathwood District)  
 RW1  
 RW2 (Woodington Green)

**CHURCHILL MEADOWS**

CM7 (Not Yet Named)  
 CM9 (Not Yet Named)  
 CM12 (Not Yet Named)  
 CM25 (Undeveloped)

**CENTRAL ERIN MILLS**

CE7 (Sugar Maple Woods)  
 CE9 (Quenippenon Meadows)  
 CE10 (Erin Wood)  
 CE5 (Woodland Chase Trail)  
 CE1 (Woodland Chase Trail)  
 CE12 (Bonnie Brae)  
 CRR5  
 CRR4 (Not To Be Named)  
 CRR11 (Not Yet Named)

**STREETSVILLE**

SV12 (Bonnie Brae)  
 SV10  
 CRR4 (Not To Be Named)  
 SV1 (Turney Woods)  
 CRR3 (Riverview & Timothy Street)  
 CRR2 (Credit Meadows)

**EAST CREDIT**

CRR5  
 CRR4 (Not To Be Named)  
 CRR3 (Riverview & Timothy Street)  
 CRR2 (Credit Meadows)  
 EC22 (Bidwell Trail common)  
 EC13 (Willowvale Fields & Creditview Wetlands)  
 CRR11 (Not Yet Named)

**HURONTARIO**

HO1 (Ceremonial Green)  
 HO3 (Staghorn Woods)  
 HO6 (Hawthorne Valley Trail)  
 HO7 (McKechnie Woods)  
 HO9 (Britannia Woods)

**NORTHEAST**

NE4 (Not Yet Named)  
 NE3 (Not To Be Named)  
 NE1  
 NE6  
 NE5 (Not To Be Named)  
 NE7 (Not To Be Named)  
 ETO4 (Not Yet Named)  
 ETO3 (Edward L. Scarlett & Red Oak Plan & Not To Be Named)  
 NE8  
 NE10  
 NE11 (Wildfield)  
 NE12 (Wildfield)  
 ETO2 (King's)  
 ETO1 (Mount Charles)  
 NE9 (Wildwood)

**LISGAR**

LS1 (Lisgar Meadow Brook)  
 LS2 (Avonlea Grove)  
 LS3 (Trelawny Woods)

**MEADOWVALE**

ME10 (Eden Woods)  
 ME12 (Lake Wabukayne)  
 ME11 (Lake Aquitaine)  
 ME9 (Maplewood)  
 ME8 (Windrush Woods)  
 ME13 (Windwood)

**MEADOWVALE BUSINESS PARK**

MB9  
 MB7 (Mullet Creek)  
 MB8 (Maple Grove)  
 MB3 (Syntex Green)  
 MB4 (Leslie Trail)  
 MB6 (Totoredaca)  
 MB2  
 MB1

**MEADOWVALE VILLAGE**

MV19 (Levis Valley)  
 CRR1 (Meadowvale C.A.)  
 MV18 (Not Yet Named)  
 MV2 (Fletcher's Flats)  
 MV12 (Not Yet Named)  
 MV11  
 MV15  
 CRR2 (Credit Meadows)

**GATEWAY**

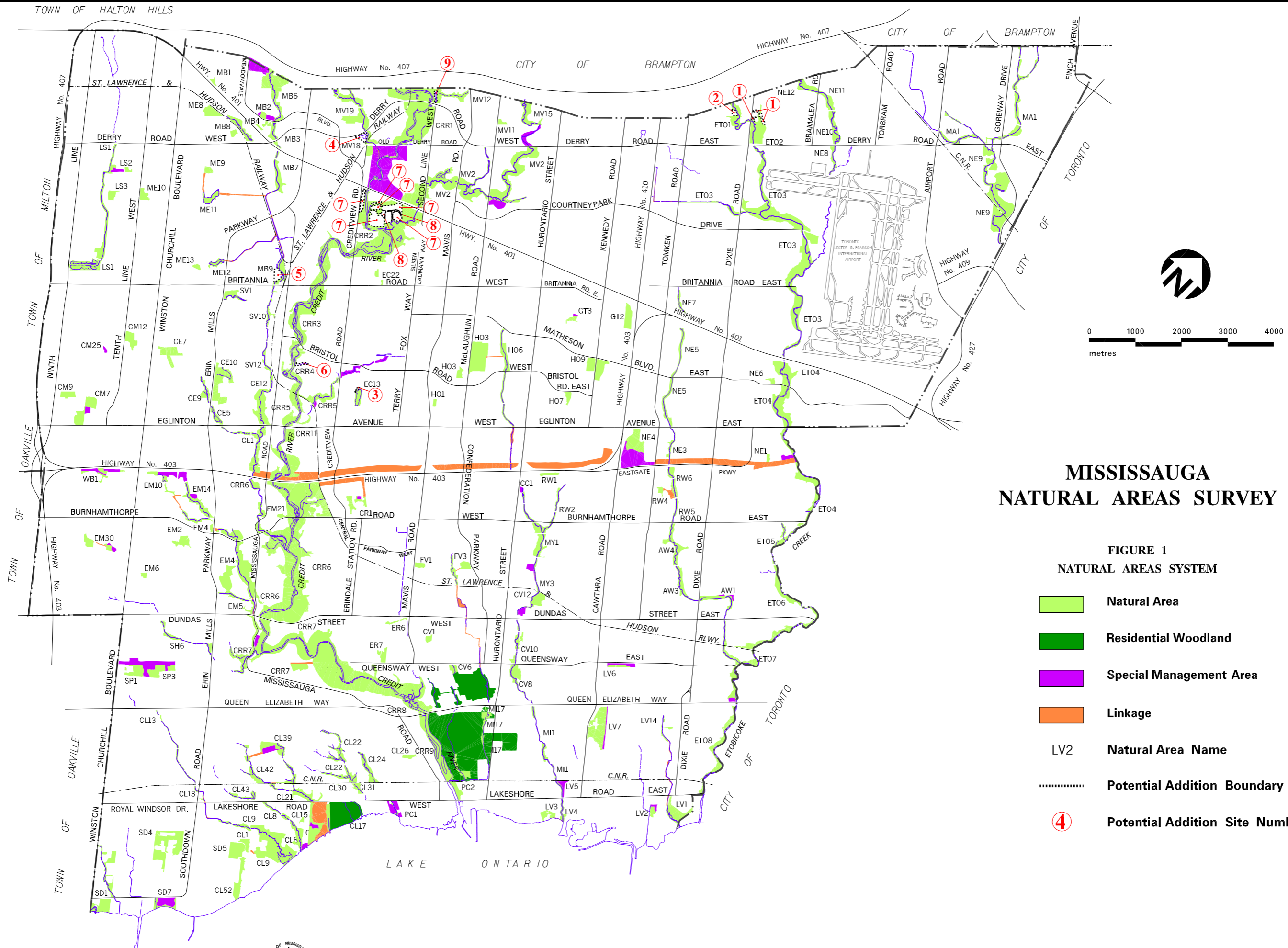
GT3  
 GT2 (Not Yet Named)

**MALTON**

MAI (Brandon Gate, Malton Greenway & Derry Greenway)







# MISSISSAUGA NATURAL AREAS SURVEY

FIGURE 1  
NATURAL AREAS SYSTEM

- Natural Area
- Residential Woodland
- Special Management Area
- Linkage
- LV2 Natural Area Name
- ..... Potential Addition Boundary
- 4 Potential Addition Site Number





### 3.3 Special Management Areas and Linkages

As of the 2011 updates, 44 Special Management Areas have been identified. This is a decrease of 11 SMAs from 1996. Eight of these 11 changes are due to re-classification of SMAs to natural areas and the other 3 are owing to losses to development. The total number of Linkages has decreased to 29 and this is an overall decrease of 11 since 1996. Four Linkages were re-classified as natural areas and the other 7 were removed due to development. The majority of these changes occurred prior to 2011.

### 3.4 Landform Types

The overall changes to the three major landform types (valleyland, tableland, and wetland) in the NAS between 1996 and 2011 are presented in Appendix 8. The majority of the NAS in 2011, 1724.33 ha (80.70% of the NAS), is associated with valleylands. This has increased by 98.03 ha since 1996. This is mainly due to the addition of seven sites associated with valleylands since the inception of this study. In contrast, the 313.52 ha of tablelands only account for 14.67% of the NAS in 2011; a decrease from 16.40% in 1996. This is largely owing to a loss of eight tableland sites from 1996 to 2002 due to development. However, two tableland sites were added in 2008, with one of those tableland sites (CM25) being re-classified to SMA in 2010.

From a City-wide perspective, there were steady decreases in the area of tableland natural areas from 339.9 ha (1.16% of the City) in 1996 to 313.52 ha (1.07% of the City) in 2011. The area of wetlands also decreased marginally from 103.7 ha (0.36% of the City) in 1996 to 98.84 ha (0.34% of the City) in 2011 (Appendix 8). In contrast, the proportion of valleylands has increased from 1626.3 ha (5.60%) in 1996 to 1724.33 ha (5.89% of the City) in 2011. Although the decrease in tableland and wetland areas are relatively minor, the trend is consistent over the past 15 years. Between 2010 and 2011 there were very small decreases in the size of both tableland and wetland landform types (0.32 ha and 0.02 ha, respectively) owing to boundary refinement. Overall, this trend indicates a small but gradual loss of tableland and wetland natural areas in the City.

Natural areas that occur on tableland (primarily wooded areas) tend to be discrete islands that have limited connections to other remnant natural features. Valleylands are better connected by virtue of the linearity of the landform and because they have historically been better protected from development.

The mean size of natural areas in valleyland and tableland landscape types has also been decreasing since 1996 due to the incremental removal of portions of natural areas for development (Appendix 8). However, the mean size of wetlands increased to 19.77 ha, compared to 17.3 ha in 1996.

Tableland natural areas are generally very small (mean size of 5.70 ha) when compared to the valleyland areas (mean size of 21.29 ha) in 2011. Tableland natural areas are also decreasing in size and abundance. In contrast, the number of valleyland natural areas is increasing. This is directly related to which areas are readily developable (tableland) and which areas are not (valleyland). The general loss of tableland natural areas within the City since the inception of

this study in 1996 indicates a need to review the City’s strategy for the protection of the natural areas system, including the development approval process and policy framework to ensure that this trend does not continue.

### 3.5 Vegetation Communities

The 81 ELC vegetation communities described for the City are provided in Appendix 9. The vegetation communities have been grouped into six broad categories: valleylands, woodlands, successional, wetlands, anthropogenic, and other. The category “other” was used for four communities (tall-grass prairie, open beach/bar, treed beach/bar, and unknown) that did not easily fit into any of the other five categories. The category “anthropogenic” refers to ten communities that have been created and maintained through human intervention (anthropogenic, manicured, cultural plantation, and cultural savannah). The most prevalent vegetation communities within the City remain those in the valleyland category. The single tall-grass prairie community is still considered the only provincially rare vegetation community within the City.

It is difficult to compare the vegetation communities which were categorized with the old Mississauga classification system to those which are now classified based on the ELC system (see discussion in Methods, Section 2.2). As of 2011, all vegetation communities were reclassified based on ELC. As such, the values cannot be compared to old community classifications in a meaningful way. In future, trend analysis of vegetation types will be based on the ELC completed this year. The values calculated this year will be used as base numbers, which will be reported on in the future. This will provide more accurate data which can be compared to observe trends. Details on each community category are provided below.

#### Valleylands

The valleylands category includes 23 vegetation communities which cover a total area of 838.18 ha. Nineteen vegetation communities in this category are considered uncommon in the City (Appendix 9), occupying less than 1% of the total area of NAS. Thirteen communities can also be considered “at risk” in the City, being represented only in a single natural area.

These changes in valleyland size are attributable to additions or subtractions of natural areas, revisions of natural area boundaries due to naturalization of plant community edges, and revisions based on property boundaries. However, the large decrease in 2011 is primarily attributed to the conversion of community classifications from Mississauga classifications to ELC as well as an overall increased detail of vegetation community delineation.



Photo 1. Valleyland at ETO4.

### **Woodlands**

Woodlands include 25 vegetation communities, all of which occur outside of valleylands, although they may contain woodland streams (Appendix 9). These woodland communities cover a total of 768.49 ha. Eighteen of the vegetation communities in this category are considered uncommon in the City, each occupying less than 1% of the total area of natural areas or containing an uncommon “working-group” (Krahn *et al.* 1995). Six of these communities can also be considered “at risk” in the City, each being represented only in a single natural area (Appendix 9). In addition, the Peel-Caledon Significant Woodlands and Significant Wildlife Habitat Study (NSE *et al.* 2009) identifies moist-fresh hemlock – sugar maple mixed forest type (FOM6-1) to be regionally significant. Therefore, this community would be considered regionally significant. There is an emphasis on the protection and management of the remaining woodland vegetation communities (City of Mississauga 2007).



Photo 2. Woodlands at HO7.

### **Successional**

The successional category is composed of 12 vegetation communities which cover a total of 428.32 ha (Appendix 9). Six of the vegetation communities in this category are uncommon in the City occupying approximately 1% of the total area of natural areas (Appendix 9). Three communities are considered “at risk” in the City; being represented in only one natural area. Of these three communities, two are also considered to be uncommon within the City (Photo 3).

Overall, the generally small number of successional communities in the City continues to highlight the perception that these types of communities do not contribute to the biodiversity of the City and, therefore, are not important to retain. However, these communities perform a number of important ecological functions: they provide habitat for a number of plant and animal species (including birds), act as a buffer between forests and adjacent development, provide structural diversity to a site (variation in the height and spatial structure of plants provides a wider range of animal habitat), and they provide habitat for small mammals and insects, which in turn provide a prey base for other species higher up the food chain. In addition, successional communities often contribute a linkage function between natural areas.



Photo 3. Successional community at ETO3

### **Wetland**

The wetland category is composed of twenty vegetation communities which cover a total area of 132.98 ha (Appendix 9). Wetlands comprise only 0.45% (132.98 ha) of the total City area (Appendix 9). Eighteen of the twenty vegetation communities in this category are considered uncommon in the City occupying approximately 1% of the total area of natural areas. The two vegetation communities that do not fall into the ‘uncommon’ category, cattail mineral shallow marsh type (MAS2-1) and open aquatic (OAO), represent only 1.05 and 1.87% of the total area of natural areas, respectively. Additionally, eight of the communities that are considered uncommon in the City are also considered to be “at risk” within the City; being represented at only one natural area (Photo 4).



Photo 4. Wetland at EC13.

Despite their small size, wetland communities tend to contribute disproportionately to the biodiversity of the City, mainly owing to the large number of plant and animal species that are restricted to this habitat. In addition to the concern about outright removal of these communities for development, there is also the concern that even if a wetland is retained within a subdivision, alterations to the hydrological and/or hydrogeological regime from the development may result in reductions in biodiversity or even conversion of the vegetation community from wetland to upland. These areas are especially important for amphibian species which can be key indicators of habitat quality.

### **Anthropogenic**

The anthropogenic category is composed of ten vegetation communities and cover a total area of 237.72 ha within the City (Appendix 9). All but two communities (Anthropogenic and Manicured) are considered uncommon in the City occupying approximately 1% of the total area of natural areas.

### **Other**

The “other” category is composed of four vegetation communities (Appendix 9): mineral open beach/bar ecosite (BBO1), mineral treed beach/bar ecosite (BBT1), dry tallgrass prairie type (TPO1-1), and unknown. This category covers a total area of 10.48 ha and represents 0.04 % of the total City area as it has since 2006. The communities identified in this category are only found in the following natural areas SD1, SD5, SD7, CL8, CL9, CL30, LV3, and LV4. All four community types within this category remain uncommon in the City, collectively occupying 0.48% of the total area of the NAS. The tall grass prairie (S) community is also considered to be “at risk” in the City as it is represented in only one natural area, CL30 (Lorne Park Prairie). In addition, the tall grass prairie community is considered to be provincially significant.

## 4.0 SIGNIFICANT FEATURES

### 4.1 Flora

The total number of floral species in the City of Mississauga stands at 1,169. There are 704 native species in Mississauga (60% of the flora) and 465 non-natives. The percentage of native plants present within these urban natural area is relatively low in comparison with the flora of Ontario as a whole, which has approximately 73% native plant species (Kaiser 1983). Seven flora species were added to the plant list this year; two native species, four non-native species, and one species identified only to genus (*Crataegus* sp.) (Table 3). Of the native species recorded from Mississauga, 29 (2%) are considered extirpated, 234 (20%) are rare (known from only 1 to 3 locations in the City) and 136 (12%) are uncommon (known from 4 to 10 locations in the City). There were no additional plants designated as provincially rare in 2011 (NHIC 2011), thus the provincial status of species occurring in Mississauga remains unchanged. There are two provincially significant species documented from Wards 5, 6, and 11 in 2011; butternut and woodland satin grass (*Muhlenbergia sylvatica*) (Appendix 11). Butternut was documented from numerous locations in 2011 (Appendix 10); however, woodland satin grass has not been documented from these Wards since 1980.

Table 3: Species added to the City of Mississauga flora list in 2011 – records from field work.

Common Name	Latin Name	Rarity Status		NAS Site
		G Rank	S Rank	
great blue cohosh	<i>Caulophyllum giganteum</i>	G4G5Q	S4?	CRR2, MV2
black cosmos*	<i>Cosmos bipinnatus</i>	G?	SNA	MV18
hawthorn sp.	<i>Crataegus</i> sp.	G?	S?	27 NAS Sites
lemon-balm*	<i>Melissa officinalis</i>	G?	SNA	CRR3
Chinese lantern*	<i>Physalis alkekengi</i>	G?	SNA	CE12
downy ground-cherry*	<i>Physalis pubescens</i>	G5	SNA	MV19
least bur-reed	<i>Sparganium natans</i>	G5	S5	ETO3

\* indicates a non-native species

The Butternut tree is currently designated as Endangered nationally by COSEWIC and provincially by Ontario Ministry of Natural Resources (OMNR). Species listed as Endangered in the province are afforded habitat protection under the Endangered Species Act. Butternut is listed as Endangered because it is rapidly declining throughout its entire North American range as a result of infections by a fungus, butternut canker (*Sirococcus clavigignenti-juglandacearum*). In 2011, surveys for butternut were conducted at twelve natural areas where access was available (Appendix 10). A total of thirteen butternut trees were observed in three natural areas (CRR1, CRR2, and NE5), including two sites (CRR2 and NE5) where there were no previous records of the species.

There are 496 floral species which are considered to be a Species of Conservation Concern (CVC 2010) within the City. Of these, 27 floral species are Tier 1, 344 are Tier 2, and 125 are Tier 3 (see Appendix 5 for definitions of each Tier). As can be expected, the larger natural areas (*i.e.* CRR1, CRR2, CRR3, CRR4, and MV2) have greater amounts of floral Species of Conservation Concern.

## 4.2 Floristic Quality Assessment

The Floristic Quality Index (FQI) and Coefficient of Conservatism (CC) were re-calculated for 40 natural areas to include field data collected in 2011. Appendix 6 provides the FQIs and native mean coefficients for all natural areas that were assessed and summarizes changes. In 1996, 107 of the 144 natural areas were assessed using the FQA. FQIs ranged from 2.68 to 80.10 and the native mean coefficients ranged from 1.20 to 4.82. As of 2011, a total of 137 natural areas and all three residential woodlands have been assessed using the FQA, based on data collected during a field or roadside visit. The current FQI values within the City range from 4.90 to 83.66 and the native mean coefficients range from 1.40 to 4.52. High, medium and low values for these are defined in Appendix 2.

In 1996, the majority of natural areas fell in the medium range of native mean CC (3.3 to 3.99) and in the low range for the FQIs (< 30.00). In 2011, this is still the case for both the native mean CC and the FQI. Lower native mean CC indicates a greater presence of species characteristic of disturbed environments, and a commensurately lower proportion of plant species that indicate high quality habitat. Species with low mean CC tend to occur in a wide range of habitats and are less susceptible to disturbance. In contrast, plant species with high mean CC tend to be conservative in their habitat requirements (see Section 2.3). The decrease in the highest mean CC value within the high category, from 4.82 in 1996 to 4.52 in 2011, suggests a slight increase in disturbance in at least some of Mississauga's natural areas. This could also be attributed to more species being identified over the years as further inventory of natural areas occurs. In addition, FQI values have increased at 36 of the 40 sites in 2011. These increases typically ranged between 2 to 15 points, and likely occurred as a result of more thorough inventory and the fact that species lists are added to each year, and as such the number of species, and the potential for increased FQI values increases.

## 4.3 Fauna

The 2011 breeding bird surveys conducted in natural areas in Wards 5, 6 and 11 continued to document the widespread use of most natural areas by habitat-generalist breeding bird species. Despite habitat becoming increasingly fragmented, a few habitat-specialists are still present in larger patches and/or patches with a high diversity of vegetation communities. Many of these species are significant (Species of Conservation Concern) in the Credit River Watershed (CVC 2010). Highlights included extensive riparian areas with connected tableland forest, such as the Credit River and its tributaries (CRR1, CRR2, CRR3, MV2, and MV19) Etobicoke Creek and its tributaries (ETO3, ETO4, and NE9). These sites sustained the highest number of "possible" breeding bird species of any areas surveyed in 2011, with a high diversity of adaptable species tolerant of urban habitats (*e.g.*, American robin, northern cardinal and song sparrow), as well as



more habitat-specific, and area-sensitive species (for example, savannah sparrow and blue-gray gnatcatcher).

Species dependent on certain specific microhabitats (for example species that depend on high bluffs such as bank swallow, rough-winged swallow, cliff swallow) were typically found along the Credit River, Etobicoke Creek and other larger creek valleys. The most common Credit Valley Conservation Species of Concern were the mid-to late-successional species (of shrubby cultural meadows and young forest): common grackle and gray catbird. This is not because there is abundant cultural meadow and young forest, but because of the narrow bands of riparian vegetation along the smaller creek valleys that contain many elements common to successional areas, such as shrubs and young trees. These communities likely persist because of the high level of disturbance and high light levels present there. Marsh area-sensitive species such as rails, pied-billed grebes and American coots are very rare in Mississauga (the only recent record within Wards 5, 6, and 11 is Virginia rail in EC13 in 1998, otherwise the records are outside of these Wards; many of which are at Rattray Marsh). Raptorial birds (hawks, falcons, *etc.*) are more common along the Credit River and larger creek valleys (*e.g.*, CRR2 and ETO3) than in other parts of Mississauga, reflecting the larger number of open natural areas to support a forage base. Raptors are also commonly found in forest patches with open communities adjacent (*e.g.*, HO3). Red-tailed hawk was noted at nine forested sites in 2010: CRR1, CRR2, CRR3, ETO3, GT3, HO3, HO9, MV19, and MV2. Older areas of the City still provide habitat for some declining bird species that depend on human structures in older neighbourhoods. However, these species are also typically sensitive to development and are not present in new residential areas. Such species include barn swallow, chimney swift, and cliff swallow.

There are seven provincially significant bird species documented from Wards 5, 6, and 11. Provincial status for two fauna species reported in the City of Mississauga have changed in 2011; eastern meadowlark and barn swallow (Appendix 12). Both eastern meadowlark and barn swallow are designated as Threatened. Status in Ontario has been changed to reflect the status given by COSEWIC and COSSARO. Eastern meadowlark was not documented from any sites during field surveys in 2011, but has been identified in the past from four natural areas within Wards 5, 6 or 11: MV2, CRR2, EC13, and ETO1. The last record of this species within Wards 5, 6, or 11 was in 2010 at ETO1. Barn swallow was last documented from these Wards in 2011 at CRR1. In previous years, this species has been documented from four other sites within these Wards: CRR2, EC13, MV19, and MV2. In addition, bobolink, another species designated as Threatened by the province, has been recorded EC13 in Ward 6. However, this record is from 1998 and suitable habitat no longer exists at EC13. The species was not noted in the 2012 update. Only one provincially significant bird species within Wards 5, 6, and 11 is a confirmed breeder; yellow-breasted chat at ETO2. This species was documented from this site in 2011. The remaining five provincially significant species (barn swallow, black-crowned night-heron, bobolink, Canada warbler, chimney swift, and eastern meadowlark) are all documented as probable breeders within these Wards.

There two provincially significant species of reptiles and one provincially significant amphibian recorded from Wards 5, 6, and 11 (Appendix 12). Common snapping turtle and eastern milksnake were both documented from these Wards in 2011 (one from field surveys and one from literature review). In addition, one provincially significant amphibian (Jefferson/blue-

spotted salamander complex) was documented from MV2 in 2007. Although amphibian surveys were completed at MV2 in 2011, no Jefferson/blue-spotted salamander complex were found.

Currently, there are 217 fauna CVC Species of Conservation Concern (SCC, CVC 2010) documented from the City. Of these, 52 fauna species are Tier 1, 93 are Tier 2, and 72 are Tier 3 (Tiers are defined in Appendix 5). Of the 217 fauna SCC there are 170 bird species, 22 mammal species, 16 amphibian species, and nine species of reptile. Of the 170 bird SCC documented from within the City, 18 are confirmed breeding, 42 are probable, 25 are possible, 79 are observed, four are migrants, and two are wintering within the NAS. As described above, most of these SCC are habitat specialists, for which habitat is more likely to be eliminated as natural areas become isolated, fragmented and altered by surrounding development.

Amphibian surveys were conducted at 11 sites in 2011 (Appendix 13) and focused on early forest breeding amphibians that require vernal pools such as spring peepers and wood frogs. Generally, very few sites within the natural areas system provide habitat for forest breeding amphibians, which require “fishless” ponds in or near woodlands for breeding. These ponds are fed by snow melt, groundwater and/or rainfall, and are full in early spring and dry out slowly over the summer. The water in the ponds needs to persist long enough to allow amphibian larvae to transform into adults, generally around mid-July. This habitat is rare in Mississauga. The following sites, where habitat appeared potentially suitable for woodland frogs (from aerial photo review), were surveyed for frogs in 2011: CRR1, CRR2, CRR3, EC13, ETO3, ETO4, MB9, MV2, MV12, MV19, and NE9.

American toads are still extant in several locations, as they can use a number of upland and wetland habitats for foraging and breeding. This species was documented at CRR2, MB9, MV12, MV19, and NE9. Western chorus frogs were documented from EC13 in 2011. This species requires open marshy or grassy ponds for breeding, and spends the non-breeding period in a variety of open uplands and woodlands. Grassy areas, including those that contain ponds, are some of the first habitats to become developed in most urban growth areas. Western chorus frog had not been documented from EC13 since 1988, despite being surveyed at least xx times. This suggests that the habitat is marginal and breeding probably does not occur there every year. EC13 is entirely fenced off from public access and the cultural savannah around the wetland provides added buffer from adjacent activities. This also demonstrates the benefits of buffers and restricted public access to natural areas.

Gray tree frogs, which vocalize later than spring peepers, have been heard in the past at EC13 (1989), CRR1 (2001), and CRR2 (2001) but none were heard in 2011.

Green frog, which is a much more adaptable species that can use storm water ponds for breeding, will likely persist in Mississauga. This species was heard at sites MV2, MV12 and NE9 in 2007. These same sites were surveyed in 2011 and no green frogs were heard. Northern leopard frogs are still present in several locations within the City, as they can use a number of upland and wetland habitats for foraging and breeding. This species was not documented during the frog call surveys in the breeding season, but an incidental observation was documented from ETO2 in September 2011. Bullfrogs require extensive emergent vegetation and deeper water, and this type of habitat is also rare in Mississauga, except in the marshes at the mouth of the Credit River.

Bullfrogs were not heard in 2011, despite surveying sites where previous records of bullfrog existed (MV12, CRR2, and EC13).

A survey was completed for salamanders breeding within Wards 5, 6, and 11 within CRR2 and MV2. Aerial photography and past records of salamanders within these Wards was used to determine locations of spring salamander surveys. No salamanders were found at either site in 2011. Adult spotted salamanders, which have similar requirements to woodland frog species but spend the non-breeding period underground, were noted in CRR2 for the first time in 2007. This species occurs very rarely in Mississauga, generally only in vernal pools in the largest forested areas (e.g., CRR10, MV2), and in some areas that have remained undeveloped. This was a difficult spring for emerging salamanders as there



Photo 5. White-tailed deer at ETO3.

was a period of warm weather when many salamanders emerged, followed by another frost. This frost may have killed some salamanders on route to vernal pools. However, not all salamanders emerged during the first warm period, and would have then emerged once conditions were appropriate and the frost had melted. There is still potential for salamanders at both of these sites. Further studies in future years are recommended to continue monitoring the presence or absence of this species from these sites.

Mammals common to urban areas are found occasionally with the natural areas system. Such mammals include white-tailed deer (Photo 5), grey squirrel, and raccoon. White-tailed deer are typically more common in larger valleyland systems including the Credit River and Etobicoke Creek corridors in Wards 5, 6, and 11.

## 5.0 MANAGEMENT ISSUES

Generally, the natural areas within the City that were surveyed in 2011 continue to be in fair condition (see Appendix 6 for changes and Appendix 2 for definitions of “condition”). Natural areas evaluated as being in fair condition have moderate disturbances (e.g., few trails, limited dumping, some trampling, *etc.*) and an average number of non-native flora species, typical of what can be expected in an urban natural area. The overall condition of the natural areas visited in 2011 remained largely unchanged from previous studies.

The most common disturbances within natural areas are those associated with the inevitable increase in the uncontrolled human use of natural areas following development of adjacent sites. Examples of these disturbances include: the creation of *ad hoc* trails, the use of mountain bikes (including the construction of some elaborate racing circuits), the presence of garbage, boundary encroachment, vandalism, invasive species, and toxic non-native species. These disturbances have become more prevalent at many of the natural areas surveyed this year and are discussed below. Another threat to these natural areas is the ongoing pressure for additional development within Mississauga.

## 5.1 Ad-hoc Paths

### **Threat**

*Ad-hoc* paths are commonly created within NAS sites. These paths greatly increase the amount of disturbance by compacting the soil, trampling vegetation, disturbing soils such that they are favourable for non-native plant species, and potentially disturbing local wildlife by increasing human activity in areas which were previously undisturbed.

### **Management Recommendation**

Trails that are not part a formal trail system should generally be closed off and entrances covered with natural debris (*i.e.* place logs *etc.* across path) to discourage use of the path and allow the area to regenerate. Signs could be posted at the entrances to these closed off trails to explain that the trail has been closed for natural regeneration. Ideally, natural areas prone to human use should be subject to a trail plan to rationalize the best location and design for trails. Providing well-constructed trails, within a rationalized trail system, satisfies the need for passive recreation and may reduce the number of newly constructed *ad-hoc* trails. The development of trail plans for all natural areas should be a priority for the City. Where a natural area is located in an area subject to development, the trail plan could be required as part of the development application.

### **Locations**

This management issue was noted at 24 of the 40 NAS sites evaluated in 2011.

## 5.2 Mountain and BMX Bike Use

### **Threat**

Mountain and “Bicycle Moto-cross” (BMX) circuits have been created in many natural areas. These circuits typically involve substantial disturbance of soil and degradation of vegetation in the surrounding area. They often include the construction of elaborate circuits that may involve excavations, mounding of soil to create jumps, and construction of aerial routes with lumber. These pose a significant impact to natural areas. Mountain bike trails also frequently traverse steep slopes and have in some areas (*e.g.*, slopes along the Credit River valley) resulted in erosion issues and exposure of root systems.

### **Management Recommendation**

There is a high demand for BMX and mountain bike trails in natural settings. Although the City has three dirt jump parks and one park specifically for mountain bikes (Ellis Leuschner Challenge Park), this recreational activity continues to be an issue which needs to be addressed. Consideration could be given to a ban on BMX and mountain bike use off of sanctioned trails. Signage, barriers, education initiatives and promotion of existing facilities may assist in addressing this impact. This issue could be addressed jointly with CVC, Conservation Halton and the TRCA, as they have similar issues in many of the Conservation Areas they manage, and may be able to assist with education and outreach through their Stewardship Programming.

The City could develop a rehabilitation protocol for areas impacted by trails and circuits. This could include re-grading areas, scarifying compacted soils and undertaking planting programs to re-establish natural cover in publicly owned natural areas. This could be combined with a

community education program and involve local volunteers. Contact and dialogue with local cycling organizations should be initiated to make them aware of the issue and solicit their assistance in developing a solution.

### **Locations**

This management issue was noted at SV1 in 2011.

## **5.3 ATV Use**

### **Threat**

The use of All-Terrain Vehicles (ATV) within natural areas is relatively uncommon within Mississauga; however, this threat is present and has the ability to create a significant impact to natural areas. These motorized vehicles degrade ground flora by destroying the organic surface soil layers and compacting soils. In addition, due to the great distance the ATVs can travel, they also have the potential to carry invasive plant species into natural areas. ATV trails often traverse steep slopes (Photo 6) which typically result in erosion and exposed root systems. ATV trails also often travel through creeks to connect to another trail network which increases the possibility of water contamination from oils used on the ATV as well as the degradation of aquatic flora and fauna.



Photo 6. ATV trail on steep slope at ETO1.

### **Management Recommendation**

Strong consideration should be given to a ban on ATV use within all natural areas within the City through an appropriate by-law. On-site signage, barriers, and education initiatives may assist in addressing this impact. This issue could be addressed jointly with the conservation authorities as they have similar issues in some of the Conservation Areas they manage, and may be able to assist with education and outreach through their Stewardship Programming.

The City should develop a rehabilitation protocol for areas impacted by ATV use. This could include re-grading areas, scarifying compacted soils and undertaking planting programs to re-establish natural cover in publicly owned natural areas. This could be combined with a community education program and involve local volunteers.

### **Locations**

This management issue was noted at ETO1 in 2011.

## 5.4 Dumping/Garbage

### Threat

As noted in previous studies, the dumping of discarded horticultural plants, largely as a result of encroachment where residents use the natural areas behind their house for compost and dumping yard waste, is another common vector for the introduction of non-native plants to natural areas. In addition to dumping yard waste, garbage and compost often gets dumped into these natural areas as well (Photo 7). Garbage and compost is detrimental to natural areas in that it smothers the ground vegetation and does not allow flora to grow up from underneath. It may also contain potential harmful contaminants, and is a potential hazard for fauna.



Photo 7. Party spot littered with garbage at ETO1.

### Management Recommendation

Fencing off natural areas adjacent to residential and industrial lands is the best method of deterring dumping within natural areas (McWilliam *et al.* 2011). City policy requires developers to install chain link fence (with no gates) along the property boundary when a development is adjacent to hazard lands and natural areas. These fences are often compromised by adjacent residences that cut fencing and install gates to allow access into the natural areas. It is recommended that the City continue enforcement of the original intent of the by-law, and eliminate access points in fencing between private lands and natural features. In addition, volunteer events could be held to pick up garbage from these natural areas. This would help to keep the garbage issue under control. Signage which states that no dumping is allowed and the associated fines is also a deterrent for people dumping garbage at NAS sites. This signage has been posted at many NAS sites; however, text on these signs tends to fade over time and these signs should be replaced as needed. Dumping is another impact that would benefit from additional education, as the public is often unaware of the impact of dumping garden waste.

### Locations

This management issue was noted at 31 of the 40 NAS sites evaluated in 2011.

## 5.5 Boundary Encroachment

### Threat

Encroachment into a woodland edge usually results in a number of indirect impacts that can degrade woodlands. Woodland edges act as an interface between the interior forest conditions and the open areas outside the woodland. These natural edges function to support dense shrub growth and tree foliage, which is often thicker along the outside edge. Trees that have grown to maturity along woodland edges are generally more resilient to blow-down, as a result of having adapted to the more exposed edge environment. When the edge is disturbed or removed, the edge microclimate changes, resulting in elevated temperatures, higher light levels, greater wind penetration, decreased humidity, *etc.* This can initiate a chain of events including soil desiccation, change in soil microfauna, and changes to food webs, nutrient cycles and

decomposition cycles. This in turn can effect vegetation composition by making the habitat more suitable for species of open conditions (usually non-native), and less suitable for native woodland plant species, as well as impacting birds and other wildlife. Trees along a 'new' edge created when only part of a woodland is removed, are also more susceptible to windthrow. Additionally, in situations where residential lots back directly onto woodland, edge encroachment often takes the form of residents manicuring the woodland ground layer. This often involves removing native flora, making pathways, collecting and removing small and large woody debris and sometimes the detritus layer, and changing the structural characteristics of the woodland. These all have substantial detrimental effects on vegetation and wildlife habitat.

### **Management Recommendation**

Chain link fencing is the best deterrent to encroachment (McWilliam *et al.* 2011) and it should be placed in locations where natural areas directly abut residential or industrial areas. The impacts of encroachment should be addressed in educational and stewardship programs. Boundary encroachment by-laws should be enforced to the extent possible, with education being emphasized for first-time offenders.

### **Locations**

This management issue was noted at 12 of the 40 NAS sites evaluated in 2011.

## **5.6 Vandalism**

### **Threat**

Tree carving, tree cutting, and spray-painting are all types of vandalism which have been observed at NAS sites. These activities are detrimental to the growth and function of the ecosystem.

### **Management Recommendation**

Similar to previous recommendations, limiting public access via fencing *etc.*, as well as enforcement of City by-laws, would decrease the occurrence of this threat. Since these activities often occur in the more remote parts of natural areas, reduction of *ad hoc* trails (which often provide access the remote areas) may also reduce the frequency of this impact.

### **Locations**

This management issue was noted at NAS sites ETO4, HO3, and MA1 in 2011.

## **5.7 Development**

### **Threat**

Development continues to impact natural areas, through the removal of individual trees and larger areas containing native vegetation. Impacts can result from the construction of residential dwellings and related structures such decks, sheds and swimming pools, industrial buildings, infrastructure and parking areas within the boundaries of natural areas.

### Management Recommendations

All of the remaining natural areas in the City should be protected from development and managed to maintain or increase biodiversity. Of particular importance is the protection and subsequent management of all woodlands, wetlands and successional habitats wherever possible. Protection of wetlands in close proximity to forested and cultural habitats is particularly important for both plant and wildlife.

### Locations

This issue was noted at MB9 in 2011, where part of a woodland was removed to allow development.

## 5.8 Invasive Species

### Threat

There has been a continual increase in the proportion of non-native to native plant species in natural areas since 1996 (see Appendix 6). Of the 36 natural areas surveyed this year, all showed an increase of non-native species. Without active management, species such as Norway maple (*Acer platanoides*), garlic mustard (*Alliaria petiolata*), European buckthorn (*Rhamnus cathartica*), dog-strangling vine in a continued loss of native plant species in natural areas (Photo 8). This is a province-wide problem and is a difficult one to mitigate.



Photo 8. Dog-strangling vine invading a meadow at NE9

### Management Recommendation

This problem cannot be effectively addressed without a City-wide strategy. A high priority should be placed on developing an approach to addressing non-native species and development management initiatives to address the most invasive exotic species. Such a study should include an assessment of the feasibility of managing some aggressive exotics and prioritize species and areas to most effectively use City resources. Species that are candidates for high priority are Norway maple, garlic mustard, purple loosestrife, dog-strangling vine, white poplar (*Populus alba*), Japanese knotweed (*Polygonum cuspidatum*), European buckthorn, and white mulberry (*Morus alba*). The City should consider ways to restrict or prevent the planting of invasive non-native plants, as well as providing encouragement and a mechanism for the City and the community to work together to remove such plants. Consultation with the conservation authorities is encouraged as this is an issue they need to address within their Conservation Areas.

Initiate a public education program in concert with community-based stewardship initiatives to involve local citizens in the conservation and management of natural areas, as outlined in the Natural Areas Survey (Geomatics 1996). The key to this is demonstrating the ongoing



degradation of woodland through careless and improper use. The public education and stewardship activities in Cawthra Woods (LV7) offer a good example of what can be achieved.

### Locations

This management issue was noted at all 40 NAS sites evaluated in 2011.

## 5.9 Toxic Non-native Species

### Threat

There are human health and/or safety issues associated with giant hogweed (*Heracleum mantegazzianum*) and wild parsnip (*Pastinaca sativa*). Giant hogweed was reported for the first time in Mississauga in 2009. Giant hogweed is a non-native species introduced from Europe and has been noted at six natural areas within Wards 5, 6, and 11. The non-native wild parsnip has been recorded during field work in Mississauga since 2000. As of the 2011 update, wild parsnip has been recorded from seven natural areas in Wards 5, 6, and 11. Both of these species are a human health risk because they exude a clear watery sap containing photosensitizing agents which in combination with daylight cause skin in contact with the sap to burn.

### Management Recommendation

It is recommended that these species be made a priority for removal from NAS sites. A City-wide strategy to deal with aggressive non-native species impacts needs to be formulated and management plans developed to remove the most invasive exotic species as soon as possible.

### Locations

This management issue was noted at the following NAS sites in 2011: CRR2, CRR4, and CRR5.

## 5.10 City Naturalization Initiatives

### Threat

Naturalized areas observed during field work at a number of sites have typically involved leaving an area of unmowed grass to regenerate naturally, with the addition of native plantings in some areas (Photo 9). While the size of the natural area increases as a result of this regeneration, this strategy also provides habitat for invasive plants such as purple loosestrife (*Lythrum salicaria*) and dog-strangling vine (Toronto Region Conservation Authority 2008). In addition, if the natural area occurs in a valleyland, its inherent ability to function as a linkage will promote the spread of these invasive species within the City.



Photo 9. Restoration signage at HO3.

### Management Recommendation

To the extent possible, such areas should be planted with native species or otherwise managed toward a native community to prevent or reduce the impact of non-native plant species. It is important that restoration plantings be managed, at least through the establishment phase, otherwise in at least some cases the plantings do not survive, as has happened at natural area

ME13. Thus, all naturalization (creation of natural habitat from manicured parkland) projects undertaken in natural areas by the City should involve both the planting/seeding of native species and the control of non-native species.

### **Locations**

Naturalization initiatives were noted at 14 of the 40 NAS sites evaluated in 2011.

## **5.11 Need for Management Plans**

### **Threat**

All of the management issues noted above are a result of development adjacent to natural areas and uncontrolled human use of natural areas. Use of NAS sites by the public is appropriate and should be encouraged to promote an appreciation of Mississauga's natural heritage. However, uncontrolled use and access will degrade the City's natural areas.

### **Management Recommendation**

The only approach to minimizing impacts from human use is through the development of management plans for natural areas. These management plans should identify permitted uses and locate trails consistent with the capacity of each site to sustain use, as well as identifying portions of area that are too sensitive to permit human access and areas that should be rehabilitated and/or restored. The development of management plans for natural areas within the City could be prioritized with higher consideration given to areas that are most susceptible to degradation, and which have high natural heritage values.

Consideration should be given to prioritize natural areas based on significance, representation, size and condition, and those of greatest value. Issues addressed in the management plans should include, but not be limited to: access, encroachment, appropriate activities, non-native plant control, and restoration initiatives (see Geomatics 1996 for a complete description of management plan (previously named "Conservation Plan") requirements). Restoration initiatives could be started on two or three natural areas for a period of two to three years, and natural areas could then be dealt with on a rotational basis that focuses on those natural areas at greatest risk.

## **5.12 Summary of Management Issues**

Observations at natural areas in Mississauga are consistent with reports from the literature that human use of natural areas results in the degradation of such areas through: alteration of decomposition and nutrient cycles, the loss of understory vegetation (particularly herbaceous species) (Friesen 1998, Matlock 1993, McWilliam *et al.* 2011), as well as the loss of leaf litter and humus, reduction of moss species, and soil compaction (Matlock 1993). Matlock (1993) also suggested that the recovery of soil and understory vegetation could take 10 to 20 years after the cessation of traffic. Deterioration of the quality of Mississauga's natural areas can be expected to continue unless there is a substantial effort to manage natural areas through site specific management plans (Conservation Plans) and community stewardship initiatives.

## 6.0 CONCLUSIONS

After over ten years of update surveys covering the entire City several trends have emerged. First, there has been a general decrease in the quality of vegetation as indicated by an increase in the number of natural areas with decreasing native mean coefficients (Section 4.2, Appendix 6). However, the relatively minor decrease in the mean CC within the high category, from 4.82 in 1996 to 4.52 in 2011, suggests there may only be a slight increase in disturbance in at least some of Mississauga's natural areas, although this may be a result of more thorough inventories. There is an overall increase in FQI values overall, although this is minor and has not resulted in a shift toward higher FQI categories (*i.e.*, low to medium, medium to high, *etc.*). Continued monitoring of the natural areas over time will show whether these changes are a positive trend or an anomaly.

Second, there has been a decrease in the area of tableland and wetland natural areas in the City (Section 3.4). Between 1996 and 2006 development was a primary factor in the loss of 159.26 ha from the natural areas system including the loss of fourteen natural areas in their entirety. There has been no net loss of natural area within the natural areas system since 2006. Between 2006 and 2011, the natural areas system has increased by 199.06 ha, thus since its inception in 1996, the overall area of natural areas in the natural areas system is 39.80 ha larger. The primary reason for this increase is the inclusion of potential addition areas into the natural areas system.

Nineteen valleyland communities, eighteen woodland communities, six successional communities, eighteen wetland vegetation communities, eight anthropogenic communities, and four "other" communities are uncommon in the City (Appendix 9). In addition, thirteen of the valleyland communities, six woodland communities, three successional communities, eight wetland communities, and one "other" community are "at risk" in the City, occurring in only one natural area each.

With the conversion to ELC and the inability to meaningfully compare 2011 ELC vegetation communities to previously-classified Mississauga vegetation communities, there is the potential to lose 15 years of valuable data. We recommend that an approach to utilizing the pre-ELC data for trend analysis be developed as part of a future NAS update or the NHSS review.

Tableland NAS sites tend to be discrete islands that have limited connections to other remnant natural features. This reinforces the need to place a high priority on the protection of the remaining tableland features present within the City, and an emphasis on their management to maintain or improve their quality.

There has been a decline in the diversity and abundance of amphibian species between 1996 and 2011. This trend also reinforces the need to maintain and manage (and where possible restore) the remaining natural areas in the City. In particular, tableland natural areas (including woodlands, wetlands and successional vegetation communities) which continue to be the most seriously threatened by development.

One positive trend is the increase in naturalization projects undertaken by the City. The majority of naturalized areas observed during fieldwork between 1996 and 2011 have involved leaving an

area of un-mowed grass adjacent to a watercourse or woodlot feature to regenerate naturally, with the addition of native plantings in some areas. While this approach will increase the overall size of the natural area in question, this initiative could be enhanced by taking an approach that includes more planting and long-term management, which would more likely result in a healthy natural area with a diversity of native plant and animal species.

Continued efforts to protect and increase the proportion of the City occupied by natural habitat will promote biodiversity and reinforce the goals and objectives of the Natural Areas Program as set out in the original NAS report (Geomatics 1996).

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**Appendix 1: Natural Area Classification Scheme**

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## Appendix 1: Natural Area Classification Scheme (as updated in North-South Environmental Inc. 2004)

With changes to the rarity status of significant species at the national, provincial and regional levels, the criteria for classifying the natural areas were updated in 2004. Changes to the criteria as defined in Geomatics (1996) are highlighted in bold. Areas need only fulfill one criterion in any class to be designated in that class.

### Significant Natural Site

These are areas that are outstanding from a natural areas perspective, in the context of the City of Mississauga. Significant Natural Sites must fulfill one of the following criteria:

- ANSI, ESA and other areas designated for outstanding ecological features
- areas with a Floristic Quality Index (FQI) of  $\geq 40.00$
- areas with a mean floristic coefficient of  $\geq 4.50$
- woodlands  $\geq 10\text{ha}$  (25 acres) in size
- areas that support provincially significant (S1, S2, S3) or “species at risk” listed as special concern, threatened or endangered (designated by COSEWIC or COSSARO)
- woodlands with the potential to provide interior conditions (*i.e.*, no dimension of the woodland is  $< 700\text{m}$ )
- woodlands that support old-growth trees ( $\geq 100$  years old)
- wetlands  $\geq 2\text{ha}$  (5 acres) in size regardless of rank
- the Credit River and Etobicoke Creek valleys

### Natural Site

These are areas that represent good examples of remnant features that once characterized the City of Mississauga. Natural Sites must fulfill one of the following criteria:

- woodlands  $\geq 2\text{ha}$  (5 acres) but  $< 10\text{ha}$  (25 acres) (defined as forests which support appropriate understory and canopy species)
- **areas** that represent uncommon vegetation associations in the City
- areas that support regionally significant plant (in the City of Mississauga) or animal species (CVC species of concern)
- areas with a Floristic Quality Index (FQI) of 25.00 to 39.99
- areas with a mean floristic coefficient of 3.50 to 4.49
- areas that include natural (*i.e.*, not engineered) landscape features [*e.g.*, valley lands, watercourses, unusual (in the context of the City) landform features]

**Natural Green Space**

This class includes areas which perform ecological functions but do not satisfy any of the criteria for the previous two natural area classes. Natural Green Space includes:

- watercourses with vegetation other than mowed grass, even if they are predominantly engineered (*e.g.*, straightened or channelized)
- wooded areas that are < 2ha (5 acres) in size and do not fulfill any of the other criteria for Natural Site or Significant Natural Site
- Lakes Aquitaine and Wabukayne

**Residential Woodland**

These are older residential areas, generally with large lots, and almost completely in private ownership. They support trees with a mature, fairly continuous canopy, but the native understory is generally absent or degraded, usually through maintenance of residential lawns and landscaping. However, these areas still serve some functions such as: providing habitat for tolerant canopy birds, both in migration and for breeding; fixing atmospheric carbon; and facilitating groundwater recharge owing to the high proportion of permeable ground cover. With approaches that involve landscaping with native species, the ecological function of these areas would be greatly increased.

**Special Management Areas**

These are areas adjacent to or close to existing natural areas, and which have the potential for restoration, or which should be planned or managed specially. They are primarily identified to alert planners to the possibility of directing compatible land uses to lands adjacent to natural areas.

**Linkages**

These are areas which serve to link two or more of any of the five previous classes within the City, or to natural areas outside of the City boundaries. Linkages could include:

- stormwater management facilities including ponds and watercourses;
- designated open space;
- rights of way; and
- greenspace along major arterial roads providing there is an adequate barrier between the linkage and roadway.

**Appendix 2: Methods**

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## Appendix 2: Methods for the Mississauga Natural Areas Survey.

### Background Review

A background review was carried out comprising a careful analysis of digital aerial photographs and a review of reports (inventory reports, EIS, *etc.*) undertaken since the last update study, that might affect the natural areas reviewed for this survey. Field visits were made to 34 of the 36 sites included in the NAS review for 2011 (Appendix 3). Natural areas MB1 and MB2 did not receive a full field visit because permission to access these sites was not provided; however, these sites received a road side visit or were visited by walking along public areas adjacent to the natural areas (*e.g.*, along stream corridors).

### Fieldwork

For those sites in Wards 5, 6, and 11 that are in public ownership or for which access was available, a two-season field program was undertaken. This entailed a late spring visit to update information on spring ephemeral plant species and carry out breeding bird surveys, and a mid-summer visit to document summer flora, disturbances and any other changes. The following information was recorded on data sheets for each natural area that received a field visit:

- all flora and fauna species observed were recorded, and plant specimens collected where necessary to confirm identification;
- vegetation community descriptions were confirmed and updated where necessary;
- evidence of disturbance, regeneration and management needs were noted; and
- the overall condition was qualitatively rated in comparison to other sites in the City.

Breeding bird surveys were conducted in the early morning hours (05:00 to 10:00) between June 6 and June 13, 2011 for all of the natural areas in Wards 5, 6, and 11 where access was available. These surveys followed the Breeding Bird Atlas protocol (Ontario Breeding Bird Atlas 2001) for collecting evidence of breeding birds with the exception that only one breeding bird survey is completed each year, as opposed to the recommended two surveys. For most sites, the entire area was covered to detect bird species, but in sites where access was not granted, birds were recorded from as many nearby road access points as possible.

A review of digital aerial photographs was made to locate any potential amphibian breeding habitat. A visit was made to those sites with potential habitat in the early spring, after 20:00, to confirm the presence of habitat and to look and listen for the presence of any amphibian species. Amphibian surveys followed the Canadian Wildlife Service Marsh Monitoring protocol (Marsh Monitoring Program Participant's Handbook for Surveying Amphibians 2008).

Of the 40 sites visited in 2011, 12 sites were visited in an attempt to locate individual butternut trees (*Juglans cinerea*) as part of the ongoing program to monitor their presence and health. A maximum of 1 hour was spent in each natural area searching in appropriate vegetation communities (*e.g.*, floodplains, forest edges) to locate individual trees. If a butternut tree was found, it was accurately located in the field using a Global Positioning System (GPS). The condition of the individual tree was assessed, including a determination of whether the tree was infected with butternut canker (see discussion in Section 4.1).

As the NAS study pre-dated the provincial Ecological Land Classification (ELC, Lee *et al.* 1998), the original community classification did not conform to ELC standards. A list of vegetation communities in the City and their approximate corresponding ELC vegetation community classifications were provided by North-South Environmental (North-South Environmental 2000, Appendix 5). Since then, all natural areas have been evaluated in the field using ELC protocols to update the NSE 2000 list, and to comply with the provincial standard. Vegetation communities within the natural areas system are now properly classified according to ELC protocol. Vegetation communities which cover less than 1% of the NAS are considered “uncommon” while communities which are located at only one natural area are considered “at risk.” There is often overlap between these two classifications, as most vegetation communities which are “at risk” are also “uncommon.”

## **Analysis**

The City of Mississauga database records and fact sheets for each natural area were updated based on the literature review and fieldwork carried out in 2011. Hard copies of species lists and field notes were provided under separate cover to the City. The provincial rarity ranks for floral and faunal species were also reviewed and updated where required. Provincial rarity status was based on Natural Heritage Information Centre (NHIC 2011) rankings and Species at Risk (Appendix 5). For the purpose of reporting descriptive statistics, 29,269.0 ha was used as the total area of the City of Mississauga.

### **Floristic Quality Assessment**

The Floristic Quality Assessment system allows for an objective, quantitative evaluation of an area based on the quality of its flora. It can be used to compare two or more areas at a single point in time or monitor sites on an ongoing basis. It is extremely useful for measuring the success of management and restoration programs, especially in combination with other site characteristics and evaluation criteria.

The premise upon which the evaluation is based derives from the specific affinity of individual plant species for a specific habitat. Some plants exhibit conservative characteristics which restrict them to a relatively narrow range of conditions provided by specific habitats (*e.g.* prairie, wetlands, undisturbed woodland, *etc.*). Other species are not as restricted and are able to persist in a wide variety of habitats (woodland edges, abandoned fields, *etc.*). The former species are generally intolerant of human-caused disturbances because they will only persist in that narrow range of conditions provided by the native habitat. Species in the latter group are generally tolerant of disturbed conditions. For example, if the hydrological regime of a wetland is altered through stormwater management, any conservative species that occur there can be expected to be impacted, because the narrow range of conditions in which they can persist has been changed. Because of this, the FQA can be used to evaluate the degree of disturbance at a site and identify those habitats that are least disturbed.

Each native species in Ontario has been assigned a numerical value from 0 to 10 by a group of experts on the provincial flora (Oldham *et al.* 1995). This is referred to as the “coefficient of conservatism” (CC). Species ranked as 10 are the most restrictive or “conservative”, and thus



are most representative of high quality habitat. In order to evaluate a site, a species list is compiled, and the CC of all native plants are summed and divided by the total number of native plants to yield a mean CC for all the native plants in the site. A Floristic Quality Index (FQI) can then be calculated by multiplying the mean coefficient by the square root of the total number of native species recorded. Natural areas can then be compared using their mean CC and/or FQI. Sites with higher CC and/or FQI are generally in better condition than those with lower CC and/or FQI.

During the floral inventory of a given area, the mean coefficient of conservatism tends to stabilize quite quickly as new plants are recorded and included in the total for the site. The mean CC thus serves as a reliable indicator of natural area quality even when only reconnaissance inventories are available. However, the FQI is more influenced by species richness; therefore, areas that have complete inventories tend to have a higher FQI. Although the FQI is generally sensitive to the species richness of a site, it does not seem to be correlated to the size of a site.

Areas with incomplete inventories (generally defined as sites with fewer than 30 native species), or ones where just rare plants were surveyed, may provide biased results and the Floristic Quality Assessment was not used for such areas. However, heavily disturbed areas where an inventory of 30 or fewer native species represents a relatively complete inventory, were assessed. The mean coefficients and FQI have been categorized as high, medium and low values as follows:

Native mean coefficients -    high > 4.00;  
  medium = 3.3 to 3.99;  
  low < 3.3;  
Floristic Quality Indices -    high > 40;  
  medium = 30 to 39.99;  
  low < 30).

The Floristic Quality Indices were updated for the natural areas where the floral inventory changed between 1996 and 2010.

### **Condition**

Each site is ranked with respect to its current condition, based on observations during field reconnaissance. Overall disturbance at each site is noted, especially that associated with urban stresses such as litter, vandalism and unplanned trail networks. Non-native plants are recorded and expressed as a proportion (percentage) of the total known flora of the site. The provincial flora is approximately 27% non-native (Kaiser 1983) which provides context for evaluating the "nativeness" of the flora at a particular site. Sites are evaluated as excellent, good, fair or poor. A site in excellent condition has very little disturbance (*e.g.*, no trails, no dumping, limited cutting, no trampling, *etc.*), and few non-native floral species. A site in poor condition has many disturbances (*e.g.* trails, non-natives, garbage, *etc.*), and has a high percentage of non-native plants. A fair site is intermediate with respect to disturbance and has a medium ratio of native/non-native plants.

Recent disturbances, threats and management needs were noted where they changed from previous assessments. Recommendations for the mitigation of real or potential impacts that resulted from recent developments including naturalization projects are provided.

### **Mapping**

Boundary changes were determined by using aerial photographs to compare the mapped boundaries of each natural area (from the previous update) with boundaries resulting from any recent development. This was accomplished using colour 2011 aerial photographs overlaid with the existing natural area boundaries provided by the City. The boundaries were revised on the aerial photographs to reflect any encroachment from recent development and subsequently field checked, to the extent possible based on access. Boundary delineation followed the approach used in the Natural Areas Survey (Geomatics 1996). Refinements to the boundaries are considered minor changes to the natural area. Changes which are greater boundary refinements are considered to be major changes and constitute a potential addition to the natural area. Revisions were subsequently digitized by the City of Mississauga, Geographic Technology Services using MicroStation GeoGraphics format. Updated surficial areas (hectares and acres) for the natural areas and vegetation communities were determined using GIS and incorporated into the database. Updated UTM coordinates for the natural areas and vegetation communities were also incorporated into the database.

**Appendix 3: Reports Examined for Natural Areas Survey Updates**

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### Appendix 3: Reports Examined for Natural Areas Survey Updates

The format of this appendix follows Appendix 2 in the Natural Areas Survey (Geomatics 1996). The numbers correspond to those used in the database for literature references.

- 225 Gartner Lee Limited. 2004. Environmental Impact Study for the Proposed Training Facility, Part of Lot 2, Concession 4, East of Hurontario Street, Part 1.
- 226 Dillon Consulting Limited. 2003. Beaverbrook Homes (Lakeshore Village) Project Inc. "Lakeshore Village" Environmental Analysis Report.
- 227 Gartner Lee Limited. 2003. Scoped Environmental Impact Study, Glenerin Inn Redevelopment, City of Mississauga.
- 229 Philips Engineering Limited. 2004. North Sixteen District 'Scoped' Subwatershed Study and Ninth Line District Floodplain Mapping.
- 230 Stantec Consulting Ltd. 2004. Letter to Glen Schnarr & Associates Inc. re: Derrydale Golf Course - Ecological Constraints.
- 231 Bird and Hale Limited. 2003. Tree Evaluation Report 816 Meadow Wood Road Mississauga
- 232 Stantec Consulting Ltd. 2004. Credit River Pedestrian Bridge City of Mississauga Environmental Impact Study.
- 233 Aboud & Associates. 2004. Scoped Environmental Impact Study and Arborist Report. 77 Indian Valley Trail, Mississauga.
- 234 Dillon Consulting Limited. 2005. Greenfield South Power Plant Site Tree Inventory. Final Report.
- 235 Dillon Consulting Limited. 2005. Greenfield South Power Plant Site Environmental Impact Study – Vegetation Community Addendum. Final Report.
- 236 Gartner Lee Limited. 2005. Environmental Impact Study Update – Proposed EUSA Hydropole Training Facility, Creekbank Road and Matheson Boulevard, City of Mississauga.
- 237 Stantec Consulting Limited. 2004. Stonebrook Properties Inc. Scoped Environmental Impact Statement.
- 239 Stantec Consulting Limited. 2005. Orlando Mississauga Environmental Impact Study.
- 240 Toronto and Region Conservation Authority. 2005. Comments on Site Plan Application.
- 250 Gartner Lee Limited. 2006. Environmental Impact Study for Janoscik Property, Mississauga, Ontario.
- 251 Golder Associates. 2006. Scoped Environmental Impact Study Part of Lot 9, Concession 2, West of Tomken Road - South of Eglinton Avenue, City of Mississauga.
- 252 North-South Environmental Inc. 2006. Hershey Centre Woods Conservation Plan for Sports Complex at Hershey Centre (Phase III).
- 253 Baker Forestry Services Nursery and Consulting. 2006. Tree Survey Report for 3669 Mississauga Road, Northeast corner of Burnhamthorpe Road West and Mississauga Road, Ghalioungui Property. 4pp.
- 254 The Municipal Infrastructure Group with Dillon Consulting and Parish Geomorph. 2006. Streetsville Quarry Environmental Management and Servicing Report Update, City of Mississauga.
- 255 The Municipal Infrastructure Group. 2006. Streetsville Quarry: comments in response to queries from Credit Valley Conservation Authority.
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- 257 Tripodo, Paul, Leah Lefler, and Rod Krick. 2007. Credit Valley Conservation Authority field visit to NAS sites: SD5, CL13, LV4, LV5, MI1, and CL17.
- 258 Reid and Amelon. 2007. Acoustic Bat Monitoring Report. Credit River Watershed (Draft). August 30 – September 4 2007.
- 259 Reid, F. 2007. Small Mammals of the Credit River Watershed. Preliminary Monitoring Report: October 2 – 18, 2007. Draft.
- 260 Ecoplans Ltd. 2007. Jack Darling Park Rare Plant Management Plan.
- 261 EcoTec Environmental Consultants Inc. 2007. Tree Inventory and Avian Assessment CP Rail Right of Way at Bridge 19.9 Galt, Streetsville, Ontario.
- 262 Beacon Environmental. Uptown Mississauga: Hurontario and Eglinton Scoped Environmental Impact Study. Prepared for Pinnacle International (Ontario) Limited.
- 263 Philip van Wassenae. Urban Forest Innovations Inc. 2008. Tree Preservation/Arborist Report for 2182 Gordon Drive, Mississauga, Ontario. Prepared for Marta Vodinelic.
- 264 North-South Environmental Inc. 2008. Tree survey for Part of Block E (1459 Stavebank Road), Registered Plan B-09, City of Mississauga.
- 265 Ecoplans Limited. 2007. Environmental Impact Statement. 2725 Speakman Drive.
- 266 Gray Owl Environmental Inc. 2008. Environmental Impact Statement for 2225 Dundas Street East, Mississauga, Ontario.
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**Appendix 4: Fieldwork Identified and Date Completed**

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**Appendix 4: Fieldwork Identified and Date Completed.**

Natural areas for which the need for a field visit was identified was based on aerial photograph interpretation and literature review. Natural areas are grouped into categories based on the type of change identified either within or adjacent to the natural area. Field Visit indicates the type of visit the natural area received, field work or a road side visit (see section 2.2 for an explanation). Ownership indicates whether the natural area is privately owned and therefore required access permission or whether it is a City owned site (e.g., parkland).

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
<b>Minor changes to NAS boundaries</b>						
CE5	NGS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	13/06/11
					spring flora	13/06/11
					summer flora	02/09/11
CE10	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	13/06/11
					spring flora	13/06/11
					summer flora	02/09/11
CE12/SV12	SNS	• review of flora and fauna, site condition and site boundaries.	greenbelt	field work	breeding birds	13/06/11
					spring flora	13/06/11
					summer flora	25/08/11
					butternut	25/08/11
CR1	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	09/06/11
					spring flora	09/06/11
					summer flora	20/09/11
CRR1	SNS (ESA)	• review of flora and fauna, site condition and site boundaries	parkland	field work	amphibians	12/05/11
					breeding birds	06/06/11
					spring flora	06/06/11
					summer flora	06/09/11
					butternut	06/09/11

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
CRR2	SNS (ESA, ANSI)	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	06/06/11, 10/06/11
					amphibians	12/05/11
					spring flora	06/06/11, 10/06/11
					summer flora	16/09/11
					butternut	16/09/11
CRR3	SNS	• review fauna and site boundaries	parkland	field work	amphibians	10/05/11
					breeding birds	15/06/11
					spring flora	15/06/11
					summer flora	06/09/11
					butternut	06/09/11
CRR4	SNS (ESA, ANSI)	• review fauna and site boundaries	parkland	field work	breeding birds	15/06/11
					spring flora	15/06/11
					summer flora	08/09/11
CRR5	SNS	• review of fauna and site boundaries	parkland	field work	breeding birds	15/06/11
					spring flora	15/06/11
					summer flora	08/09/11
					butternut	08/09/11
EC13	SNS (wetland)	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	09/06/11
					amphibians	10/05/11
					spring flora	09/06/11
					summer flora	09/09/11

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
EC22	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland /private	field work /roadside visit	breeding birds	10/06/11
					spring flora	10/06/11
					summer flora	24/08/11
ETO1	SNS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland /private	field work /roadside visit	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	09/09/11
ETO2	SNS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	09/09/11
ETO3	SNS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	private	roadside visit	breeding birds	07/06/11
					amphibians	10/05/11
					spring flora	07/06/11
					summer flora	17/08/11
					butternut	17/08/11
ETO4	SNS	<ul style="list-style-type: none"> <li>review fauna and site boundaries</li> </ul>	parkland	field work	breeding birds	07/06/11
					amphibians	10/05/11
					spring flora	07/06/11
					summer flora	23/08/11
GT2	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	19/08/11
GT3	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	private	roadside visit	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	19/08/11

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
HO1	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	10/06/11
					spring flora	10/06/11
					summer flora	09/09/11
HO3	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland /private	field work /roadside visit	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	23/08/11
H06	NGS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland /private	field work /roadside visit	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	23/08/11
HO7	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	23/08/11
HO9	SNS (ESA)	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	08/06/11
					spring flora	08/06/11
					summer flora	23/08/11
					butternut	23/08/11
MA1	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	06/06/11
					spring flora	06/06/11
					summer flora	09/08/11
MV2	SNS (ESA, ANSI)	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	09/06/11
					amphibians	04/04/11, 12/05/11
					spring flora	09/06/11
					summer flora	08/08/11
					butternut	08/08/11

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
MV12	NS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	10/06/11
					amphibians	12/05/11
					spring flora	10/06/11
					summer flora	24/08/11
MV15	NS	• review of flora and fauna, site condition and site boundaries	private	roadside visit	breeding birds	10/06/11
					spring flora	10/06/11
					summer flora	24/08/11
MV18	NS	• review of flora and fauna, site condition and site boundaries	private	roadside visit	breeding birds	10/06/11
					spring flora	10/06/11
					summer flora	24/08/11
MV19	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	13/06/11
					amphibians	12/05/11
					spring flora	13/06/11
					summer flora	25/08/11
NE5	NGS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	17/06/11
					spring flora	07/06/11
					summer flora	19/08/11
					butternut	19/08/11
NE6	SNS	• review of flora and fauna, site condition and site boundaries	private	roadside visit	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	23/08/11
					butternut	23/08/11
NE7	NGS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	19/08/11

Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
NE8	NGS	<ul style="list-style-type: none"> <li>review of flora, site condition and site boundaries</li> </ul>	private	roadside visit	breeding birds	06/06/11
					spring flora	06/06/11
					summer flora	16/08/11
NE9	SNS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	06/06/11
					amphibians	10/05/11
					spring flora	06/06/11
					summer flora	10/08/11
					butternut	10/08/11
NE10	NGS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	06/06/11
					spring flora	06/06/11
					summer flora	13/08/11
NE11	NGS	<ul style="list-style-type: none"> <li>review of flora, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	13/08/11
NE12	NGS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt	field work	breeding birds	07/06/11
					spring flora	07/06/11
					summer flora	13/08/11
SV1	SNS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	parkland	field work	breeding birds	13/06/11
					spring flora	13/06/11
					summer flora	09/08/11
					butternut	09/08/11
SV10	NGS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	greenbelt /private	field work /roadside visit	breeding birds	13/06/11
					spring flora	13/06/11
					summer flora	09/08/11



Natural Area	Site Status	Reason for Field Visit (based on review of aerial photography and available literature)	Ownership	Field Visit		Completion Date (DD/MM/YY)
				Type	Timing	
MB9	NGS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	private	roadside visit	breeding birds	13/06/11
					amphibians	12/05/11
					spring flora	13/06/11
					summer flora	25/08/11
MV11	NS	<ul style="list-style-type: none"> <li>review of flora and fauna, site condition and site boundaries</li> </ul>	private	roadside visit	breeding birds	09/06/11
					spring flora	09/06/11
					summer flora	24/08/11



**Appendix 5: Rarity Status Definitions**

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## **Appendix 5: Rarity Status Definitions – Provincial Rarity and CVC’s Species of Conservation Concern.**

The following six rarity ranks follow the Natural Heritage Information Centre (NHIC 2009).

### **Global Rarity (G Rank)**

Global ranks are assigned by a consensus of the network of conservation data centres, scientific experts, and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species, subspecies or variety. This ranking system ranges from G1 to G5; with G1 being extremely rare and G5 being common.

### **COSEWIC**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) provides assessments for species’ at risk of extinction or extirpation and provides a subsequent designation. These designations range from Endangered (E), Extirpated (XT), Extinct (X), Not at Risk (NAR), Special Concern (SC), and Threatened (T). The Canadian list of Species at Risk is developed from these assessments.

### **SARA**

The Species at Risk Act (SARA) is one part of a three part Government of Canada strategy for the protection of wildlife species at risk. This three part strategy also includes commitments under the Accord for the Protection of Species at Risk and activities under the Habitat Stewardship Program for Species at Risk. The species assessment process is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (see above). A committee of experts use status reports to conduct a species assessment and assign the status of a wildlife species believed to be at some degree of risk nationally.

### **National Rank (N RANK)**

National Rank is a term used by conservation data centres and NatureServe to refer to the national conservation status rank of an element.

### **MNR Status**

The Ontario Ministry of Natural Resources assigns rarity ranks ranging from Extinct, Extirpated, Endangered (Regulated), Endangered (Not Regulated), Threatened, Special Concern to Not at Risk.

### **COSSARO**

The Committee on the Status of Species at Risk in Ontario is based on a Ministry of Natural Resources (MNR) committee that evaluates the conservation status for species at risk in Ontario. The Ontario list of Species at Risk, on which the Ontario Endangered Species Act and sections of the Planning Act are based, is developed from these assessments.

### **Provincial Rank (S RANK)**

Provincial ranks are used by the NHIC to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political

boundaries of Ontario. The NHIC evaluates provincial ranks on a continual basis and produces updated lists at least annually. The ranking system ranges from S1 to S5; with S1 being critically imperilled and S5 being secure.

### **Provincially Significant Species**

Flora species ranked S1, S2 or S3 by the NHIC are considered to be provincially significant. Fauna species ranked S1, S2 or S3 by the NHIC are currently breeding, or have bred historically (prior to 1970) within the City are considered to be provincially significant.

### **Regional Rarity (R Rank)**

The regional rarity ranks are assigned to plant species within the City of Mississauga based on Webber (1984), and updated through contributions from Jocelyn Webber, consultant's reports, and 1995 field work.

The regional ranking system is as follows:

- 0 extirpated within the City;
- 1 1 to 3 locations within the City, these species are considered to be regionally rare;
- 2 4 to 10 locations within the City, these species are considered to be regionally significant
- 3 11 to 39 locations within the City; and
- 4 > 40 locations within the City.

### **Credit Valley Conservation Species of Conservation Concern tiers (CVC 2010).**

#### **Tier 1—Species of Conservation Concern**

Tier 1 species, Species of Conservation Concern, are either currently protected under Canada's Species At Risk Act (SARA) or Ontario's Endangered Species Act (ESA), have been designated a species at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or by the Committee on the Status of Species at Risk on Ontario (COSSARO), or have been assigned at Subnational Rank (S-rank) of S1-S3? by the Natural Heritage Information Centre (NHIC). Once sufficient data on species of the Credit River Watershed is collected, an anticipated outcome is for species that are locally rare to be updated to Tier 1 status and for CVC to develop policy to protect these species and their habitat.

Tier 1 species are generally characterized by low abundance, low population density, specialized habitat requirements, and/or a narrow tolerance for survival. Because of their rarity and sensitivity, species of conservation concern should be identified and managed carefully, as even minor alterations to their habitat could be catastrophic. Identification and protection of habitats at various scales will help to maintain local populations and contribute to the protection and recovery of species identified as conservation priorities.

#### **Tier 2—Species of Interest**

Tier 2 species are those that have not been identified as Species of Conservation Concern but may be at risk from extirpation from the Credit River Watershed. These species appear to be exhibiting population declines, are naturally rare, are known or suspected to be sensitive to habitat loss and the effects of urbanization, or are species for which data is lacking. CVC aims to track these species to ensure that through policy and stewardship they receive the protection they require to prevent extirpation.

**Tier 3—Species of Urban Interest**

Species that have been designated Tier 3 are being tracked in urban areas. Urban areas are considered to be those within 2 km of built up cities or towns, including Mississauga, Brampton, Georgetown, Acton, Erin and Orangeville. Generally these species are secure in rural areas but have shown declines in or sensitivities to areas that are anthropogenically influenced or disturbed. CVC is interested in tracking these species to guide management decisions and address species declines in urban areas.





**Appendix 6: Changes in Natural Areas Updated (1996 to 2011)**

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**Appendix 6: Changes in Natural Areas in Wards 5, 6, and 10 from 1996 to 2011**

This table provides changes within natural areas evaluated in 2010. All changes between 1996 and 2011 are shown for natural areas where changes occurred. Blank cells represent no change from the previous year. Abbreviations as follows: SNS = Significant Natural Site, NS = Natural Site, NGS = Natural Green Space, Increase = ↑, Decrease = ↓. Some of the increases or decreases are significant in the context of the natural areas program while others are considered minor. Native FQI, native mean coefficient and condition are explained in Appendix 2. Provincially and regionally significant species are defined in Appendix 5. The Tiers of the CVC Species of Conservation Concern (CVC 2010) are defined in Appendix 5.

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
CE5	96																	
	98																	
	99	NGS		5.47	13	8 (61.5%)	2.68	1.20	1									Poor
	00																	
	01																	
	02																	
	04																	
	05																	
	06																	
	07				↓4.27	↑34	↑19(55.88%)	↑5.42	↑1.40				8					
11				↓4.18	↑47	↑28(59.57%)	↑7.34	↑1.68			3	↑11				2		
CE10	96	SNS		18.2	73	13(17.80%)	33.82	4.37	3		6	8		2			↑Good	
	98				↑93	↑19(20.40%)	↑36.04	↑4.19			↑7	↑9	↑2				↓Good-Fair	
	99				↑99		↑37.90	↑4.24			↑9	↑13						
	00																	
	01																	
	02																	
	04																	
	05																	
	06																	
07				↑18.68	↑132	↑28(21.21%)	↑42.18	↓4.14		↑1	↑16	↑17	↑3					

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	06																	
	07			↑19.83	↑134	↑57(42.54%)	↑29.06	↑3.31		↑1	↑9		↑24	↑6				
	11			↓18.68	↑171	↓47(27.49%)	↑45.62	↑4.11		↓0	↑12	43	↑20				7	
CR1	96	SNS	ESA,ANSI	4.90	47	3(4.30%)	29.55	4.45	2		2		1					Fair
	98		ESA															
	99																	
	00																	
	01																	
	02				↑70	↑11(15.71%)	↑33.72	↓4.39			↑6		↑4	1				
	04																	
	05																	
	06																	
	07				↑5.67	↑111	↑33(29.73)	↑35.89	↓4.06			↑11		↑12				
11				↑6.01	↑135	↑43(31.85%)	↑37.53	↓3.93			↓8	27	↑14				4	
CRR1	96	SNS	ESA,ANSI	71.40	41	12(26.80%)	0.00	0.00	5		2		2	2	1			Fair
	98		↓ESA		↑76	↑23(30.26%)	↑26.65	↑3.66			↑4		↑6					
	99																	
	00																	
	01						↓25.55	↓3.51					↑29	↑4	↑7			
	02				↑249	↑82(32.93%)	↑48.66	↑3.77			↑37							
	04		↑ESA, wetland	↓69.82	↑252		↑49.07	↓3.76	↑10	↑1				↑5				
	05			↑69.83	↑266	↑89(33.46%)	↑49.97				↑38		↑50	↑7	↑8			
	06																	
	07				↑73.39	↑294	↑107(36.39%)	↑51.46			↑41		↑53	↑9				
11				↑77.07	↑337	↑122(36.20%)	↑55.97	↑3.83	↑11		↓16	73	↑63	↑10		1	48	
CRR2	96	SNS	ESA,ANSI	91.29	89	30(30.00%)	32.94	4.29	8		3		13	9	10			Good
	98				↑100	↑31(31.00%)	↑32.99	↓3.97			↓2		↑14					
	99																	
	00																	

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	01					↓30(30.00%)	↓32.75	↓3.91					↑44		↑11			
	02				↑112	↑35(31.25%)	↑33.85	↓3.86	↑9		↑3		↑45					
	04																	
	05																	
	06																	
	07			↑98.30	↑183	↑66(36.07%)	↑40.19	↓3.72	↑12		↑14		↑52					
	11			↑101.08	↑264	↑87(32.95%)	↑52.61	↑3.97		1		65	↑59		↑13	1	51	
CRR3	96	SNS		68.94	34	5(14.71%)			4		3		1					Fair
	98				↑74	↑26(35.10%)	25.26	3.65					↑7					
	99																	
	00																	
	01					↓25(33.78%)	↓25.00	↓3.57					↑36	4	8			
	02				↑91	↑31(34.07%)	↑27.44	↓3.54					↑37	↑5		↑1		
	04																	
	05																	
	06																	
	07				↑74.64	↑92	↓31(33.70%)	↑27.86	↑3.57		1			↑41				
11			↓74.12	↑193	↑85(44.04%)	↑38.45	↑3.72	↑6		↑4	30	↑48			↑2	35		
CRR4	96	SNS	ESA,ANSI	24.69	11	2(18.18%)			3		1				7			Good
	98																	
	99																	
	00																	
	01			↓21.17									19	3		1		
	02				↑54	↑22(40.74%)	18.07	3.19	↑4		↑6		↑22			↑2		
	04																	
	05																	
	06																	
	07				↑22.99								↑28					
11			↑24.24	↑138	↑58(42.03%)	↑33.06		↑8		↓3	28	↑39	↑4		↑3	27		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
CRR5	96																	Good
	98	SNS		21.22	64	27(42.20%)	21.37	3.51	2				5		5			Fair
	99																	
	00																	
	01			↑24.74		↓26(40.63%)	↓21.09	↓3.42					↑15	2	↓2			
	02																	
	04																	
	05																	
	06																	
	07				↑28.27						↑1			↑27	↑3		↑1	
11			↑29.58	↑83	↑35(42.17%)	↑22.37	↑3.23	↑5			11	↑35					20	
EC13	96	SNS	Wetland	4.61	162	29(16.70%)	50.73	4.40	4		68		89	6	11			Excellent
	98				↑168		↑53.01	↑4.50			↓65							
	99																	
	00					↑27 (16.07%)							↓86					
	01																	
	02				↑169		↓52.78	↓4.43			↑66							
	04			↓4.39	↑186	↑31 (16.67%)	↑54.62	↓4.39			↑71		↑88					
	05																	
	06																	
	07			↑4.85	↑194	↑35(18.04%)	↑54.64	↓4.33										
11			↓4.84	↑211	↑40(18.96%)	↑56.53	↑4.34			↓51	86				↑1		74	
EC22	96	NS		2.59	39	4 (10.3%)	24	4.06	1		4		1	1				Fair
	98			↓2.32	↑55	↑7(12.70%)	↑25.26	↓3.65										↓Fair-Poor
	99				↑72	↑9(12.50%)	↑30.62	↑3.86			↑6		↑4					
	00																	
	01																	
	02				↑75		↑31.14	↓3.83										
04																		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	05																	
	06																	
	07			↓1.54	↑79	↓9(11.39%)	↑31.67	↓3.79					↑10	↑2				
	11			↑1.57	↑101	↑25(24.75%)	↓31.66	↓3.63			↓3	18	↑15				4	
ETO1	96	SNS		10.40					2									Fair
	98				37	11(29.7%)	15.30	3.00	↑4		1		3	1				↓Fair-Poor
	99																	
	00																	
	01																	
	02			↓9.13	↑39	↓10(25.64%)	↓15.00	↓2.79					↑4	↑2				
	04																	
	05																	
	06																	
	07				↑11.18	↑94	↑41(43.62%)	↑21.28	↑2.92			↑8		↑16				
11			↓10.34	↑155	↑72(46.45%)	↑26.54	↓2.91	↑4		↓3	20	↑39	↑3			15		
ETO2	96	SNS		13.01					1									Poor
	98				20	12 (60.0%)	3.54	1.25					2	1				
	99																	
	00																	
	01																	
	02				↑31	↑19 (61.29%)	↑7.22	↑2.08					↑3					
	04																	
	05																	
	06																	
	07				↑14.16	↑65	↑30(46.15%)	↑14.27	↑2.41			5		↑9				
11			↑15.56	↑103	↑49(47.57%)	↑19.08	↑2.60	↑2		↓2	12	↑15	↑2	1	1	9		
ETO3	96	SNS		134.93	405	169 (41.2%)	57.09	3.72	4	2	60		7	5	5			Fair
	98			↑112.22	↑406					↓1	↑61							↓Fair-Poor
	99				↓400	↓167(41.8%)	↓56.47	↓3.7			↓58							

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	00																	
	01																	
	02			↓78.87		↓164 (41.00%)	↓56.35	↓3.67			↑59							
	04																	
	05																	
	06																	
	07			↑87.35			↓56.15	↓3.66		↑2			↑34	↑8				
	11			↑98.98	↑423	↑178(42.08%)	↑57.20	↓3.65	↓3		↓33	90	↑41				30	
ETO4	96	SNS	ESA	58.00	128	35(26.6%)	42.31	4.39	3		14		23	2	9			Fair
	98				↑ 141	↑ 37(26.2%)	↑ 43.93	4.31			↑ 15		↑ 24	↑ 3				
	99																	
	00					↓36(25.53%)									↑ 5			
	01																	
	02																	
	04																	
	05			↓52.81	↑179	↑ 53 (29.61%)	↑ 45.36	↓ 4.09	↑ 4	↑ 1	↑ 18		↑ 41					↑ Good-Fair
	06																	
	07			↑53.47									↑45	↑4				
11			↓52.55	↑296	↑113(38.18%)	↑54.04	↓4.03	↑6		↓16	66	↑53	↑9			39		
GT2	96	NS		7.20	41	6 (7.0%)	22.12	3.79	3		3		2	1				Good
	98				↑56	↑10(17.9%)	↑26.24	↑3.87	↑6		↑6		↑9	↑3	↑1			
	99																	
	00																	
	01																	
	02				↑68	↑11 (16.18%)	↑29.80	↑3.95					↑10					
	04																	
	05																	
	06																	
07			↓6.80	↑76	↑12(15.79)	↑32.13	↑4.02			↑8		↑21						



Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition	
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010		
	11			↑7.31	↑106	↑25(23.58%)	↑33.63	↓3.76	↓5		↓4	24	↑32	↑4			14		
GT3	96	NS		2.67	43	12 (25.6%)	19.04	3.42	2		1		1					Fair	
	98																		
	99																		
	00																		
	01																		
	02					↓11 (25.58%)	↓18.74	↓3.31											
	04																		
	05																		
	06																		
	07				↓1.81	↑71	↑26(36.62%)	↑20.58	↓3.07			↑2		↑6					
11			↑1.89	↑91	↑34(37.36%)	↑23.97	↑3.18	↓1		↓1	12	↑11				1			
HO1	96	NS		1.20	20	5 (25.0%)	16.27	4.20	1				2	1				Fair	
	98				↑23		↑17.44	↓4.11					↑3					↓Fair-Poor	
	99																		
	00																		
	01																		
	02				↑33	↑7 (21.21%)	↑19.81	↓3.88					↑5						
	04																		
	05																		
	06																		
	07				↑1.21	↑40	↑10(25.00%)	↑20.08	↓3.67					↑8					
11			↓1.16	↑51	↑12(23.53%)	↑22.10	↓3.54				5	↑11	↑2			2			
HO3	96	NS		14.41	49	9 (18.4%)	25.61	4.06	3				11	2				Fair	
	98				↑56	↑11 (19.6%)	↑25.79	↓3.84					↑12						
	99																		
	00																		
	01																		
	02				↑60		↑26.43	↓3.78					↑13						

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	04																	
	05																	
	06																	
	07			↑15.04	↑73	↑14(19.18%)	↑28.38	↓3.69			1		↑28	↑4				
	11			↑24.66	↑120	↑38(31.67%)	↑33.11	↓3.68	↑4		↑3	19	↑35				19	
HO6	96	NGS		8.50					1									Poor
	98																	
	99																	
	00																	
	01																	
	02																	
	04																	
	05																	
	06																	
	07				41	21(51.22%)	9.84	2.20	1		1		21	1				
11			↑14.36	↑101	↑54(53.47%)	↑20.35	↑3.00	↑2			14	↑26	↑3			8		
HO7	96	NS		4.09	54	10 (16.7%)	26.53	4	3		4							Fair
	98			↓2.11	↑59			↓3.78	↓2				2					↓Fair-Poor
	99				↑72	↑16 (22.2%)	↑29.13	↓3.89					↑6					
	00																	
	01																	
	02			↓1.07	↑80	↑17 (21.25%)	↑30.62						↑8	1				
	04																	
	05																	
	06																	
	07			↑1.36	↑84	↑18(21.43%)	↑31.39	↓3.86			↓3		↑15					
11			↑2.52	↑137	↑49(35.77%)	↑34.65	↓3.69	↑3		↓2	22	↑20				7		
HO9	96	SNS	ESA,ANSI	27.06	201	55 (26.4%)	50.4	4.17	2		22		9	1		1		Excellent-Poor
	98		↓ESA	↓16.09	↑202		↑50.64	↑4.18	↓1		↓21		↑11					↓Good-Poor

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	99				↑204		↑51.2	↑4.19			↑22		↑18	↑2	1			
	00																	
	01																	
	02			↓11.34	↑207		↑51.34	↓4.16					↑19					↑Good
	04																	
	05																	
	06																	
	07			↑12.76	↑229	↑66(28.82%)	↑52.57	↓4.12		1	↑26							
	11				↓228		↓52.40				↓11	56	↑23			↓0	12	
MA1	96	NGS		25.79					1									Poor
	98	NS		↓24.06	50	25 (50.0%)	14.00	2.80			3		2					
	99																	
	00																	
	01																	
	02				↑61	↑31 (50.82%)	↑15.34						↑4					
	04																	
	05																	
	06																	
	07			↑24.42	↑83	↑45(54.22%)	↑15.89	↓2.69					↑19					
11			↑32.34	↑135	↑70(51.85%)	↑25.40	↑3.23				19	↑24	↑1			8		
MB9	96	NGS		6.60					1						2			Poor
	98																	
	99																	
	00																	
	01																	
	02																	
	04																	
	05																	
06																		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition		
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010			
	07	↑NS			88	42 (47.73%)	19.76	2.91			9		17	1						
	11			↓6.16	↑139	↑62(44.60%)	↑24.66	↓2.83	↑2		↓5	17	↑23		↑5		13			
MV2	96	SNS	ESA,ANSI	80.18	200	60 (29.50%)	46.99	3.97	4	1	20		58	10	2			Good - Fair		
	98			↓78.38	↑215	↑69 (31.60%)	↑47.59	↓3.94					↑59	↑12		1				
	99																			
	00					↓68 (31.63%)					↓19						6			
	01						↓47.01	↓3.88					↑67	↑15	↑4		↑14			
	02			↓60.55	↑218	↑71 (32.57%)	↑47.33	↑3.90	↑5											
	04																			
	05																			
	06																			
	07			↑61.78	↑248	↑83(33.47%)	↑50.68	↑3.95			↑27		↑70		↑5					
11			↑92.67	↑3.14	↑110(35.03%)	↑58.33	↑4.09	↑6		↓18	74	↑72		↑11		65				
MV11	06	NS		2.90	24	4(16.67%)	17.44	3.20	1									Fair		
	07				↑48	↑15(31.25%)	↑22.28	↑3.88			5		7							
	11			↓1.51	↑64	↑17(26.56%)	↑23.19	↓3.38			↓3	10					1			
MV12	96	SNS		13.28	103	32 (31.07%)	33.94	4.03	3		7		5	4				Fair		
	98	↓NS		↑13.38	↑115	↑35 (30.40%)	↑35.33	↓3.95												
	99																			
	00			↓11.08	↑121		↑36.23	↓3.91												
	01			↓8.71					↓2				↑8							
	02			↓8.63	↑125		↑36.26	↓3.82												
	04			↓8.27																
	05																			
	06																			
	07			↓8.18	↑148	↑46(31.08%)	↑38.91	↑3.85			↑10		↑14	↑5	3					
11			↑12.18	↑184	↑61(33.15%)	↑41.83	↑3.79	↑5		↓5	33	↑21				13				
MV15	96																			
	98	NS		10.7	53	25(45.30%)	14.74	2.79	2		1		7	1				Poor		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition	
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010		
	99																		
	00																		
	01																		
	02			↓10.69		↓24(45.28%)	↓14.48	↓2.69											
	04																		
	05																		
	06																		
	07			↓9.67	↑77	↑35(45.45%)	↑19.44	↑3.00			↑2		↑23	↑2					
	11			↑2.93	↑108	↑44(40.74%)	↑25.20	↑3.17	↑3		↓1	16	↑27					8	
	96	NS		3.14	19	1 (5.26%)			2		1		2						Fair
	98																		
	99																		
	00																		
	01												↑7					↑2	
	02			↓2.60															
	04																		
	05																		
	06																		
	07			↑2.84	↑39	↑13(33.33%)	7.07	2.50	2		1		↑15						
	11			↑2.93	↑91	↑28(30.77%)	↑22.16	↑3.34				9	↑18	1				8	
MV19	96	SNS		26.3	196	50 (25.0%)	50.48	4.18	3		31		13	6	3				Excellent
	98			↓22.66	↑202	↑53 (25.7%)	↑51.04				↓29		↑14						↓Good
	99				↑207		↑52.06	↑4.19			↑30		↑20		↑4				
	00																		
	01																		
	02			↑22.93	↑212	↑56 (26.42%)	↓51.80	↓4.15	↑5		↑31		↑23						
	04																		
	05																		
	06																		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	07			↑23.92	↑238	↑65(27.31%)	↑53.90	↓4.10	↓6		↑36		↑35		↑5			
	11			↑27.92	↑293	↑94(32.08%)	↑57.42	↓4.08	↓5		↓23	75	↑40				23	
NE5	96	NGS		13.29					1								Poor	
	98			↓ 12.75														
	99																	
	00																	
	01																	
	02			↓ 12.20	↑ 17	↑ 11 (64.71%)							↑ 1					
	04																	
	05	↑ NS		↑ 12.58	↑ 30	↑ 20 (66.67%)							↑ 14					
	06																	
	07			↑12.95	↑47	↑27(57.45%)	↑7.33	2.44					↑17					
11			↑14.03	↑90	↑50(55.56%)	↑14.74	↑2.79		1	1	2	↑22				8		
NE6	96	NS		4.34	40	10 (25.0%)	20.27	3.70	2								Good	
	98				↑ 60	↑ 16 (26.7%)	↑ 24.27	↑ 3.66			↑ 1		↑ 4	↑ 1				
	99																	
	00																	
	01																	
	02			↓ 4.00		↓ 15 (25.00%)	↓ 24.00	↓ 3.58										
	04																	
	05	↑ SNS		↓1.64	↑91	↑28 (30.77%)	↑26.96	↓3.40	↓1	↑1	↑2		↑13	↑3				
	06																	
	07			↓1.42	↑101	↑33(32.67%)	↑28.50	↑3.46	↑2				↑15					
11			↑1.51	↑106	↑36(33.96%)	↑28.89	↑3.48				↓0	12	↑17			9		
NE7	96																	
	98	NGS		2.76					1								Poor	
	99																	
	00																	
	01																	

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	02																	
	04																	
	05																	
	06																	
	07			↓2.66	38	25(65.79%)	6.93	1.92	1				5	2				
	11			↑2.95	↑67	↑39(58.21%)	↑12.28	↑2.32				5	↑9					2
NE8	96	NGS		11.05					1									Poor
	98			↓6.25														
	99																	
	00																	
	01																	
	02			↓2.98														
	04																	
	05																	
	06																	
	07	↑NS		↑3.75	↑28	17(60.71%)	6.93	2.09			3							
11			↑4.17								↓0	2	5					
NE9	96	NS		45.21	46	24 (50.0%)			4		1		5					Fair
	98			↓43.66	↑67	↑27 (40.3%)	↑20.55	↑3.25			↑5		↑12	↑1	↑1			
	99																	
	00																	
	01																	
	02			↑44.47	↑194	↑76 (39.18%)	↑37.74	↑3.47			↑27		↑38	↑3	↑4			
	04	↑SNS		↑46.00	↑197	↑78 (39.59%)				1			↑39					
	05																	
	06																	
	07			↑47.65	↑224	↑87(38.84%)	↑40.56	↑3.48			↑31		↑42	↑7	↑5			
11			↑54.00	↑235	↑91(38.72%)	↑42.21	↑3.54	↑8		↓18	45	↑45		↑7			27	
NE10	96	NGS		8.27					1									Poor

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition		
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010			
	98																			
	99																			
	00																			
	01																			
	02																			
	04																			
	05																			
	06																			
	07	↑NS		↑9.01	55	29(52.73%)	10.59	2.08			3		13							
	11			↑9.23	↑85	↑45(52.94%)	↑12.81	↓2.03			↓0	5	↑24					7		
NE11	96	NGS		6.07					1										Poor	
	98			↓5.72																
	99																			
	00																			
	01																			
	02			↓5.63																
	04																			
	05																			
	06																			
	07	↑NS			↑6.26	52	28(53.85%)	11.02	2.25			6								
11				↓7.07	↑83	↑44(53.01%)	↑14.09	↑2.26			↓0	8	↑11					3		
NE12	96	NGS		6.49					1											
	98																			
	99																			
	00																			
	01																			
	02																			
	04																			
	05																			



Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition	
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010		
	06																		
	07	↑NS		↑7.05	59	26(44.07%)	14.45	2.25			5		9						Poor
	11			↑7.07	↑91	↑48(52.75%)	↑18.21	↑2.81			↓1	8	↑15					5	
SV1	96	SNS		5.62	67	16 (23.9%)	29.55	4.14	2		3								Fair
	98	↓NS		↓4.63	↑79	↑18 (22.8%)	↑31.75	↓4.07			↑4		7	2					
	99				↑94	↑22 (23.4%)	↑34.77	↑4.1			↑5		↑9						
	00																		
	01																		
	02			↓4.57	↑102	↑23 (22.55%)	↑35.67	↓4.01					↑10						
	04																		
	05																		
	06																		
		07			↑5.67	↑117	↑31(26.50%)	↑36.99	↓3.99		1			↑16					
	11			↑5.68	↑147	↑43(29.25%)	↑38.14	↓3.74	↑4		↓4	23	↑20					6	
SV10	96	NGS		3.93	28	13 (42.9%)	9.55	2.47	1				1	1					Poor
	98																		
	99																		
	00																		
	01																		
	02			↓3.04	↑40	↑20 (50.00%)	↑10.29	↓2.30								↑1			
	04																		
	05																		
	06																		
		07			↑4.24	↑65	↑29(44.62%)	↑17.00	↑2.83					↑12					
	11			↑5.21	↑84	↑38(45.24%)	↑18.63	↓2.78			↑1	4	↑15					3	
CE12/ SV12	96	SNS		17.61	52	19 (34.6%)	17.76	3.09	2	1			4	1					Fair
	98	↓NS		↑19.33	↑91	↑39 (41.8%)	↑22.19	↓3.08			↑1		↑13	↑3	↑1				
	99			↓1.72		↓38(41.76%)	↓21.98	↓3.02	↓1										
	00																		

Site	Year	Classification	Designation	Area (ha)	Flora								Fauna					Condition
					Total	# non-native (proportion)	Native FQI	Native Mean C	# veg. comm.	prov. sig. species	loc. sig. species	CVC 2010	# birds	# mammals	# reptiles and amphibians	prov. sig. species	CVC 2010	
	01																	
	02				↑94	↑40 (42.55%)	↑22.05	↑3.00					↑14					
	04																	
	05																	
	06				↑97	↑42(43.30%)	↑22.52	↑3.04										
	07			↑2.34														
	11			↑22.32	↑171	↑78(45.61%)	↑30.36	↑3.16	↑4		↑3	21	↑26	↑7			12	

**Appendix 7: Comparison of Classifications (1996 to 2011)**

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## Appendix 7: Comparison of Natural Area Classifications (1996 to 2011)

Comparison Categories	Year	Classification				TOTAL
		Significant Natural Site (SNS)	Natural Site (NS)	Natural Green Space (NGS)	Residential Woodland (RW)	
Number of Sites	1996	51	59	31	3	144
	1998	45	64	31	3	143
	1999	46	68	28	3	145
	2000	45	70	27	3	145
	2001	47	67	26	3	143
	2002	47	66	24	3	140
	2004	62	53	21	3	139
	2005	61	61	14	3	139
	2006	62	53	21	3	139
	2007	62	58	16	3	139
	2008	62	59	17	3	141
	2009	62	59	17	3	141
	2010	62	62	13	3	140
	2011	62	62	13	3	140
Total Area (ha)	1996	1530.17	349.92	197.05	252	2329.14
	1998	1423.39	426.35	171.55	252	2273.29
	1999	1425.44	445.66	160.18	239.93	2271.21
	2000	1416.56	456.57	148.86	237.42	2259.41
	2001	1413.16	433.64	145.89	237.42	2230.11
	2002	1388.21	428.56	133.63	237.42	2182.82
	2004	1552.40	267.64	123.15	238.25	2181.44
	2005	1548.29	299.69	90.31	237.13	2175.42
	2006	1541.65	268.45	122.65	237.13	2169.88
	2007	1591.47	300.16	92.95	237.13	2221.71
	2008	1649.62	326.11	100.15	235.43	2311.31
	2009	1660.00	329.09	101.00	235.38	2325.47
	2010	1685.11	332.01	94.10	235.38	2346.60
	2011	1700.20	337.40	95.96	235.38	2368.94

Comparison Categories	Year	Classification				TOTAL
		Significant Natural Site (SNS)	Natural Site (NS)	Natural Green Space (NGS)	Residential Woodland (RW)	
Proportion of Natural Areas	1996	74%	17%	9%	-	-
	1998	70%	21%	9%	-	-
	1999	70%	22%	8%	-	-
	2000	70%	23%	7%	-	-
	2001	71%	22%	7%	-	-
	2002	71%	22%	7%	-	-
	2004	71%	12%	6%	-	-
	2005	71%	14%	4%	-	-
	2006	71%	12%	6%	-	-
	2007	65.3%	12%	3.8%	-	-
	2008	71.37%	14.11%	4.33%	-	-
	2009	71.38%	14.15%	4.34%	-	-
	2010	70.42%	13.88%	3.93%	-	-
	2011	71.77%	14.24%	4.05%	-	-
Proportion of the City	1996	5.23%	1.2%	0.67%	-	7.10%
	1998	4.91%	1.41%	0.60%	-	6.92%
	1999	4.87%	1.52%	0.55%	-	6.94%
	2000	4.84%	1.56%	0.51%	-	6.91%
	2001	4.83%	1.48%	0.50%	-	6.81%
	2002	4.73%	1.46%	0.46%	-	6.65%
	2004	5.30%	0.91%	0.42%	-	6.63%
	2005	5.29%	1.02%	0.31%	-	6.62%
	2006	5.27%	0.92%	0.42%	-	6.61%
	2007	5.44%	1.03%	0.32%	-	6.76%
	2008	5.64%	1.11%	0.34%	-	7.09%
	2009	5.67%	1.12%	0.35%	-	7.14%
	2010	5.76%	1.13%	0.32%	-	7.21%
	2011	5.81%	1.15%	0.33%	-	7.29%

**Appendix 8: Comparison of Major Landform Types (1996 to 2011)**

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## Appendix 8: Comparison of Major Landform Types (1996 and 2011)

Comparison Categories	Year	Landform Type			
		valleylands and associated tablelands	tablelands	wetlands	TOTAL
Number of Sites	1996	73	60	6	139
	1998	73	59	6	138
	1999	76	58	6	140
	2000	76	58	6	140
	2001	79	53	6	138
	2002	78	52	5	135
	2004	77	52	5	134
	2005	77	52	5	134
	2006	77	52	5	134
	2007	80	53	5	138
	2008	80	55	5	140
	2009	80	55	5	140
	2010	81	55	5	141
	2011	81	55	5	141
Total Area (ha)	1996	1626.3	339.9	103.7	2069.9
	1998	1588.0	328.5	100.4	2016.9
	1999	1622.1	301.6	100.3	2024
	2000	1594.8	319.7	100.3	2014.7
	2001	1593.9	291.2	100.3	1985.4
	2002	1555.3	285.2	97.7	1938.1
	2004	1554.8	285.1	96.0	1935.9
	2005	1550.08	284.98	95.97	1931.03
	2006	1542.49	287.03	95.97	1925.49
	2007	1590.35	290.54	96.43	1977.32
	2008	1656.95	312.81	98.86	2068.62
	2009	1670.56	313.40	98.86	2082.83
	2010	1689.47	313.84	98.86	2102.17
	2011	1724.33	313.52	98.84	2136.69

Comparison Categories	Year	Landform Type			
		valleylands and associated tablelands	tablelands	wetlands	TOTAL
Mean Size (ha)	1996	22.3	5.7	17.3	-
	1998	21.8	5.6	16.7	-
	1999	21.3	5.2	16.7	-
	2000	20.2	5.3	16.7	-
	2001	19.4	5.3	16.7	-
	2002	19.2	5.4	19.5	-
	2004	19.4	5.4	19.2	-
	2005	19.4	5.4	19.2	-
	2006	19.28	5.4	19.20	-
	2007	19.88	5.48	19.29	-
	2008	20.71	5.69	19.77	-
	2009	20.88	5.70	19.77	-
	2010	21.12	5.71	19.77	-
	2011	21.29	5.70	19.77	-
Proportion of Natural Areas	1996	78.30%	16.40%	5.00%	99.70%
	1998	78.50%	16.20%	5.00%	99.70%
	1999	79.90%	14.80%	4.90%	99.70%
	2000	79.10%	15.80%	4.90%	99.80%
	2001	80.30%	14.70%	5.00%	100%
	2002	80.30%	14.70%	5.00%	100%
	2004	80.30%	14.70%	5.00%	100%
	2005	80.30%	14.70%	5.00%	100%
	2006	80.11%	14.91%	4.98%	100%
	2007	80.43%	14.69%	4.88%	100%
	2008	80.10%	15.12%	4.78%	100%
	2009	80.21%	15.05%	4.75%	100%
	2010	78.64%	14.61%	4.60%	97.85%
	2011	80.70%	14.67%	4.63%	100%

Comparison Categories	Year	Landform Type			
		valleylands and associated tablelands	tablelands	wetlands	TOTAL
Proportion of the City	1996	5.60%	1.16%	0.36%	7.10%
	1998	5.43%	1.12%	0.34%	6.90%
	1999	5.55%	1.03%	0.34%	6.92%
	2000	5.45%	1.09%	0.34%	6.88%
	2001	5.45%	0.99%	0.34%	6.78%
	2002	5.31%	0.97%	0.33%	6.62%
	2004	5.31%	0.97%	0.33%	6.61%
	2005	5.30%	0.97%	0.33%	6.60%
	2006	5.27%	0.98%	0.33%	6.58%
	2007	5.43%	0.99%	0.33%	6.76%
	2008	5.66%	1.07%	0.34%	7.07%
	2009	5.71%	1.07%	0.34%	7.12%
	2010	5.77%	1.07%	0.34%	7.18%
	2011	5.89%	1.07%	0.34%	7.30%

Note: The number of sites (141) does not include the three residential woodlands (CL17, CV2, and MI4) as well as Lakes Aquitaine (ME11) and Wabukayne (ME12) as these sites are not readily classified into the three landform types. Also, the four combined sites do not necessarily have the same landform type (*i.e.* MB8/ME8 and CL1/SD5), and are therefore all counted separately. Consequently, figures differ slightly from those provided elsewhere in the report.



**Appendix 9: Vegetation Community Size and Proportion (1996 to 2011)**

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**Appendix 9: Vegetation Community Size and Proportion (2011).**

The area (in hectares) of vegetation communities mapped for the City of Mississauga from 2011 (grouped according to six broad categories). Communities are based on the Ecological Land Classification system (Lee *et al.* 1998).

ELC Code	Vegetation Community	# Occurrences	Area (ha)	Proportion of Natural Areas	Proportion of City
<b>Valleylands</b>					
CUM1-1	dry-moist old field meadow type	22	120.54	5.54%	0.41%
CUW1	mineral cultural woodland ecosite	1	2.52	0.12%	0.01%
FOD	deciduous forest	1	3.36	0.15%	0.01%
FOD1-1	dry-fresh red oak deciduous forest type	1	2.33	0.11%	0.01%
FOD2-1	dry-fresh oak - red maple deciduous forest type	1	6.39	0.29%	0.02%
FOD2-4	dry-fresh oak - hardwood deciduous forest type	1	1.05	0.05%	0.00%
FOD5	dry-fresh sugar maple deciduous forest ecosite	12	191.00	8.78%	0.65%
FOD5-1	dry-fresh sugar maple deciduous forest type	2	4.88	0.22%	0.02%
FOD5-2	dry-fresh sugar maple - beech deciduous forest type	1	1.92	0.09%	0.01%
FOD5-3	dry-fresh sugar maple - oak deciduous forest type	4	22.64	1.04%	0.08%
FOD5-7	dry-fresh sugar maple - black cherry deciduous forest type	2	9.90	0.45%	0.03%
FOD5-8	dry-fresh sugar maple - white ash deciduous forest type	2	6.44	0.30%	0.02%
FOD6-3	fresh-moist sugar maple - yellow birch deciduous forest type	1	1.92	0.09%	0.01%
FOD7	fresh-moist lowland deciduous forest ecosite	2	4.53	0.21%	0.02%
FOD7-2	fresh-moist ash lowland deciduous forest type	2	6.39	0.29%	0.02%
FOD7-3	fresh-moist willow lowland deciduous forest type	62	421.65	19.38%	1.44%
FOD7-3/CUM1-1	fresh-moist willow lowland deciduous forest type/dry-moist old field meadow type	1	6.24	0.29%	0.02%

ELC Code	Vegetation Community	# Occurrences	Area (ha)	Proportion of Natural Areas	Proportion of City
FOD7-4	fresh-moist black walnut lowland deciduous forest type	1	0.74	0.03%	0.00%
FOD7-5	fresh-moist black maple lowland deciduous forest type	1	0.61	0.03%	0.00%
FOM2/FOM3	dry-fresh white pine - oak mixed forest ecosite/dry-fresh hardwood - hemlock mixed forest ecosites	1	1.10	0.05%	0.00%
FOM3-1	dry-fresh hardwood - hemlock mixed forest type	3	17.10	0.79%	0.06%
FOM7-2	fresh-moist white cedar - hardwood mixed forest type	1	4.67	0.21%	0.02%
FOM8-2	fresh-moist white birch mixed forest type	1	0.25	0.01%	0.00%
<b>Totals</b>			<b>838.18</b>	<b>38.53%</b>	<b>2.86%</b>
<b>Woodlands</b>					
FOC3-1	fresh-moist hemlock coniferous forest type	3	8.07	0.37%	0.03%
FOD1-2	dry chinquapin oak - pine mixed forest type	1	1.91	0.09%	0.01%
FOD2-1	dry-fresh oak - red maple deciduous forest type	3	17.70	0.81%	0.06%
FOD2-2	dry-fresh oak - hickory deciduous forest type	4	9.75	0.45%	0.03%
FOD2-4	dry-fresh oak - hardwood deciduous forest type	7	17.55	0.81%	0.06%
FOD3-2	dry-fresh white birch deciduous forest type	1	0.46	0.02%	0.00%
FOD4-1	dry-fresh beech deciduous forest type	1	1.89	0.09%	0.01%
FOD4-2	dry-fresh white ash deciduous forest type	2	8.65	0.40%	0.03%
FOD5	dry-fresh sugar maple deciduous forest ecosite	1	0.36	0.02%	0.00%
FOD5-1	dry-fresh sugar maple deciduous forest type	13	98.87	4.55%	0.34%
FOD5-2	dry-fresh sugar maple - beech deciduous forest type	17	64.12	2.95%	0.22%
FOD5-3	dry-fresh sugar maple - oak deciduous forest type	19	78.71	3.62%	0.27%
FOD5-6	dry-fresh sugar maple - basswood deciduous forest type	1	2.40	0.11%	0.01%



ELC Code	Vegetation Community	# Occurrences	Area (ha)	Proportion of Natural Areas	Proportion of City
FOD5-7	dry-fresh sugar maple - black cherry deciduous forest type	1	1.85	0.08%	0.01%
FOD5-8	dry-fresh sugar maple - white ash deciduous forest type	10	56.15	2.58%	0.19%
FOD6-1	fresh-moist sugar maple - lowland ash deciduous forest type	2	8.55	0.39%	0.03%
FOD6-5	fresh-moist sugar maple - hardwood deciduous forest type	7	42.63	1.96%	0.15%
FOD7-2	fresh-moist ash lowland deciduous forest type	27	68.04	3.13%	0.23%
FOD7-4	fresh-moist black walnut lowland deciduous forest type	6	21.55	0.99%	0.07%
FOD9-1	fresh-moist oak - sugar maple deciduous forest type	5	214.38	9.85%	0.73%
FOD9-4	fresh-moist shagbark hickory deciduous forest type	5	11.87	0.55%	0.04%
FOM2-1	dry-fresh white pine - oak mixed forest type	4	4.17	0.19%	0.01%
FOM3-1	dry-fresh hardwood - hemlock mixed forest type	5	11.91	0.55%	0.04%
FOM3-2	dry-fresh sugar maple - hemlock mixed forest type	2	9.27	0.43%	0.03%
FOM6-1	fresh-moist sugar maple - hemlock mixed forest type	2	7.67	0.35%	0.03%
<b>Totals</b>			<b>768.49</b>	<b>35.33%</b>	<b>2.63%</b>
<b>Successional</b>					
CUM1-1	dry-moist old field meadow type	59	138.65	6.37%	0.47%
CUM1-1/CUW1	dry-moist old field meadow type/mineral cultural woodland ecosite	2	1.58	0.07%	0.01%
CUM1-1/MAM2-10	dry-moist old field meadow type/forb mineral meadow marsh type	1	74.68	3.43%	0.26%
CUM1-1/MAM2-2	dry-moist old field meadow type/reed-canary grass mineral meadow marsh type	2	36.04	1.66%	0.12%
CUS1	mineral cultural savannah ecosite	1	4.94	0.23%	0.02%
CUS1-1	hawthorn cultural savannah type	5	16.60	0.76%	0.06%
CUT1	mineral cultural thicket ecosite	3	5.93	0.27%	0.02%

ELC Code	Vegetation Community	# Occurrences	Area (ha)	Proportion of Natural Areas	Proportion of City
CUT1/CUS1	dry-moist old field meadow type/mineral cultural savannah ecosite	1	7.91	0.36%	0.03%
CUW1	mineral cultural woodland ecosite	13	60.66	2.79%	0.21%
FOD3-1	dry-fresh poplar deciduous forest type	19	28.85	1.33%	0.10%
FOD4	dry-fresh deciduous forest ecosite	13	50.37	2.32%	0.17%
FOD8-1	fresh-moist poplar deciduous forest type	3	2.11	0.10%	0.01%
<b>Totals</b>			<b>428.32</b>	<b>19.69%</b>	<b>1.46%</b>
<b>Wetland</b>					
MAM2/MAS2	mineral meadow marsh ecosite/mineral shallow marsh ecosite	1	0.93	0.04%	0.00%
MAM2-10	forb mineral meadow marsh type	3	10.37	0.48%	0.04%
MAM2-2	reed-canary grass mineral meadow marsh type	7	6.24	0.29%	0.02%
MAM2-2/MAS2-1	reed-canary grass mineral meadow marsh type/cattail mineral shallow marsh type	1	0.78	0.04%	0.00%
MAM2-6	broad-leaved sedge mineral meadow marsh type	3	3.28	0.15%	0.01%
MAS2-1	cattail mineral shallow marsh type	14	22.83	1.05%	0.08%
MAS2-9	forb mineral shallow marsh type	1	0.19	0.01%	0.00%
MAS3-1	cattail organic shallow marsh type	6	9.81	0.45%	0.03%
MAS3-4	broad-leaved sedge organic shallow marsh type	1	0.08	0.00%	0.00%
MAS3-8	bur-reed organic shallow marsh type	1	0.35	0.02%	0.00%
OAO	open aquatic	7	40.71	1.87%	0.14%
SAF1-3	duckweed floating-leaved shallow aquatic type	2	0.87	0.04%	0.00%
SAM1-4	pondweed mixed shallow aquatic type	4	19.85	0.91%	0.07%
SWD2-2	green ash mineral deciduous swamp type	1	0.31	0.01%	0.00%

ELC Code	Vegetation Community	# Occurrences	Area (ha)	Proportion of Natural Areas	Proportion of City
SWD3-1	silver maple mineral deciduous swamp type	4	4.98	0.23%	0.02%
SWD3-2	silver maple mineral deciduous swamp type	1	1.51	0.07%	0.01%
SWD3-4	Manitoba maple mineral deciduous swamp type	2	2.30	0.11%	0.01%
SWD4-1	willow mineral deciduous swamp type	4	1.65	0.08%	0.01%
SWD4-1/CUM1-1	willow mineral deciduous swamp type/dry-moist old field meadow type	1	2.95	0.14%	0.01%
SWT3-2	willow organic thicket swamp type	2	3.00	0.14%	0.01%
<b>Totals</b>			<b>132.98</b>	<b>6.11%</b>	<b>0.45%</b>
<b>Anthropogenic</b>					
Anthropogenic	Anthropogenic	4	32.64	1.50%	0.11%
CUP1-3	black walnut deciduous plantation type	1	0.08	0.00%	0.00%
CUP2	mixed plantation ecosite	2	9.45	0.43%	0.03%
CUP3	coniferous plantation ecosite	8	13.07	0.60%	0.04%
CUP3-1	red pine coniferous plantation type	2	0.70	0.03%	0.00%
CUP3-2	white pine coniferous plantation type	1	0.80	0.04%	0.00%
CUP3-3	Scots pine coniferous plantation type	2	3.57	0.16%	0.01%
CUP3-9	Norway spruce - European larch coniferous plantation type	1	1.76	0.08%	0.01%
CUS1	mineral cultural savannah ecosite	1	5.21	0.24%	0.02%
Manicured	Manicured	30	170.42	7.83%	0.58%
<b>Totals</b>			<b>237.72</b>	<b>10.93%</b>	<b>0.81%</b>
<b>Other</b>					
BBO1	mineral open beach/bar ecosite	2	0.16	0.01%	0.00%

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<b>ELC Code</b>	<b>Vegetation Community</b>	<b># Occurrences</b>	<b>Area (ha)</b>	<b>Proportion of Natural Areas</b>	<b>Proportion of City</b>
BBT1	mineral treed beach/bar ecosite	4	2.56	0.12%	0.01%
TPO1-1	dry tallgrass prairie type	1	0.06	0.00%	0.00%
Unknown	n/a	1	7.69	0.35%	0.03%
<b><i>Totals</i></b>			<b><i>10.48</i></b>	<b><i>0.48%</i></b>	<b><i>0.04%</i></b>

**Appendix 10: Butternut Survey Summary**

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**Appendix 10: Butternut Survey Summary of 2011 Field Season in Wards 5, 6, and 11.**

Site	Results of 2010 Survey	Last Recorded Observation Prior to 2011 Survey	2011 Condition
CE12/SV12	not located	reference 12 (duToit Associates Limited and Ecoplans Limited 1977)	N/A
CRR1	2 trees located (LL 06/09/11)	2005 field survey (MJ 12/10/05)	one is badly cankered with only 60% of the canopy remaining, the other has several large cankers with only 30% of the canopy
CRR2	5 trees located in two separate locations (SP 16/09/11)	no previous record	all in good health; no evidence of canker (possible hybrids)
CRR3	not located	1998 field survey (MJ 10/09/98)	N/A
CRR5	not located	reference 52 (City of Mississauga 1976)	N/A
ETO3	not located	no access in 2005, reference 132 (Weber 1980)	N/A
HO9	not located	not located in 2005 (MJ 12/10/05), last located in 1978 field survey (JW 31/07/78)	N/A
MV2	not located	reference 126 (Gartner Lee Limited 1994)	N/A
NE5	6 trees located (SS 19/08/11)	no previous record	all in good health; no evidence of canker (possible hybrids)
NE6	not located	2007 field study (SKM 08/07/07)	N/A
NE9	not located	possibly 2 dead trees located in 2007 (SP 08/08/07), prior to that, butternut record from 2005 (MJ 13/10/05)	N/A
SV1	not located	reference 52 (City of Mississauga 1976)	N/A





**Appendix 11: Provincially Significant Native Flora Species**

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**Appendix 11: Provincially significant native flora species in Wards 5, 6, and 11.**

These species are documented for the City of Mississauga in Wards 5, 6, and 11. Provincial rarity status follows (NHIC 2011). Rarity ranks are defined in Appendix 5 of the Natural Areas Survey.

Scientific Name	Common Name	G RANK	S RANK	MNR	COSEWIC	Loc. Rank	Location	Last recorded in Mississauga
<i>Juglans cinerea</i> L.	Butternut	G4	S3?	END	END	3	12 locations (see Appendix 10)	2011 (see Appendix 10 for details)
<i>Muhlenbergia sylvatica</i> (Torr.) Torr. ex A. Gray var. <i>sylvatica</i>	Woodland Satin Grass	G5	S2			1	ETO3	1980



**Appendix 12: Provincially Significant Fauna Species**

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**Appendix 12: Provincially significant native fauna species in Wards 5, 6, and 11.**

These species are documented for Wards 5, 6, and 11 in the City of Mississauga. Rarity status follows (NHIC 2011) and are defined in Appendix 5 of the Natural Areas Survey.

Common Name	Scientific Name	G RANK	S RANK	MNR	COSEWIC	Highest Breeding Evidence	Documented Sites	Last Recorded in Wards 5, 6, or 7
<b>Bird</b>								
barn swallow	<i>Hirundo rustica</i>	G5	S4B	THR	THR	probable	CRR1, CRR2, EC13, MV19, MV2	2011
black-crowned night-heron	<i>Nycticorax nycticorax</i>	G5	S3B,S3N			probable	CRR4	2011
bobolink	<i>Dolichonyx oryzivorus</i>	G5	S4B	THR	THR	probable	CRR2, EC13, ETO3, MV19, MV2	2007
Canada warbler	<i>Wilsonia canadensis</i>	G5	S4B	SC	THR	probable	CRR3, HO3, EC13	2007
chimney swift	<i>Chaetura pelagica</i>	G5	S4B,S4N	THR	THR	probable	CRR1, CRR5, EC13	literature record 2004
eastern meadowlark	<i>Sturnella magna</i>	G5	S4B	THR	THR	probable	CRR2, EC13, ETO1, MV2	2010
yellow-breasted chat	<i>Icteria virens</i>	G5	S2B	SC	SC	confirmed	ETO2	2011
<b>Reptile</b>								
common snapping turtle	<i>Chelydra serpentina serpentina</i>	G5	S3		SC	-	CRR1, CRR2, CRR3, CRR4, EC13	literature record 2011
eastern milk snake	<i>Lampropeltis triangulum triangulum</i>	G5	S3	SC	SC	-	CRR3, CRR4, CRR5	2001
<b>Amphibian</b>								
Jefferson/blue-spotted salamander complex	<i>Ambystoma sp.</i>	G4	S2			observed	MV2	literature record 2005





**Appendix 13: Amphibian Surveys for 2011**

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**Appendix 13: Amphibian Surveys in Wards 5, 6, and 11.**

Species documented during amphibian surveys completed in 2011. Rarity status follows (NHIC 2009) and are defined in Appendix 5 of the Natural Areas Survey. None of the species are considered to be significant by MNR or COSWEIC.

Common Name	Scientific Name	G Rank	S Rank	Location
American toad	<i>Bufo americanus americanus</i>	G5	S5	CRR2, MB9, MV2, MV12, MV19, NE9
Western chorus frog	<i>Pseudacris triseriata</i>	G5	S4	EC13
Spring Peeper	<i>Pseudacris crucifer crucifer</i>	G5	S5	MB9