City of Mississauga

Natural Areas Survey

2012 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 2011 update initiated the fourth round of updates of the City Wards. The 2012 update comprises a total of 40 natural areas in Wards 1 and 2.

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 7.34% 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 2012 there has been an increase 209.02 ha. Thus since its inception in 1996, the overall area of natural areas in the natural areas system is 49.76 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 28, respectively, as many of these have been converted to natural areas and some have been removed due to development.

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% of the natural areas system in 1996 to 1721.88 ha, 80.54% in 2012). In contrast, tablelands only account for 316.41 ha, which is 14.80% of the total natural areas system in 2012; 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 1.08% of City in 2012 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 natural areas system) to 99.66 ha (4.66% of the natural areas system) in 2012. The proportion of the City that is classified as wetland decreased marginally from 0.36% in 1996 to 0.34% in 2012.

Generally, the natural areas within the City that were surveyed in 2012 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 2012 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 2012. 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 fifteen 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 49.76 ha from 1996 to 2012. Much of this increase was composed of valleylands, and some associated tablelands. A total of 75 vegetation communities are considered uncommon in the City, occupying less than 1% of the total area of the natural areas system. In addition, 35 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 2012 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 adjacent 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, undertaken during 1995 and 1996 (Geomatics 1996), 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 continues the fourth round of updates and comprises a total of 40 natural areas in Wards 1 and 2.

Periodically, new candidate natural areas, Linkages, or SMAs are evaluated as part of the annual reviews. Since 1996 a total of 156 natural areas, including new sites, have been identified. However as of 2012, 15 sites have been removed from the NAS, eight sites have been combined (MB8/ME8, CC1/MY1, CE12/SV12, and CL1/SD5). 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 identifies 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 1 and 2. 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 28 of the 40 sites included in the NAS review for 2012. Of these 28 sites, 14 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. Twelve 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 roadside 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 includes a comparison with the list of Species of Conservation Concern (SCC) developed by Credit Valley Conservation (CVC) in 2010. Definitions of provincial rarity rankings and SCC Tiers are provided in Appendix 5.

2.2 Vegetation and Natural Area Classification Scheme

In 2004, the criteria for classifying the natural areas (i.e., valleyland, tableland, or wetland) were updated (section 3.2, North-South Environmental 2004). 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 current provincial standard; the Ecological Land Classification (ELC) system (Lee *et al*. 1998). In 1996 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 since 2008 update surveys included ELC determinations as part of the field work during annual updates. As a result, vegetation descriptions have been 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 the database, update report, and natural area factsheets conformed to provincial standards.

In 1996, Mississauga vegetation community classifications were categorized into six categories: valleyland, woodland, successional, wetland, anthropogenic, and other (which includes beach/bar and tallgrass prairie). These categories are have become increasingly problematic since some are landform types (valleyland), some are vegetation community types (woodland and wetland), and some characterize community types (successional). This causes discrepancy in the data as some communities could be classified into more than one category (i.e. cultural meadows can be characterized as successional but can also be located in valleylands).

Because of this a new categorization system was created which better characterizes the vegetation communities within the natural areas system. The new vegetation community categories are as follows: woodland, cultural, wetland, anthropogenic, and "other". These categories all relate solely to the type of vegetation community and do not take into account

landform, as landform is analyzed separately within this report. However, there will be overlap among these categories as ELC communities can be classified into more than one category. For example a treed swamp can be categorized as woodland and wetland. This is not an issue as the data for each of the categories are meant to be treated independently and not as categories that can be added together to obtain overall values.

The ELC vegetation communities within the City were categorized in the following manner:

Woodland	**Wetland**	**Cultural**	**Anthropogenic**	**Other**
FOC[1]	SWC	CUM	Anthropogenic	BBO
FOM	SWM	CUT	Manicured	BBT
FOD	SWD	CUW		TPO
SWC	SWT	CUS		
SWM	MAM	CUP		
SWD	MAS			
CUW	SAF			
CUS	OAO			
CUP				

3.0 GENERAL TRENDS

3.1 Changes and Trends in Wards 1 and 2

Appendix 6 documents the changes that occurred in Ward 1 and 2 natural areas between 1996 and 2012. To enable comparison, the same categories (e.g., area, number of flora and fauna species, significant species, etc.) from 1996 were used. 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[2];
- 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.

[1] See the ELC for Southern Ontario manual (Lee *et al*. 1998) for explanation of ELC codes
[2] It is suggested that this criterion be re-evaluated to determine if 25% is an appropriate value to determine a significant change in the size of a Natural Area.

Figure 1 (page 6) shows the location of natural areas, Special Management Areas (SMA), Residential Woodlands (RW), and Linkages. 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, and Linkages are identified separately.

The City is currently conducting a Natural Heritage System review in which potential additions to the current Natural Areas System are being investigated. Because of this no additions to existing natural areas are proposed in this update

3.2 Trends in the Natural Areas System

A detailed summary of the changes to natural area classifications between 1996 and 2012 is provided in Appendix 7. Overall, the number of natural areas (excluding RW) decreased from 141 in 1996 to 136 in 2004. In 2008, this number increased to 138 because of the addition of ME13 and CM25. In 2010, there was a decrease to 137 natural areas due to the conversion of CM25 from NGS to a SMA. The number of natural areas remains at 137 in 2012.

In 2012, there was an increase of 9.96 ha of natural area since 2011. This change was due to small increases to the SNS, NS, and NGS categories which are largely due to refining natural area boundaries. This brings the total area of natural areas and RW in the City to 2378.90 ha, an increase from 2329.14 ha in 1996.

Overall, the proportion of SNS in the City has increased from 5.23% (1530.17 ha) in 1996 to 5.89% (1722.69 ha) in 2012. This is largely due to the change in classification of two sites, SP1 and SH6, from NS to SNS due to an increase in the FQI value at SP1 and the presence of a significant flora species found at SH6. As a result, the total area of NS decreased, but only slightly because another site, LV5, was re-classified from NGS to NS in 2012 due to an increase in the FQI value. Consequently, the overall area of NS decreased to 3.29 ha (1.13% of the City). This is a decrease from the 1996 area of 3.49.92 ha (1.20% of the City). 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 decreased during this update period largely due to the conversion of LV5 to NS from NGS. Since 1996 there has been an overall decrease of NGS from 197.05 ha (0.67% of the City) to 94.57 ha (0.32% of the City).

Table 1: Legend for Figure 1 Natural Areas System for the City of Mississauga

AW1 (Willowcreek)
AW4 (Applewood Hills)
AW3 (Applewood Hills)
CC1 (Bishopstoke Walk)
CR1 (Deer Run & Deer Wood)
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)
CM7 (Not Yet Named)
CM9 (Not Yet Named)
CM12 (Not Yet Named)
CM25 (Undeveloped)
CRR1 (Meadowvale C.A.)
CRR2 (Credit Meadows)
CRR3 (Riverview & Timothy Street)
CRR4 (Not To Be Named)
CRR5
CRR6 (Erindale)
CRR7 (Loyalist Creek Hollow)
CRR8
CRR9 (Credit River Flats)
CRR10 (Riverwood)
CRR11 (Not Yet Named)
CE1 (Woodland Chase Trail)
CE5 (Woodland Chase Trail)
CE7 (Sugar Maple Woods)
CE9 (Quenippenon Meadows
CE10 (Erin Wood)
CE12 (Bonnie Brae)
CV1 (Iroquois Flats)
CV2 (Not To Be Named)
CV8 (Camilla)
CV6 (Stillmeadow)
CV12 (Richard Jones)
CV10 (Cooksville)
EC13 (Willowvale Fields & Creditview Wetlands)
EC22 (Bidwell Trail common)
EM30 (Tom Chater Memorial)
EM2 (South Common)
EM4 (Sawmill Valley Trail)
EM5 (Glen Erin Trail)
EM6 (King's Masting)
EM10 (Pheasant Run & McCauley Green)
EM14 (Sawmill Valley Trail)
EM21 (R.F.C. Mortensen)
ER6
ER7 (Huron)
ETO1 (Mount Charles)
ETO2 (King's)
ETO3 (Edward L. Scarlett & Red Oak Plan & Not To Be Named)
ETO4 (Garnetwood)
ETO5 (Fleetwood)
ETO6
ETO7 (Valley Park & Etobicoke Valley)
ETO8 (Orchard Heights)
FV1 (Grand Park Woods)
FV3 (Dr. Martin L. Dobkin)
GT3
GT2 (Not Yet Named)
HO1 (Ceremonial Green)
HO3 (Staghorn Woods)
HO6 (Hawthorne Valley Trail)
HO7 (McKechnie Woods)
HO9 (Britannia Woods)
LS1 (Lisgar Meadow Brook)
LS2 (Avonlea Grove)
LS3 (Trelawny Woods)
LV1 (Not Yet Named)
LV2
LV3 (Adamson Estate)
LV4 (Helen Molasy Memorial)
LV5 (Helen Molasy Memorial)
LV6
LV7 (Cawthra Woods)
LV14 (Lakeview Golf Course)
MAI (Brandon Gate, Malton Greenway & Derry Greenway)
MB1
MB2
MB3 (Syntex Green)
MB4 (Leslie Trail)
MB6 (Totoredaca)
MB7 (Mullet Creek)
MB8 (Maple Grove)
MB9
ME8 (Windrush Woods)
ME9 (Maplewood)
ME10 (Eden Woods)
ME12 (Lake Wabukayne)
ME11 (Lake Aquitaine)
ME13 (Windwood)
MI1 (Not To Be Named)
MI4
M17 (Credit River Flats)
MI17 (Mary Fix)
MV19 (Levis Valley)
MV18 (Not Yet Named)
MV2 (Fletcher's Flats)
MV11
MV12 (Not Yet Named)
MV15
MY1 (Mississauga Valley)
MY3 (Stonebrook)
PC1 (Rhododendron Gardens)
PC2 (Port Credit Memorial)
RW1
RW2 (Woodington Green)
RW4 (Rathwood District)
RW5 (Applewood Hills)
RW6 (Applewood Hills)
SD1 (Not Yet Named)
SD4
SD5 (Meadowwood)
SD7 (Lakeside)
SH6 (Thornelodge)
SP1
SP3
SV1 (Turney Woods)
SV10
SV12 (Bonnie Brae)
WB1 (Erin Mills Twin Arena)
NE4 (Not Yet Named)
NE3 (Not To Be Named)
NE1
NE6
NE5 (Not To Be Named)
NE7 (Not To Be Named)
NE8
NE10
NE11 (Wildfield)
NE12 (Wildfield)
NE9 (Wildwood)

MISSISSAUGA
NATURAL AREAS SURVEY

0 1000 2000 3000 4000
metres

FIGURE 1
NATURAL AREAS SYSTEM

- Natural Area
- Residential Woodland
- Special Management Area
- Linkage
- LV2 Natural Area Name

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2012

3.3 Special Management Areas and Linkages

As of the 2012 update, 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 by 12 to 28 since 1996. Five Linkages were re-classified as natural areas and the other 7 were removed due to development. All of these changes occurred prior to 2012.

3.4 Landform Types

Changes within the Natural Areas System

The overall changes to the three major landform types (valleyland, tableland, and wetland) in the Natural Areas System between 1996 and 2012 are presented in Appendix 8. The majority of the natural areas in 2012 are associated with valleylands (1721.88 ha; 80.54% of the natural areas). This has increased by 95.58 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 316.41 ha of tablelands only account for 14.80% of the natural areas in 2012; a decrease of 23.49 ha in 1996. This is largely owing to a loss of eight tableland sites between 1996 and 2002 due to development. However, three tableland sites were added between 2007 and 2008, with one of those tableland sites (CM25) being re-classified to SMA in 2010. Thus there has been a net loss of six tableland sites since 1996.

A small portion (4.66%) of the NAS consists of wetlands. This is a slight decrease from 5% in 1996 and equates to a loss of 4.04 ha of wetland as of the 2012 update.

Changes within the City

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 316.41 ha (1.08% of the City) in 2012. The area of wetlands also decreased marginally from 103.7 ha (0.36% of the City) in 1996 to 99.66 ha (0.34% of the City) in 2012 (Appendix 8). In contrast, the proportion of valleylands has increased from 1626.3 ha (5.60%) in 1996 to 1721.88 ha (5.88% of the City) in 2012. Although the decreases in tableland and wetland areas are relatively minor, the trend is consistent over the past 16 years. Between 2011 and 2012 there were small increases in the size of both tableland and wetland landform types (2.89 ha and 0.82 ha, respectively) owing to boundary refinement. In general the areas of each of these landforms reached an all-time low between 2005 and 2006, however, since then there has generally been a positive trend in these features and the overall areas have generally been increasing in size. This may speak to the City's environmental protection and conservation policies, as we are seeing fewer and fewer natural areas being removed for development, and a higher priority being placed on their protection.

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 landform types decreased marginally since 1996 due to the incremental removal of portions of natural areas for development (Appendix 8). However, since hitting a low in 2006, there has been a gradual increase in the mean size of these landform types. The mean size of wetlands increased to 19.93 ha in 2012, compared to 17.3 ha in 1996, however, this may be owing to the removal of smaller wetlands.

Tableland natural areas are generally very small (mean size of 5.86 ha) when compared to the valleyland areas (mean size of 21.52 ha). 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 areas which have development potential (tableland) and those which do 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 stem and hopefully reverse this trend.

3.5 Vegetation Communities

The 86 ELC vegetation communities described for the City are grouped into five broad categories: woodlands, wetlands, cultural, anthropogenic, and other (Table 2). The category "other" was used for three communities (tall-grass prairie, open beach/bar, and treed beach/bar) that did not easily fit into any of the other five categories. The category "anthropogenic" refers to communities that have been created and maintained through human intervention (anthropogenic and manicured).

Table 2: Details of each of the five vegetation community categories.

Community Category	Number of ELC Community Types	Area (ha)	Proportion of the Natural Areas System (%)*	Proportion of the City (%)
Woodland	55	1720.28	79.07	5.88
Wetland	21	136.06	6.25	0.46
Cultural	19	505.14	23.22	1.73
Anthropogenic	2	203.82	9.37	0.70
Other	3	3.19	0.15	0.01

* Note these do not add up to 100% since some natural areas fall into more than one category (e.g., swamps are both woodlands and wetlands)

The most prevalent vegetation communities within the City are those in the woodland category. This category has the greatest number of ELC communities, the largest area as well as constituting the highest proportion of both the natural areas system and the City overall. This is because the majority of the woodland communities are located within valleylands which are the most prevalent landform feature within the natural areas system (Section 3.4). Nearly the same number of ELC communities fall into the wetland and cultural categories, however the cultural communities cover almost four times as much area as the communities in the wetland category. This indicates that the individual wetland communities are generally much smaller than the

cultural communities. The single tall-grass prairie community at Lorne Park Prairie (CL30) is still the only provincially rare vegetation community within the City (Photo 1).

It is difficult to determine trends in vegetation communities which were categorized with the previous Mississauga classification system to those which are now classified based on the ELC system. This is compounded by the change in categories for vegetation communities (see discussion in Methods, Section 2.2). As such, the values cannot be compared to old community classifications in a meaningful way. In future, trend analysis of the five vegetation community categories will be based on calculations completed this year.

Photo 1. Signage at Lorne Park Prairie (CL30).

4.0 SIGNIFICANT FEATURES

4.1 Flora

The total number of floral species in the City of Mississauga is 1,170. There are 706 native species in Mississauga (60% of the flora) and 464 non-natives. The percentage of native plants present within these urban natural areas is relatively low in comparison with the flora of Ontario as a whole, which has approximately 73% native plant species (Kaiser 1983). One flora species was added to the plant list this year; a provincially significant native species which has been planted at two Natural Areas (Table 3). Of the native species recorded from Mississauga, 29 (2%) are considered extirpated, 236 (20%) are locally rare (known from only 1 to 3 locations in the City) and 136 (12%) are locally uncommon (known from 4 to 10 locations in the City). There were no additional plants designated as provincially rare in 2012 (NHIC 2012), thus the provincial status of species occurring in Mississauga remains unchanged. There are eight provincially significant species documented from Wards 1 and 2 in 2012 (Appendix 10):

- American chestnut (*Castanea dentata*)
- butternut (*Juglans cinerea*)
- bushy cinquefoil (*Potentilla paradoxa*)
- balm-of-gilead (*Populus* x *jackii*)
- Clelands evening-primrose (*Oenothera clelandii*)
- pin oak (*Quercus palustris*)

- showy goldenrod (*Solidago speciosa*)[3]
- dense blazing star (*Liatris spicata*)

Butternut was documented from seven locations in 2012 (Appendix 9). American chestnut, red spruce, and dense blazing star were also documented in 2012. The remaining species were documented prior to 2012. Two records in particular are quite old and have not recently been recorded within these Wards: balm-of-gilead (1970) and Clelands evening-primrose (date unknown).

Table 3: Species added to the City of Mississauga flora list in 2012 – records from field work.

Common Name	Latin Name	Rarity Status			NAS Site
		G Rank	S Rank	COSEWIC	
dense blazing star*	*Liatris spicata*	G5	S2	THR	PC1, PC2

* indicates a planted 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 2012, surveys for butternut were conducted at fifteen natural areas where access was available (Appendix 9). A total of eleven butternut trees were observed in 2012. Ten of these trees were located in six natural areas (CL21, CL31, ETO8, LV1, SD1, and SD7) where previous records had been documented, and one tree is located at SH6 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*. CL9 and LV7) tend to have greater numbers of floral Species of Conservation Concern (SCC). However, not all large natural areas have high numbers of floral SCC. The number of floral SCC documented from a site also depends on the extent that the natural area has been studied. Larger sites with limited access (*i.e.*, no permission to access private lands, such as SD4); tend to have lower quantities of SCC flora documented than smaller sites that can be more thoroughly inventoried on City property (*i.e.,* CL16, CL21, CL24, and CL39). In addition, the natural areas within Wards 1 and 2 which have greater amounts of SCC flora are generally found within the Clarkson-Lorne Park planning district which may be due to the fact that these natural areas are in relative close proximity and many are connected by watercourses.

[3] Showy goldenrod (*Solidago speciosa*) was documented from LV1 in a report completed for Credit Valley Conservation (Natural Resource Solutions Inc. 2009). This species is restricted to prairies on Walpole Island and one location near Kenora in northwestern Ontario. As such, this record should be evaluated as to its validity.

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 2012. Appendix 6 provides the FQIs and native mean coefficients for all natural areas that were assessed in 2012 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 2012, a total of 137 natural areas 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 6.93 to 83.64 and the native mean coefficients range from 1.68 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 2012, this is still the case for 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 2012, suggests a slight increase in disturbance in at least some of Mississauga's natural areas. However, 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 39 of the 40 sites in 2012. 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 higher FQI values increases.

4.3 Fauna

The 2012 breeding bird surveys conducted in natural areas in Wards 1 and 2 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 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 (CRR9), Etobicoke Creek (ETO7), Applewood Creek (LV1), Lake Ontario Waterfront (SD1, SD7, CL9, PC1, CL16, CL1/SD5, LV3), and Cooksville Creek (MI1). Highlights also included two tableland sites: LV7 and SP1. These sites sustained the highest number of "possible" breeding bird species of any areas surveyed in 2012, with a high diversity of adaptable species tolerant of urban habitats (*e.g.*, American robin, black-capped chickadee, northern cardinal, and song sparrow), as well as more habitat-specific, and area-sensitive species (*e.g.*, savannah sparrow, tufted titmouse, black-and-white warbler, and blue-gray gnatcatcher). Additionally, natural areas in the Clarkson-Lorne Park district also had many interesting species such as wood thrush (CL16) and area-sensitive species including winter wren (CL17 and CL24) and black-and-white warbler (CL9).

Species dependent on certain specific microhabitats (for example species that depend on high bluffs such as bank swallow and cliff swallow) were typically found in natural areas along Etobicoke Creek and the Lake Ontario waterfront in 2012. 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 necessarily 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 Virginia rail, pied-billed grebe, American bittern, and American coot are very rare in Mississauga. Most of the recent records of these birds in Wards 1 and 2 are documented from Rattray Marsh (CL9) in 2009, as well as Virginia rail and American bittern in CRR9 in 2004, and American coot at SD7 in 2003. Raptorial birds (hawks, falcons, *etc*.) are more common along 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. Red-tailed hawk was noted at four forested sites in 2012: CL16, CL21, CL24, and CL43. In 2012, Cooper's hawk was observed nesting at LV7 and was observed acting territorial at CL24. 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 chimney swift and barn swallow. Chimney swift was observed at three sites in 2012: LV4, LV14, and SD1. Barn swallow is a provincially significant species that is ranked as Threatened by COSWEIC and COSSARO and is protected under the Endangered Species Act, and will be discussed below.

Thirty-three provincially significant bird species have been documented from Wards 1 and 2 (Appendix 11). The majority of these significant species records are from literature reviews, many of which are documented from an Aurora District OMNR wetland evaluation study at Rattray Marsh (CL9) that undertaken in 2009. Therefore some of these species records could possibly be out-of-date in terms of what currently inhabits the natural areas in these Wards. Although the literature (including the wetland evaluation) may have been published recently, it may contain old or historical species records. Of the thirty-three provincially significant species, one species, barn swallow, was documented in during the 2012 field studies. Barn swallow was observed nesting at both MI1 and LV4 in 2012. In previous years, this species has been documented from seven other sites within these Wards (Appendix 11). Barn swallow was documented from LV4, MI1, PC2, and SD7 in 2012, and is the only Threatened species confirmed breeding bird species in Wards 1 and 2.

There are seven provincially significant species of reptiles and one provincially significant amphibian recorded from Wards 1 and 2 (Appendix 11). None of the reptile species were documented from these Wards in 2012. There is one record for eastern hognose snake from CL9 which was last documented in 1924. This is considered to be a historical record as this species likely no longer inhabits that natural area. In addition, one provincially significant amphibian (Jefferson/blue-spotted salamander complex) has been documented from Cawthra Woods (LV7). This salamander was not documented from this site during the 2012 field studies, however this is a known healthy population which is likely still present at that site.

Currently, there are 217 fauna CVC Species of Conservation Concern (SCC, CVC 2010) documented from the City. Of these, 52 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, 21 are confirmed breeding, 40 are probable, 27 are possible, 77 are observed, four are migrants, and one is wintering within the natural areas system. Most of these SCC are habitat specialists, for which habitat is more likely to be eliminated if natural areas become isolated, fragmented or altered by surrounding development.

Frog call surveys were conducted at eight sites in 2012 (Appendix 12) and focused on early forest-breeding amphibians such as spring peepers and wood frogs that require vernal pools. It was an early spring this year and frogs were calling in full chorus much earlier than usual, as such the first round of amphibian surveys conducted on March 16, 2012 consisted of both salamander surveys and frog call surveys, as conditions were appropriate for both species groups. A second round of frog call surveys was conducted on May 23, 2012. 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. Such conditions are rare in Mississauga. The following sites, where habitat appeared potentially suitable for woodland frogs (from aerial photo review), were surveyed for frogs in 2012: CL8, CL9, CL21, CL22, CL39, CL52, CRR9, and ETO7.

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 during the 2012 amphibian breeding season at CL9, CL39, and CRR9.

Green frog, which is an adaptable species that can use storm water ponds for breeding, will likely persist in Mississauga. This species was heard at CL9 in 2012. 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 in 2012 despite surveying sites where previous records existed (CL17, CL22, CL39, and CRR9). Bullfrogs require extensive emergent vegetation and deeper water, and this type of habitat is rare in Mississauga, except in the marshes at the mouth of the Credit River. Bullfrogs were not heard in 2012, despite surveying sites where previous records of bullfrog existed (CL8 and CL9). Rattray marsh (CL9) has numerous records of frogs (bullfrog, gray treefrog, wood frog, western chorus frog, spring peeper, northern leopard frog, mink frog, American toad, and green frog). Many of these amphibian records at CL9 are from an OMNR wetland evaluation (as discussed in Section 4.1 as being a report published in 2009, which may contain older species records).

A survey was completed for salamander breeding within Wards 1 and 2 at natural areas CL9, CL52, and LV7. Aerial photography and past records of salamanders within these Wards was used to determine locations of spring salamander surveys. No salamanders were found at any sites in 2012, although, as mentioned above, there is a known breeding population of

Jefferson/blue-spotted salamander complex at Cawthra Woods (LV7). As salamander surveys are conducted on one night, it is possible that they were not active that night, even though there was known salamander movement in ponds near Mississauga on that same night. All other salamander records within Wards 1 and 2 are quite old (10 years or more) with the exception of records of spotted salamander and red-spotted newt at CL9 (as documented from the OMNR 1999 reference that has been discussed previously). This was a difficult spring for emerging salamanders as there 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 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 (Photo 2). Such mammals include white-tailed deer, 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 1 and 2.

Photo 2. White-tailed deer at CL24.

5.0 MANAGEMENT ISSUES

Generally, the natural areas within the City that were surveyed in 2012 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 2012 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 natural areas in general 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 of 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 22 of the 40 NAS sites evaluated in 2012.

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 in natural areas 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 should make areas impacted by trails and circuits a priority for conservation plans. 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 CL24 and LV6 in 2012.

5.3 Dumping/Garbage

Threat
As noted in previous update 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 3). 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 3. Ad-hoc trail and dumping at CL8.

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 residents who cut fencing and install gates to allow access into the natural areas. It is recommended that the City continue enforcement of the encroachment 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 17 of the 40 NAS sites evaluated in 2012.

5.4 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 9 of the 40 NAS sites evaluated in 2012.

5.5 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 CL13 and CL24 in 2012.

5.6 Fire

Threat
Fire pits were observed within the natural areas system in 2012 (Photo 4). These fire pits are used as party spots. Fires pits within natural areas pose a threat of the potential for forest fires; particularly during a dry summer such as that of summer 2012.

Photo 4. Fire pit, vandalism, and garbage at CL24.

Management Recommendation
It is recommended that these fire pits be removed from the natural areas where they are present. This may discourage re-building the fire pit.

Locations
This management issue was noted at NAS site CL24 in 2012.

5.7 Erosion

Threat
Erosion on slopes with exposed soils and erosion along stream banks is an issue within the natural areas system (Photo 5). Erosion poses a threat to plant species because as sediment erodes from the root zone and roots become exposed and are unable to obtain the nutrients they require. Erosion along streams leads to sedimentation of these watercourses, as well as the potential for the creek to become wider and shallower. This subsequently increases the water temperature in the stream which makes it less habitable for many native aquatic species.

Management Recommendation
It is recommended that these areas be targeted for restoration plantings to discourage or prevent erosion. These areas would benefit from shrub and groundcover plantings such as red-osier dogwood (*Cornus stolonifera*) and ninebark (*Physocarpus opulifolius*) in riparian areas, and Pennsylvania sedge (*Carex pennsylvanica*), heart-leaved aster (*Symphyotrichum cordofolium*), and zig-zag goldenrod (*Solidago flexicaulis*) in upland forests.

Photo 5. Erosion on forest slopes in ETO8.

Locations
This management issue was noted at seven NAS sites in 2012: CL21, CL24, CL31, CL42, CL8, CL9, and LV14.

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, populations of species such as Norway maple (*Acer platanoides*), garlic mustard (*Alliaria petiolata*), European buckthorn (*Rhamnus cathartica*) and dog-strangling vine (*Cynanchum rossicum*) will continue to expand. This is a province-wide problem and is a difficult one to mitigate.

Management Recommendation
Removal of non-native species is already undertaken by the City, however, 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 including 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.

Also, the City could 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) and Rattray Marsh (CL9) offer good examples of what can be achieved.

Locations
This management issue was noted at all 40 NAS sites evaluated in 2012.

5.9 Emerald Ash Borer

Threat
Emerald ash borer (*Agrilus planipennis* Fairmaire) poses a very serious threat to forest health in southern Ontario. Emerald ash borer (EAB) is an invasive insect species introduced from eastern Asia that attacks and kills all native North American ash trees (*Fraxinus* spp.). EAB was first detected in Ontario in 2002. It has since spread throughout southern Ontario and Quebec despite

the efforts to contain the infestation. The beetle can disperse naturally through flight; however, the large scale spread of EAB has been facilitated by
the transport of firewood, nursery stock and other ash products throughout Ontario.

EAB larvae feed just beneath the bark of the tree and disrupt the transport of water and nutrients. Once signs and symptoms of infestation have developed the tree is usually in serious decline. In areas with established populations trees can be mass attacked and killed in as little as two growing seasons. Consequently, the presence of EAB in the City has serious environmental implications, including huge tree removal costs, public safety hazards, and a loss of ecosystem services.

Management Recommendation
The City currently has a management plan that has been adopted by Council that deals with the EAB issue. This management plan focuses on park and street trees. This management plan targets healthy trees by treating them with an injection of the bioinsecticide TreeAzin (to kill EAB larvae), and involves cutting down infected City trees. Ash trees within the natural areas system are not included in this management plan regime. However, the City has undertaken a planting initiative in conjunction with the Credit Valley Conservation Authority. This initiative involves planting young trees and shrubs under healthy ash canopies. This has taken place at Tom Chater Park (EM30) and Huron Park (ER7) whereby 70 trees/shrubs were planted under the canopy. Both of these City parks are outside of Wards 1 and 2. Although this is a positive initiative, it would be beneficial to create a management plan for all natural areas potentially affected by the EAB.

Locations
Ash canopy dieback was noted at CL1/SD5, CL13, CL26, and LV2 in 2012.

5.10 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 one natural area within Wards 1 and 2 (where a previous record already existed). The non-native wild parsnip has been recorded during field work in Mississauga since 2000. As of the 2012 update, wild parsnip has been recorded from six natural areas in Wards 1 and 2. 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. A positive initiative noticed while out in the field is the presence of signage which indicates the identification and risks associated with giant hogweed.

Locations
This management issue was noted at seven NAS sites evaluated in 2012: giant hogweed was observed at CL24 and wild parsnip was observed at CL13, CL24, CL43, LV4, PC1, and SD1.

5.11 City Naturalization Initiatives

Threat
Naturalized areas observed during field work at a number of sites have typically involved leaving an area of un-mowed grass to regenerate naturally, with the addition of native plantings in some areas (Photo 6). 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 6. Wood chipped path is fenced on either side to prevent access to natural area at CL39.

Management Recommendation
To the extent possible, such areas should be planted with native species or otherwise managed for accelerated succession 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. 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 10 of the 40 NAS sites evaluated in 2012.

5.12 Need for Management Plans

Threat
Many 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

One essential component of strategies to minimize impacts from human use is the development of management plans for natural areas. 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.

5.13 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 RECOMMENDATIONS

When the NAS was originally developed there were minimal digital layers to work from, so natural areas were generally categorized into valleyland, tableland, and wetland using hard copy aerial photographs, and no field-truthing. Although this worked as an original estimate of how much area of each landform feature was present within the City's natural areas system, it also introduces error by including tableland features within the valleyland category. Also, wetlands are not a landform feature, rather they are a vegetation community type. As such, reporting on wetlands as a landform type decreases the amount of valleyland or tableland reported as the wetland community type falls within one of these two landform categories. This category was originally created to characterize the amount of wetland within the City as this was seen as a valuable community type that required special protection.

Over time, as digital layers have been created, there is more information available which can more accurately describe the landforms within the City.

In order to more accurately describe the landforms within the City, a new approach is proposed which takes advantage of the digital information available. It is proposed that the City of Mississauga's natural hazard mapping be used as the line that delineates valleyland from tableland. This Natural Hazard Line includes valleylands, stable top of bank, and the natural hazard floodline. As such, it would be appropriate to describe valleylands, and anywhere outside of the Natural Hazard Line would then be classified as tableland. In order to account for discrepancies between natural area lines and the Natural Hazard Line (which may result in small areas of valleyland or tableland which are really a mapping error), it is proposed that a 10 m or 20 m buffer be placed on either side of the Natural Hazard Line and anything that falls within that buffer would be included with the larger landform type that it is attached to. This protocol is only a suggestion and may need to be refined when the GIS analyses are undertaken.

As mentioned in the methods section of this report, a 25% change in area of a site may be too large of a change to represent a significant change. It is suggested that changes less than 25% may also be considered a significant change in the size of a Natural Area. Therefore, it is recommended that the City review the 25% criterion to determine if this percentage is appropriate, or if the percentage should be lower.

In examining Natural Heritage Information Centre (NHIC) records and the Ministry of Natural Resources document "Rare Plants of Ontario" (Oldham and Brinker 2009) it is unlikely that the provincially Endangered showy goldenrod is present at NAS site LV1. Showy goldenrod is restricted to prairies on Walpole Island First Nation in southern Ontario and Kenora in northwestern Ontario (Oldham and Brinker 2009). This species was documented during a study (Natural Resources Solutions Inc. 2009) completed for the Credit Valley Conservation Authority, and has not been recorded in the City during the NAS Update surveys. It is recommended that this report (Natural Resources Solutions Inc. 2009) be reviewed to determine the validity of this species record.

7.0 CONCLUSIONS

After 16 years of update surveys of the natural areas in the City several trends have emerged. First, there has been a general decrease in the quality of vegetation at over half of the natural areas surveyed in 2012, as indicated by 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 2012, suggests there may only be a slight increase in disturbance in at least some of Mississauga's natural areas, although this may also be a result of more thorough inventories. There is an overall increase in FQI values overall, although this is minor and has only resulted in a shift toward higher FQI categories (*i.e.*, low to medium, medium to high, *etc.*) in seven of the 40 natural areas surveyed in 2012. Continued monitoring of the natural areas over time and the addition of new species to the flora and fauna lists each year may be resulting in changes to the FQI, but this represents a more accurate assessment of their true condition. Species which were present at a site in 1996 may not be present in 2012; however these species are still included on the species list. As such, it is suggested that older records that have not been documented from a site in the last 10 years not be included in the floristic quality analysis or the flora species list. Some increases in floristic quality are likely due to increased search effort.

Second, there has been an overall decrease in the area of tableland and wetland natural areas in the City since 1996 (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 2012, the natural areas system has increased by 209.90 ha, thus since its inception in 1996, the overall area of natural areas in the natural areas system is 49.76 ha larger. The primary reason for this increase is the inclusion of potential addition areas into the natural areas system and the revision of natural area boundaries.

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 2012. This trend reinforces the need to maintain and manage (and where possible restore) the remaining natural areas in the City. In particular tableland natural areas 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 2012 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 Natural Areas Program as set out in the original NAS report (Geomatics 1996).

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Appendix 1: Natural Area Classification Scheme

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. 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 ≥ 40.00
- areas with a mean floristic coefficient of ≥ 4.50
- woodlands ≥ 10ha (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 < 700m)
- woodlands that support old-growth trees (≥ 100 years old)
- wetlands ≥ 2ha (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 ≥ 2ha (5 acres) but < 10ha (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.

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

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 28 of the 40 sites included in the NAS review for 2012 (Appendix 3). The remaining 12 natural areas 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 1 and 2 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 11 and June 13, 2012 for all of the natural areas in Wards 1 and 2 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, instead of 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 2012, 15 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 2012. 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 2012) 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 2012.

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 2012 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

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 Geomorphic. 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.

256 The Municipal Infrastructure Group. 2006. Streetsville Quarry. Environmental Management and Servicing Report, City of Mississauga.

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 Wassenaer. 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.
267 Dougan & Associates. 2007 (October 15). Scoped Environmental Impact Study for Thorny Brae Place, Part of Lot 3 & 5, Range 5 (N. of Dundas Street, Mississauga, Ontario.
268 Tree Specialists Inc., The. 2007 (December 4). Tree Preservation report for 4390 Mississauga Road, Mississauga.
269 North-South Environmental Inc. 2007 (November). Environmental Impact Study Proposed Townhouse Development, 4390 Mississauga Road, Mississauga, ON.
270 University of Toronto. 2008 (February 28). Prescribed Burn at University of Toronto (Memorandum).
271 Dougan & Associates. 2007 (July 18). Letter report summarizing assessment of vegetation along a section of trail proposed to be widened in Dunn Park.
272 Credit Valley Conservation and NHP. 2007 (August 2). Review of Flora and Fauna at SD5, CL13, LV4, MI1 and CL17.
273 Webber, J. and J. Kaiser. 2007 (March). Evaluation of the vegetation and flora of the wetland units within Rattray Marsh, Mississauga, Ontario.
274 White, A. 2008. Vegetation Inventory for the 260 Traders Boulevard Devlopment Site Mississauga, ON.
275 Dougan Associates Ecological Consulting & Design. 2009 (February, 18). Scoped Environmental Impact Study for Thorny Brae Place, Part of Lot 3 & 4, Range 5 (N. of Dundas Street), Mississauga, Ontario.
276 Ontario Ministry of Natural Resources, Aurora District. 2009. Provincially Significant Rattray Marsh Wetland Complex, City of Mississauga, Region of Peel
277 Liam Murray. 2006. Memo RE: Highway 401 Widening, 410 to 1st Line West, Mississauga, Meadowvale Station Woods South of Highway 401. Credit Valley Conservation. 2pp.
278 Marshall Macklin Monaghan and Ecoplans Limited. 2005. Highway 401 Improvements from Highway 410/403 Interchange to East of Credit River. Class Environmental

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279 INSITE Landscape Architects Inc. 2008. Tree Management Report for 2551 & 2555 Meadowpine Blvd. Mississauga, Ontario.

280 Ecoplans Ltd. 2008. HATCH Property (07-3279) - Breeding Bird Surveys and Vegetation Overview.

281 Thompson Environmental Planning and Design Ltd. 2008. Scoped Environmental Impact Statement at 2935 and 2955 Mississauga Road.

282 Ontario Ministry of Natural Resources, Aurora District. 2008. Provincially Significant Credit River Marshes Wetland Complex.

283 Dougan & Associates. 2008. City of Mississauga Lakeside Park Environmental Site Investigations, Analysis and Pre-Design Recommendations Report.

284 Ontario Ministry of Natural Resources, Aurora District. 2009. Provincially Significant Churchville-Norval Wetland Complex.

285 W.D. McIlveen. 2009. Winter Birds in Mississauga Shoreline Parks. Monitoring Program 2008-2009. Prepared for Credit Valley Conservation.

286 Natural Resource Solutions Inc. 2009. Credit Valley Conservation Terrestrial Ecological Land Classification. Prepared for Credit Valley Conservation.

287 Stantec Consulting Ltd. 2009. 701 Winston Churchill Boulevard Environmental Impact Study. Prepared for Southdown Station Partnership, 200 Front St. West.

288 Ecoplans Ltd. 2010. Mississauga Bus Rapid Transit East Project Limits: Terrestrial Impact Assessment Technical Memorandum. Prepared for the City of Mississauga.

289 LGL Limited. 2009. Butternut Tree Survey, Lornewood Creek Sanitary Sewer Class Environmental Assessment, Regional Municipality of Peel.

290 AMEC Earth and Environmental Inc. 2010. Drew Road Extension (Tomken Road to Dixie Road) City of Mississauga, Ontario. Terrestrial Ecosystem Existing Conditions. Submitted to iTRANS Consulting Inc.

291 Credit Valley Conservation Authority. 2011. Flora and fauna records from surveys completed in 2011 within Meadowvale Station Woods and the Harris Property (MV2 and CRR2).

292 Toronto and Southern Ontario Birding Reports. Red-Headed Woodpecker Turney Woods Mississauga. April 18, 2012. Available Online: http://outdoorontario.net/birds/phpBB/viewtipic.php?f=1&t=995

Appendix 4: Fieldwork Identified and Date Completed

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	
Minor changes to NAS boundaries						
CL1/SD5	SNS	• review of flora and fauna, site condition and site boundaries	private/ parkland	roadside/ field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	13/08/12
CL8	SNS	• review of flora and fauna, site condition and site boundaries	private/ greenbelt	roadside/ field work	amphibians	16/03/12, 23/05/12
					breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	22/08/12
CL9	SNS	• review of flora and fauna, site condition and site boundaries.	private/ parkland	roadside/ field work	amphibians	16/03/12, 23/05/12
					breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	22/08/12
					butternut	22/08/12
CL13	NS	• review of flora and fauna, site condition and site boundaries	private/ greenbelt	roadside/ field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	16/08/12
CL15	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	22/08/12

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	
CL16	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	parkland	field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	22/08/12
					butternut	22/08/12
CL17	RW	• review fauna and site boundaries	private	roadside	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	22/08/12
CL21	SNS	• review fauna and site boundaries	greenbelt	field work	amphibians	16/03/12, 23/05/12
					breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	16/08/12
					butternut	16/08/12
CL22	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private	roadside	amphibians	16/03/12, 23/05/12
					breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	16/08/12
					butternut	16/08/12
CL24	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	greenbelt	field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
					butternut	21/08/12

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	
CL26	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	16/08/12
					butternut	16/08/12
CL30	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	16/08/12
CL31	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	greenbelt	field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	16/08/12
					butternut	16/08/12
CL39	SNS	• review of flora and fauna, site condition and site boundaries	private/ parkland	roadside/ field work	amphibians	16/03/12, 23/05/12
					breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	21/08/12
CL42	NS	• review fauna and site boundaries	private/ greenbelt	roadside/ field work	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	21/08/12
CL43	NS	• review of flora and fauna, site condition and site boundaries	parkland/ greenbelt	field work	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	21/08/12

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	
CL52	NS	• review of flora and fauna, site condition and site boundaries • search for butternut	private/ parkland	roadside/ field work	amphibians	16/03/12, 23/05/12
					breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	13/08/12
					butternut	13/08/12
CRR9	SNS	• review of flora and fauna, site condition and site boundaries	parkland	field work	amphibians	23/05/12
					breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
ETO7	SNS	• review of flora and fauna, site condition and site boundaries	private/ greenbelt	roadside/ field work	amphibians	23/05/12
					breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	01/08/12
ETO8	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private/ parkland	roadside/ field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	01/08/12
					butternut	01/08/12
LV1	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	01/08/12
					butternut	01/08/12
LV2	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	01/08/12

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	
LV3	NS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	17/08/12
LV4	NS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	17/08/12
LV5	NGS	• review of flora and fauna, site condition and site boundaries	greenbelt	field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	10/08/12
LV6	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	13/08/12
LV7	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	parkland	field work	amphibians	16/03/12
					breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	13/08/12
					butternut	13/08/12
LV14	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	01/08/12
MI1	SNS	• review of flora and fauna, site condition and site boundaries	private/ greenbelt	roadside/ field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	17/08/12

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	
MI4	RW	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
MI7	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private	roadside	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
					butternut	21/08/12
MI17	SNS	• review of flora, site condition and site boundaries	private/ parkland	roadside/ field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
PC1	NS	• review of flora and fauna, site condition and site boundaries • search for butternut	parkland	field work	breeding birds	12/06/12
					spring flora	12/06/12
					summer flora	21/08/12
					butternut	21/08/12
PC2	NGS	• review of flora and fauna, site condition and site boundaries	parkland	field work	breeding birds	11/06/12
					spring flora	11/06/12
					summer flora	21/08/12
SD1	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private/ parkland	roadside/ field work	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	13/08/12
					butternut	13/08/12
SD4	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	13/08/12

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	
SD7	SNS	• review of flora and fauna, site condition and site boundaries • search for butternut	private/ parkland	roadside/ field work	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	13/08/12
					butternut	13/08/12
SH6	NS	• review of flora and fauna, site condition and site boundaries	private/ parkland	roadside/ field work	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	08/08/12
SP1	NS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	08/08/12
SP3	SNS	• review of flora and fauna, site condition and site boundaries	private	roadside	breeding birds	13/06/12
					spring flora	13/06/12
					summer flora	08/08/12

Appendix 5: Rarity Status Definitions

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 uses 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. Species identified as Endangered or Threatened by COSSARO inevitably receive protection under the Endangered Species Act.

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 are 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 2012)

Appendix 6: Changes in Natural Areas in Wards 5, 6, and 10 from 1996 to 2012

This table provides changes within natural areas evaluated in 2010. All changes between 1996 and 2012 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 & amphibians	prov. sig. species	CVC 2010	
CL1	96	SNS		3.59	38	4 (10.5%)	28.13	4.82	1	0	2		2	0	0	0		Good
	98																	
	99				↑48	↑7 (14.6%)	↑28.74	↓4.49			↑3		↑3	↑1				
	00																	
	01																	
	02																	
	04				↑80	↑17 (21.25%)	↑34.65	↓4.37			↑5		↑14		↑1			
	08			↓3.35	↑109	↑25(22.94%)	↑37.21	↓4.06			↑9		↑16					
	12				↑135	↑36(26.67%)	↑39.70	↓3.99	↑2		↓4		↑22				10	
CL8	96	SNS	wetland	11.28	48	9 (18.8%)	19.86	3.18	7	0	2	29	13	10	1	0	0	Good
	98				↑57	↑10 (17.5%)	↑ 21.73	↑ 3.17			↑4							
	99				↑ 73	↑20 (27.4%)	↑22.94	↑ 3.15	↑8		↑5		↑14					
	00																	
	01																	
	02																	
	04				↑85	↑24 (28.24%)	↑24.58				↑6		↑28				↑5	
	08			↑12.26	↑108	↑33(30.56%)	↑30.60	↑3.53		↑1	↑12		↑30					
	12			↑13.49	↑143	↑44(30.77%)	↑37.26	↑3.74	↑9	↑2	↓5	32	↑32				20	

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 & amphibians	prov. sig. species	CVC 2010	
CL9	96	SNS	ESA,ANSI,wetland	46.89	491	156 (31.40%)	80.10	4.38	13	2	125		200	23	22	1		Good
	98				↑496	↑161 (32.30%)				↓0	↑132							
	99				↓495		↓79.83	↓4.37			↓131							
	00			↓46.81						↑1	↓130			↓22	↓21	↓0		
	01				↑496	↓159 (32.06%)	↑79.86	↓4.35			↑133							
	02						↑80.10	↑4.36								↑1		
	04			↓45.62	↑501	↑163 (32.53%)	↑80.30	↑4.37					↑203			↑3		
	08			↑45.78	↑519	↑171 (32.95%)	↑81.93	↑4.39			↑143			↑29				
	12			↓45.41	↑550	↑186 (33.82%)	↑83.64	↓4.38	↓12	↑3	↓113	195	↑229		↑23	↑3	201	
CL13	96	NGS		1.50	40	23 (55.00%)	8.25	1.94	2	0	0		2	0	0	0		Poor
	98																	
	99	↑NS		↑8.42	↑61	↑34 (55.74%)	↑13.47	↑2.59			↑1		↑5					
	00																	
	01				↑74	↑43 (58.11%)	↑14.37	↓2.58	↑3				↑8					
	02																	
	04			↓7.03	↑86	↑49 (56.98%)	↑15.04	↑2.54					↑11	↑1				
	08			↓6.18	↑135	↑77 (57.04%)	↑20.71	↑2.77			↑5		↑16	↑5				
	12			↑10.12	↑147	↑84 (57.14%)	↑22.28	↑2.85	↓1		↓2	16	↑18				4	
CL15	96	NS		0.83	44	9 (18.2%)	24.51	4.14	1	0	3		2	2	0	0		Fair
	98																	
	99				↑ 46	↑10 (21.7%)	↓22.12	↑4.17										
	00																	
	01																	
	02																	
	04				↑54	↓9 (16.67%)	↑25.79	↓3.84					↑10	↑3				
	08			↓0.77									↑12					
	12				↑58	↑12 (20.69%)	↑25.80	↓3.80			↓1	11	↑13				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 & amphibians	prov. sig. species	CVC 2010	
	96	NS		8.52	119	33 (26.9%)	37.63	4.06	5	0	11		37	16	0	0		Fair-Poor
	98				↑134	↑ 42 (30.6%)	↑38.47	↓4.01			↑13		↑38	↑17				
	99				↑138	↑ 46 (33.3%)	↓37.95	↓3.96			↑14							
	00				↑147	↓44 (29.93%)												
CL16	01																	
	02																	
	04	↑SNS		↑11.79	↑161	↑49 (30.43%)	↑39.02	↓3.84	↑6	↑1	↑15		↑42					
	08			↑15.20	↑189	↑53 (28.04%)	↑48.30	↑4.29			↑29		↑47					
	12			↓14.87	↑204	↑62 (30.39%)	↑48.40	↓4.20	↓5		↓13	59	↑61	↑18			50	
	96	RW		33.28	71	13 (18.6%)	n/a	n/a	1	0	17		0	0	4	0		n/a
	98										↑18							
	99			↑33.48														
	00				↑73	↑15 (20.55%)					↑19							
CL17	01																	
	02																	
	04			↓33.28														
	08			↓32.09	↑125	↑36(28.80%)					↑24		↑19	↑2				
	12				↑137	↑40 (29.20%)					↓14	47	↑27				14	
	96	SNS	ESA,ANSI,wetland	9.36	97	22 (21.6%)	38.91	4.49	3	0	18		2	0	1	0		Fair
	98		↓ESA,wetland								↑20							
	99																	↓Fair-Poor
	00																	
CL21	01																	
	02																	
	04			↓9.05	↑112	↑23 (20.54%)	↑41.23	↓4.37					↑17	↑3				
	08			↑9.87	↑165	↑47(28.48%	↑46.49	↓4.28		↑1	↑25		↑21		↑2			
	12			↓9.51	↑185	↑58 (31.35%)	↑48.45	↑4.30	↑5		↓17	50	↑27				14	

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 & amphibians	prov. sig. species	CVC 2010	
CL22	96	SNS	ESA,ANSI	17.85	131	45 (34.4%)	37.74	4.07	1	2	13		2	1	6	0		Good
	98									↓1	↑15							
	99			↓17.78														
	00																	
	01																	
	02																	
	04			↓17.75	↑134	↑46 (34.33%)	↓37.31	↓3.98			↓13							
	08			↑17.85	↑147	↑50(34.01%)	↑38.58	↑3.92					↑9					
	12			↑17.91	↑181	↑69 (38.12%)	↑42.24	↑3.99	↑2	↑2	↓5	36	↑17			↑1	8	
CL24	96	SNS		7.8	213	51 (23.0%)	58.06	4.56	3	0	31		6	1	0	0		Good
	98		↑ESA, ANSI		↑216						↑36							
	99				↑235	↑62 (26.4%)	↑59.23	↓4.50	↑4		↑37		↑10					
	00																	
	01																	
	02																	
	04			↓7.76	↑245	↑65 (26.53%)	↑59.89	↓4.46	↑5	↑1	↓36		↑20		↑1			
	08			↑8.08	↑257	↑69(26.85%)	↑60.93	↓4.44			↑39		↑23	↑2				
	12			↓8.03	↑281	↑83 (29.54%)	↑61.86	↓4.40	↑6		↓21	83	↑25	↑3			11	
CL26	96	NS		4.34	157	58 (35.70%)	31.66	3.18	2	0	14		5	2	0	0		Fair
	98										↑15							
	99			↑4.76	↑178	↑68 (38.20%)	↑34.52	↑3.29			↑18		↑18	↑7				
	00																	
	01			↓2.01		↑65 (36.52%)	↑34.05	↓3.20	↓1		↓17							
	02																	
	04	↑SNS		↓1.97	↑189	↑70 (37.04%)	↑36.03	↑3.30		↑1			↑19					
	08			↓1.95	↑198	↑71(35.86%)	↑38.78	↑3.44			↑21		↑21					
	12			↓1.93	↑200	↓71 (35.50%)	↑39.36	↑3.47			↓12	46					10	

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 & amphibians	prov. sig. species	CVC 2010	
CL30	96	SNS	ESA,ANSI	0.06	24	8 (33.30%)	0.00	0.00	1	2	11		0	0	0	0		Poor
	98				↑46	↑16 (34.80%)	↑25.56	↑4.67		↓1								↑Fair-Poor
	99				↑51	↑18 (35.30%)	↓25.29	↓4.58			↑14							↑Fair
	00				↑80	↑31 (38.75%)	↑28.00	↓4.00			↑20							
	01				↑81		↑27.72	↓3.92										
	04				↑83	↑33 (39.76%)	↑27.86	↑3.94					↑1					
	08				↑85	↑35 (41.18%)							↑3					
	12				↑93	↑36 (38.71%)	↑29.12	↓3.86				26	↑6	↑1				
CL31	96	SNS	ESA,ANSI	2.78	50	26 (50.0%)	0.00	0.00	1	0	2		1	0	0	0		Poor
	98																	
	99			↓2.61	↑59		↑19.32	↑3.36					↑4					
	00																	
	01																	
	02																	
	04			↓2.55	↑82	↑34 (41.46%)	↑23.09	↓3.33			↑3			↑1				
	08			↑2.82	↑101	↑42(41.58%)	↑26.30	↑3.42		↑1	↓2		↑10					
	12			↑2.88	↑121	↑52 (42.62%)	↑29.52	↑3.53			↓1	20	↑13	↑2	↑2		5	
CL39	96	SNS		12.98	245	69 (28.0%)	54.51	4.13	2	0	41		6	2	8	0		Fair
	98				↑250	↑72 (28.4%)	↑54.72	↓4.10			↓40		↑22	↑5				
	99			↓12.90	↑265	↑79 (29.8%)	↑56.46	↑4.14			↑43		↑25					
	00																	
	01																	
	02																	
	04			↓12.59	↑271		↑57.23	↓4.13					↑39	↑6				
	08			↑12.81	↑302	↑93(30.79%)	↑60.11	↑4.16	↑3	↑1	↑48							
	12			↑13.01	↑307	↑96 (31.27%)	↑60.31	↓4.15	↑4	↓0	↓26	85	↑40	↑7		↑1	32	

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 & amphibians	prov. sig. species	CVC 2010	
	96	NS		8.87	103	28 (27.2%)	35.80	4.13	3	0	9		4	1	0	0		Fair-Poor
	98																	
	99			↑8.88	↑115	↑34 (29.6%)	↑37.33	↑4.15			↑12							
	00																	
CL42	01																	
	02																	
	04			↓8.31	↑119		↓37.31	↓4.05					↑18					
	08			↓8.20	↑124	↑37(29.84%)	↑37.74						↑22					
	12			↑8.91	↑145	↑45 (31.03%)	↑38.80	↓3.88			↓7	29	↑25				10	
	96	NS		4.16	68	11 (16.2%)	29.27	3.88	2	0	5		5	1	0	0		Fair
	98																	
	99			↓4.14														
	00																	
CL43	01																	
	02																	
	04			↑4.16	↑87	↑18 (20.69%)	↑31.18	↓3.75			↑6		↑14	↑2				↓Fair-Poor
	08			↑4.19	↑162	↑48(29.63%)	↑43.27	↑4.05			↑19		↑20					
	12			↑4.22	↑178	↑55 (30.90%)	↑44.18	↓4.00	↑3		↓8	43	↑23	↑3			9	
	96	NGS		6.67	34	18 (52.9%)	12.75	3.19	1	0	0		10	1	0	0		Poor
	98																	
	99			↑6.69	↑44	↑24 (54.5%)	↑15.21	↑3.40					↑11		↑2			
	00																	
CL52	01																	
	02																	
	04	↑NS			↑73	↑43 (58.90%)	↓14.61	↓2.67					↑25					
	08	↑SNS		↑8.93						↑1								
	12				↑110	↑58 (52. 73%)	↑21.08	↑2.92			↑3	15	↑32	↑2		↑1	14	

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 & amphibians	prov. sig. species	CVC 2010	
SH6	96	NS		6.85	70	32 (46.4%)	21.37	3.51	2	0	1		4	0	0	0		Poor
	98																	
	99			↓6.44	↑80	↑38 (47.5%)	↑23.30	↑3.60			↑2		↑6	↑1				
	00																	
	01																	
	02																	
	04			↓6.28	↑104	↑49 (47.12%)	↑24.68	↓3.33	↑4				↑12	↑3				
	08			↑7.52	↑144	↑69(47.92%)	↑29.33	↑3.39			↑4		↑13					
	12	↑SNS			↑169	↑78 (46.15%)	↑32.81	↑3.44	↓3	↑1	↓1	22	↑20	↑6			5	
SD1	96	NS		19.5	96	27 (28.1%)	30.22	3.64	5	0	4		13	4	2	0		Fair
	98																	
	99			↓19.35														
	00																	
	01																	
	02																	
	04			↑19.55	↑170	↑67 (39.41%)	↑35.96	↓3.54	↑6	↑1	↑10		↑113	↑7				
	08			↑19.80	↑199	↑84(42.21%)	↑39.72	↑3.70			↑14		↑114					
	12			↑20.03	↑229	↑97 (42.36%)	↑41.92	↓3.65	↓5		↓9	44	↑129	↑9			97	
SD4	96	NS		26.58	65	16 (24.6%)	26.14	3.73	1	0	2		0	0	0	0		n/a
	98																	
	99																	
	00																	
	01																	
	02																	
	04			↓23.66	↑106	↑24 (22.64%)	↑31.69	↓3.50	↑5				↑13					Fair
	08			↑24.53														
	12			↓24.38	↑107	↓24 (22.43%)	↑31.94	↑3.51			↑3	21	↑21	↑1			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 & amphibians	prov. sig. species	CVC 2010	
SD5	96	SNS		10.14	38	4 (10.5%)	28.13	4.82	2	0	2		2	0	0	0		Good
	98																	
	99				↑48	↑ 7 (14.6%)	↑ 28.74	↓4.49			↑3		↑3	↑ 1				
	00																	
	01																	
	02																	
	04				↑80	↑17 (21.25%)	↑34.65	↓4.37	↑3		↑5		↑14		↑1			
	08			↑10.17	↑97	↑24 (24.74%)	↑35.23	↓4.12		↑1			↑16	↑3				
	12				↑102	↑27 (26.47%)	↑35.68				↓1	21	↑45				27	
SD7	96																	
	98																	
	99	NGS		2.01	34	16 (47.1%)			2					1				Poor
	00																	
	01																	
	02																	
	04	↑SNS		↑3.81	↑94	↑49 (52.13%)	↑18.84	↑2.84	↑3	↑1	↑5		↑54					
	08				↑136	↑74(54.41%)	↑23.30	↑2.98			↑8		↑57	↑2				
	12			↑3.93	↑166	↑84 (50.60%)	↑26.67	↓2.96			↓5	25	↑67				41	
CRR9	96	SNS	ESA,ANSI,wetland	25.63	37	14 (37.84%)	17.10	3.57	3	0	12		10	1	13	0		Fair
	98																	
	99																	
	00																	
	01				↑45	↑15 (33.33%)	↑21.00	↑3.83			↑16		↑27		↑10			
	02																	
	04				↑49	↑17 (34.69%)	↓20.86	↓3.69			↑17		↑40			↑2		
	08			↑26.10	↑50	↑18 (36.00%)							↑41					
	12			↑26.31	↑113	↑43 (38.05%)	↑30.24	↓3.61	↑4		↑18	27	↑49	↑2		↑4	39	

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 & amphibians	prov. sig. species	CVC 2010	
ETO7	96	SNS	ESA	27.18	84	35(39.3%)	21.39	3.04	2	0	2		11	2	11	2		Fair
	98																	
	99			↑27.36	↑96		↑25.1	↑3.21			↑4							
	00			↓21.14		↑36 (37.11)					↑5							
	01																	
	02			↑27.37	↑97	↓33 (34.02%)	↓24.89	↓3.11	↑3		↑6					↑3		
	04			↑32.40	↑103	↑38 (36.89%)	↓24.82	↓3.08										
	08			↓31.90	↑145	↑53(36.55%)	↑31.73	↑3.31	↑3		↑9		↑34	↑5	↑12			
	12			↓31.42	↑185	↑78 (42.16%)	↑35.52	↑3.43	↑4		↓3	26	↑45	↑7		↑4	36	
ETO8	96	SNS		16.67	85	34 (37.6%)	26.05	3.65	3	0	3		2	4	1	0		Fair
	98																	
	99																	
	00																	
	01																	
	02																	
	04				↑101	↑37 (36.63%)	↑29.21		↑4		↑4		↑26	↑6				
	08			↓15.87	↑133	↑45 (33.83%)	↑37.09	↑3.95		↑1	↑7		↑32					
	12			↑16.41	↑184	↑74 (40.22%)	↑40.80	↓3.89				37	↑36				18	
LV1	96	SNS		14.03	82	34 (40.2%)	23.09	3.33	4	1	0		8	0	0	0		Fair
	98	↓NS			↑83					↓0								
	99			↑14.22	↑93	↑38 (40.9%)	↑24.54	↓3.31	↑5		↑1							
	00																	
	01																	
	02																	
	04	↑SNS			↑123	↑46 (37.40%)	↑29.74	↑3.39		↑1			↑27	↑2				
	08			↓12.20	↑127	↑48 (37.80%)	↓29.70	↓3.34					↑30	↑5				
	12			↑12.94	↑230	↑96 (41.74%)	↑42.61	↑3.69	↑7	↑3	↑7	33	↑66	↑6			41	

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 & amphibians	prov. sig. species	CVC 2010	
	96	NS		2.09	26	11 (38.5%)	11.62	3.00	1	0	0		3	0	0	0		Poor
	98																	
	99																	
	00																	
LV2	01																	
	02																	
	04				↑40	↑13 (32.50%)	↑13.09	↓2.52					↑12	↑1				
	08			↑2.14														
	12			↑2.51	↑41	↓18 (31.71%)	↓12.85	↓2.43					↑18				6	
	96	NS		3.54	80	34 (40.0%)	24.33	3.59	3	0	0		18	2	0	0		Fair
	98																	
	99			↑3.55	↑83	↑34 (41.0%)	↑25.43	↑3.63			↑1		↑20	↑3				
	00																	
LV3	01																	
	02																	
	04			↓3.54	↑94	↑36 (38.30%)	↑28.23	↑3.71	↑5				↑34					
	08			↑3.99	↑137	↑56 (40.88%)	↑33.22	↓3.69			↑6		↑37					
	12			↑4.14	↑162	↑64 (39.51%)	↑36.57		↓4		↓4	30	↑60				39	
	96	NGS		0.95	n/a	n/a	0.00	0.00	1	0	0		0	0	0	0		Poor
	98																	
	99	↑NS		↑1.09	↑44	↑26 (59.1%)	↑10.61	↑2.50			↑2		↑5					
	00																	
LV4	01																	
	02																	
	04			↑2.31	↑51	↑27 (52.94%)	↑11.29	↓2.30	↑5				↑20	↑1				
	08			↑3.09	↑111	↑60 (54.05%)	↑20.85	↑2.92			↑8		↑25	↑2				
	12			↑3.17	↑151	↑78 (51.66%)	↑27.29	↑3.19			↓5	26	↑35				15	

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 & amphibians	prov. sig. species	CVC 2010	
	96	NGS		1.09	0	0	0	0	1	0	0		0	0	0	0		Poor
	98																	
	99			↓0.95														
	00																	
LV5	01																	
	02																	
	04			↑1.12														
	08			↑1.39	↑123	↑66 (53.66%)	↑24.27	↑3.21			↑11			↑2	↑2			
	12	↑NS			↑132	↑69 (52.27%)	↑26.24	↑3.31			↓5	18					6	
	96	NS		2.02	61	19 (29.5%)	24.38	3.76	1	0	3		0	0	0	0		Fair
	98																	
	99			↑2.03	↑64	↑20 (31.3%)	↑25.48	↑3.84			↑4		↑1	↑1				
	00																	
LV6	01																	
	02																	
	04				↑82	↑24 (29.27%)	↑29.41	↑3.86					↑7					
	08			↑2.38	↑83	↓24 (28.92%)	↑29.94	↑3.90			↑5		↑9					
	12			↓2.37	↑110	↑39 (35.45%)	↑33.47	↑3.97			↓3	17	↑15				4	
	96	SNS	ESA,ANSI	21.56	292	101 (33.9%)	57.67	4.17	2	0	46		65	6	3	1		Good
	98				↑300	↑103 (34.0%)	↑58.71	↑4.18			↑49		↑68	↑7	↑5			
	99		↑ESA,ANSI,wetland		↑331	↑110 (33.2%)	↑62.84	↑4.25			↑60							
	00					↓107 (32.33%)					↑61		↓67					
LV7	01																	
	02					↑108 (32.63%)	↑62.88	↓4.21										
	04				↑336	↑110 (32.74%)	↑63.66	↑4.23		↑1	↑62		↑68					
	08			↑21.84	↑339	↓110 (32.45%)	↑64.33	↑4.26			↑63							
	12			↑22.46	↑362	↑118 (32.60%)	↑66.71	↑4.27			↓38	102	↑70				54	

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 & amphibians	prov. sig. species	CVC 2010	
LV14	96	NGS		1.95	35	17 (45.7%)	13.67	3.22	1	0	0		0	0	0	0		Poor
	98																	
	99				↑40		↑13.76	↓3.16					↑1					
	00																	
	01																	
	02																	
	04	↑NS		↓1.86	↑51	↑24 (47.06%)	↑15.20	↓2.93					↑10					
	08			↑2.34														
	12			↓2.31	↑81	↑39 (48.15%)	↑16.60	↓2.57				6	↑22	↑1			7	
MI1	96	NS		6.31	9	4 (44.44%)	n/a	n/a	1	0	0		0	0	0	0		Fair
	98																	
	99																	
	00																	
	01			↓5.63	↑16	↑5 (31.25%)			↑2				↑50					
	02																	
	04			↑5.64	↑57	↑36 (63.16%)			↑4				↑51	↑2				
	08			↑6.83	↑68	↑42 (61.76%)	8.50	3.80					↑52	↑5				
	12			↑7.37	↑101	↑55 (54.46%)	↑13.97	↓2.91	↑5		↑2	8	↑55			↑1	34	
MI4	96	RW		165.14	97	27 (24.7%)	n/a	n/a	1	0	5		0	0	3	0		Fair
	98				↑134	↑41 (30.6%)					↑14		↑2					
	99			↓153.28	↓28						↓1		↓0	↓0	↓0			
	00																	
	01																	
	02																	
	04			↑154.31		↓16 (57.14%)												
	08			↓153.81	↑37	↑18 (48.65%)							↑13					
	12			↓150.33	↑57	↑25 (43.86%)					↓0	7	↑23	↑1			8	

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 & amphibians	prov. sig. species	CVC 2010	
MI7	96																	
	98																	
	99	SNS		5.95	125	39 (31.2%)	39.90	4.30	2		7		1	5				Poor
	00																	
	01																	
	02																	
	04			↓4.98						↑1			↑10	↓4				
	08												↑18					
	12			↑6.89	↑151	↑51 (33.77%)	↑42.00	↓4.20			↓3	35	↑21	↑5			10	
MI17	96																	
	98																	
	99	NS		6.04	145	45 (31.0%)	42.20	4.22	2	0	15		6	2	3	0		Fair
	00	↑SNS				↓44 (30.34%)							↓5					
	01																	
	02																	
	04			↓5.98	↑167	↑54 (32.34%)	↑43.56	↓4.10			↑16		↑19	↑8				
	08			↑6.24									↑23	↑9				
	12			↑7.17	↑181	↑58 (32.04%)	↑45.09	↓4.07	↑3	↑1	↓8	41	↓35				22	
PC1	96	NS		1.09	87	39 (44.8%)	26.56	3.83	1	0	9		68	1	0	0		Poor
	98																	
	99				↑92	↑44 (47.8%)					↓6							
	00																	
	01																	
	02																	
	04			↓1.03	↑101	↑49 (48.51%)	↓25.17	↓3.56			↑7		↑69					
	08			↑1.07	↑143	↑71 (49.65%)	↑29.88	↑3.57		↑1	↑10		↑71					
	12			↑1.08	↑163	↑85 (52.15%)	↑30.80	↓3.53			↓5	29	↑73	↑2			47	

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 & amphibians	prov. sig. species	CVC 2010	
PC2	96	NGS		4.37	0	0	0	0	1	0	0		0	0	0	0		Poor
	98																	
	99				↑18	↑10 (55.6%)							↑5					
	00																	
	01																	
	02																	
	04				↑26	↑15 (57.69%)									↑1			
	08			↓4.35	↑93	↑50 (53.76%)	↑18.74	↑3.31			↑6		↑11					
	12				↑111	↑56 (50.45%)	↑22.57	↑3.44		↑1	↓3	13	↑15	↑1			3	
SP1	96	NS		9.05	108	27 (24.3%)	33.99	3.80	5	0	11		4	1	0	0		Fair
	98																	
	99																	
	00																	
	01																	
	02			↓7.17	↑185	↑73 (39.46%)	↓38.65	↓3.65			↑16		↑20					
	04				↑194	↑77 (39.69%)	↑39.57	↑3.66			↑17		↑27	↑7				
	08				↑197	↑80 (40.61)							↑42	↑8				
	12	↑SNS		↑8.69	↑214	↑88 (41.12%)	↑40.53	↓3.61	↑6		↓9	38	↑60				36	
SP3	96	SNS	ANSI	8.84	134	30 (21.8%)	41.09	4.05	5	0	11		5	2	1	0		
	98																	
	99																	
	00																	
	01																	
	02																	
	04			↓8.54									↑13					
	08			↑8.77	↑141	↑34 (24.11%)	↓40.99	↓3.96			↑17		↑16					
	12				↑154	↑40 (25.97%)	↑41.02	↓3.84			↓6	40	↑22				9	

Appendix 7: Comparison of Classifications (1996 to 2012)

Appendix 7: Comparison of Natural Area Classifications (1996 to 2012)

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
	2012	64	61	12	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
	2012	1722.69	329.74	94.57	231.90	2378.90

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%	-	-
	2012	72.42%	13.86%	3.98%	-	-
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%
	2012	5.89%	1.13%	0.32%	-	7.34%

Appendix 8: Comparison of Major Landform Types (1996 to 2012)

Appendix 8: Comparison of Major Landform Types (1996 and 2012)

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	54	5	140
	2011	80	54	5	139
	2012	80	54	5	139
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
	2012	1721.88	316.41	99.66	2137.95

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	-
	2012	21.52	5.86	19.93	-
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%
	2012	80.54%	14.80%	4.66%	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%
	2012	5.88%	1.08%	0.34%	7.30%

Note: The number of sites (139) 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: Butternut Survey Summary

Appendix 9: Butternut Survey Summary of 2012 Field Season in Wards 1 and 2.

Site	Results of 2012 Survey	Last Recorded Observation Prior to 2012 Survey	2012 Condition
CL9	not located	reference 276 (OMNR 2009)	N/A
CL16	not located	2005 field survey (MJ 29/07/05)	N/A
CL21	2 trees located (SP 16/08/12)	2008 field survey (SKM 04/07/08)	no canker, possible hybrids
CL22	not located – no access to private property	reference 289 (LGL Limited 2009)	N/A
CL24	not located	1999 field survey (MJS 18/08/99)	N/A
CL26	not located	1995 field survey (HK/MJ 24/07/95)	N/A
CL31	1 tree located (SP 16/08/12)	2008 field survey (NF 11/10/08)	healthy, possibly planted/hybrid
CL52	not located	1995 field survey (MJ 14/08/95)	N/A
ETO8	1 tree located (LL 01/08/12)	2008 field survey (SKM 02/07/08)	health could not be assessed as the tree is located on private property and was observed from the roadside
LV1	4 trees located (LL 01/08/12)	2005 field survey (MJ 13/10/05)	one tree healthy, one tree has broken limb and some canker, one tree has 50-60% crown dieback, one tree has some canker and 40% crown dieback
LV7	not located	1999 field survey (SV 1999)	N/A
MI7	not located	1999 field survey (MJS 29/10/99)	N/A
SD1	1 tree located (LL 01/08/12)	reference 219 (Dougan & Associates 2003)	healthy, possibly planted/hybrid
SD7	1 tree located (LL 01/08/12)	2008 field survey (SP 30/07/08)	healthy, possible hybrid
SH6	1 tree located (SS 08/08/12)	N/A	healthy, no visible canker

Appendix 10: Provincially Significant Native Flora Species

Appendix 10: Provincially significant native flora species in Wards 1 and 2.
These species are documented for the City of Mississauga in Wards 1 and 2. Provincial rarity status follows (NHIC 2012). 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 Wards 1 or 2	Notes
Castanea dentata (Marshall) Borkh.	American Chestnut	G4	S3	END	END	1	CL8, MI17	2012	
Juglans cinerea L.	Butternut	G4	S3?	END	END	3	15 locations (see Appendix 9)	2012 (see Appendix 9 for details)	
Picea rubens Sarg.	Red Spruce	G5	S3			1	CL1, CL52	2012	planted
Potentilla paradoxa Nutt.	Bushy Cinquefoil	G5	S3			1	CL8, CL9	2009	
Populus x jackii Sarg.	Balm-of-gilead	GNA	S2			1	CL9	1970	
Oenothera clelandii W. Dietr.	Clelands Evening-primrose	G3G5	S1			1	CL30	date unknown	
Quercus palustris Muenchh.	Pin Oak	G5	S3			1	LV1	2009	
Solidago speciosa Nutt. var. rigiduscula Torr. & A. Gray	Showy Goldenrod	G5T?	S1			1	LV1	2009	
Liatris spicata (L.) Willd.	Dense Blazing Star	G5	S2	THR	THR	1	PC1, PC2	2012	planted

Appendix 11: Provincially Significant Fauna Species

Appendix 11: Provincially significant native fauna species in Wards 1 and 2.
These species are documented for Wards 1 and 2 in the City of Mississauga. Rarity status follows (NHIC 2012) 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 1 or 2
Bird								
Acadian Flycatcher	*Empidonax virescens*	G5	S2S3B	END	END	observed	CL9	literature record 1990
American Golden-plover	*Pluvialis dominica*	G5	S2S3B,S4N			observed	CL9	literature record 2009
Bald Eagle	*Haliaeathus leucocephalus*	G5	S1S2B,S4N			observed	CL9	literature record 2009
Barn Swallow	*Hirundo rustica*	G5	S4B	THR	THR	confirmed	CL9, CL52, CRR9, MI1, PC1, PC2, LV1, LV2, LV4, LV7,SD7	2012
Black-crowned Night-heron	*Nycticorax nycticorax*	G5	S3B,S3N			probable	CL16, CL8, CL9, CRR9, ETO7, LV3, LV4, SD1	2005
Black Tern	*Chlidonias niger*	G4	S3B	NAR	SC	observed	CL9	literature record 2009
Bobolink	*Dolichonyx oryzivorus*	G5	S4B	THR	THR	observed	CL9	literature record 1990
Canada Warbler	*Wilsonia canadensis*	G5	S4B	THR		possible	CL8, CL9, CL39, LV7	literature record 1996
Canvasback	*Aytha valisineria*	G5	S1B,S4N			observed	CL9, SD7	literature record 2003
Caspian Tern	*Hydroprogna caspia*	G5	S3B	NAR	NAR	observed	CL9, PC1, SD1	2010

Common Name	Scientific Name	G RANK	S RANK	MNR	COSEWIC	Highest Breeding Evidence	Documented Sites	Last Recorded in Wards 1 or 2
Cerulean warbler	*Dendroica cerulea*	G4	S3B			observed	CL9	literature record 2009
Common Nighthawk	*Chordeiles minor*	G5	S4B	THR		possible	CL16, CL9, SD1	literature record 2009
Eastern Meadowlark	*Sturnella magna*	G5	S4B	THR	THR	observed	CL9, SD1	literature record 2009
Gray-cheeked Thrush	*Catharus minimus*	G5	S2S4B			observed	CL9	literature record 1990
Great Black-backed Gull	*Larus marinus*	G5	S2B			observed	CL9, LV1, LV3, SD1, SD7	literature record 2009
Great Egret	*Ardea albus*	G5	S2B			observed	CL9, CRR9, PC1	literature record 2009
Horned Grebe	*Podiceps auritus*	G5	S1B,S4N		DD	observed	CL9, PC1, SD1, SD7	literature record 2009
Least Bittern	*Ixobrychus exilis*	G5	S4B	THR	THR	observed	CL9	literature record 2009
Long-tailed Duck	*Clangula lyemalia*	G5	S3B			observed	CL16, CL9, LV1, LV3, MI17, SD1, SD5, SD7	literature record 2009
Loggerhead Shrike	*Lanius ludovicianus*	G5	S2B	END	END	observed	CL9	literature record 1990
Northern Bobwhite	*Colinus virginianus*	G5	S1	END	END	observed	CL9	literature record 2009
Peregrine Falcon	*Falso peregrinus*	G4T4	S3B			observed	CL9, SD1, SD7	literature record 2003
Prothonotary Warbler	*Protonotaria citrea*	G5	S1B	END	END	observed	SD1	literature record 2003
Redhead	*Aytha americana*	G5	S2B,S4N			observed	CL9, SD1	literature record 2003

Common Name	Scientific Name	G RANK	S RANK	MNR	COSEWIC	Highest Breeding Evidence	Documented Sites	Last Recorded in Wards 1 or 2
Red-headed Woodpecker	*Melanerpes erythrocephalus*	G5	S4B	THR	SC	observed	CL9, PC1	literature record 2009
Red-necked Grebe	*Podiceps grisegena*	G5	S3B,S4N	NAR	NAR	observed	CL9, PC1, SD1	literature record 2009
Red-throated Loon	*Gavia stellata*	G5	S3B,S4N			migrant	CL9	literature record 1990
Rough-legged Hawk	*Buteo lagopus*	G5	S1B,S4N	NAR	NAR	migrant	CL9	literature record 1990
Rusty Blackbird	*Euphagus carolinus*	G5	S4B	SC		observed	CL9	literature record 2009
Semipalmated Sandpiper	*Calidris pusilla*	G5	S3B,S4N			observed	CL9, SD1	literature record 2009
Short-eared Owl	*Asio flammeus*	G5	S2N,S4B	SC	SC	observed	CL9	literature record 1990
Western Meadowlark	*Sturnella neglecta*	G5	S3B			observed	CL9	literature record 2009
White-eyed Vireo	*Vireo griseus*	G5	S2B			observed	CL9	literature record 2009
Reptile								
Blandings Turtle	*Emydiodea blandingi*	G4	S3	THR	THR	probable	CL9	literature record 2009
Common Snapping Turtle	*Chelydra serpentina serpentina*	G5	S3		SC	probable	CL9, CL22, CL39, CRR9, ETO7	1995
Common Map Turtle	*Graptemys geographica*	G5	S3	SC	SC	probable	CL9, CRR9	2005
Eastern Hognose Snake	*Heterodon platirhinos*	G5	S3	THR	THR	probable	CL9	literature record 1924
Eastern Milk Snake	*Lampropeltis triangulum triangulum*	G5	S3	SC	SC	probable	CL9, ETO7	literature record 1988

Common Name	Scientific Name	G RANK	S RANK	MNR	COSEWIC	Highest Breeding Evidence	Documented Sites	Last Recorded in Wards 1 or 2
Ribbon Snake	*Thamnophis sauritus*	G5	S3	SC	SC	observed	CL9	literature record 2009
Wood Turtle	*Gleptemys insculpta*	G4	S2	END	THR	probable	ETO7	literature record 1992
Amphibian								
Jefferson/Blue-spotted Salamander Complex	*Ambystoma sp.*	G4	S2			confirmed	LV7	literature record 1997

Appendix 12: Amphibian Surveys for 2012

Appendix 12: Amphibian Surveys in Wards 1 and 2.

Species documented during amphibian surveys completed in 2012. 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	*Bufo americanus americanus*	G5	S5	CL9, CL39, CRR9
Green Frog	*Rana clamitans melanota*	G5	S5	CL9