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City of Markham Natural Heritage Inventory and Assessment Study

Prepared by: North-South Environmental Inc. and Dougan & Associates

Prepared for

The City of Markham

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Front Page Photo: Little Rouge River near Highway 7 and Reesor Road.

Photo Credit: Sarah Mainguy

Table of Contents

List of Tables

List of Figures

List of Appendices

Natural Heritage Inventory and Assessment Study

Executive Summary

The City of Markham is committed to identifying and protecting a Greenway System for the long term preservation of natural heritage features and local biodiversity. The Natural Heritage Inventory and Assessment Study provides the first comprehensive assessment of the City's natural heritage resources since the 1992 Phase 1 Background Report for the Natural Features Study, for which data were collected in 1991 (the Phase 2 Implementation Report (Gore and Storrie 1993) provided recommendations based on the data collected in Phase 1 that were the foundation of the Greenway System). The major study objectives were to prepare updated vegetation community mapping, compile a current list of flora and fauna occurring in the City, assess trends in ecological health and condition since 1991, identify threats and disturbances to city-owned natural areas, and provide recommendations to better protect and enhance the City's natural heritage resources. Including matters to be considered in a future Natural Heritage Management Strategy.

Vegetation community mapping was scoped to lands within the current Greenway System (2014 Official Plan) as well as naturalizing lands within city-owned parks and potential woodlands and wetlands that are outside of the Greenway System. The total area of vegetation communities mapped in this study is 7063 hectares or 33.2% of the City. Wetland vegetation covered a total of 793 hectares (3.7%) and forest communities covered 924 hectares (4.4%). By considering other treed ecosystems (cultural woodlands, cultural plantations and swamp), the City's woodland cover is estimated at 1670 ha (7.85%).

Biodiversity of flora and fauna has remained similar to what was reported in 1991 with similar numbers of species reported. Concentrations of biodiversity are reported along the Little Rouge Creek, Rouge River and Morningside Creek where vegetation quality remains very high. The study concludes that the overall ecological health is high when compared to natural heritage systems in other parts of the Greater Toronto Area. In particular, the extent and intensity of invasive species is found to be low in comparison to other GTA municipalities. Management of non-native invasive species is recommended before they firmly establish in the City.

An area of concern includes the identification of numerous encroachments of private uses onto public natural areas, including mowing, cutting and dumping. Encroachments can have a cumulative effect that may threaten natural features and ecological function. Edge management such as fencing, vegetation screening, education or enforcement should be considered by the City to manage the impacts of encroachment.

The City's Greenway System currently protects the vast majority of the natural heritage features that were identified in this study. 95% of wetlands (including 98% of Provincially Significant Wetlands), 97% of woodlands and 93% of cultural communities mapped in this study are located within the Greenway System. The study recommends that the City review the vegetation community mapping and identify appropriate modifications to the Greenway System in the upcoming Official Plan review. The City should also consider the appropriateness of policy changes for the most significant portions of successional areas which support specialized bird habitat.

A number of other recommendations have been identified in this study that merit further consideration in the context of the City's future Natural Heritage Management Strategy or other policy initiatives. These include:

- Identifying biodiversity hotspots (and managing city-owned biodiversity sites)
- Establishing regular monitoring (5-year cycle) for the natural heritage system as a whole and reviewing the effectiveness of monitoring efforts associated with development applications
- Working with conservation authorities and transportation agencies to review wildlife crossing requirements at the time of infrastructure upgrades
- Continuing efforts to restore woodlands and wetlands
- Consider the establishment of natural heritage targets.

1. Introduction

The City of Markham has been committed to the protection of its natural heritage using a systems-based approach since the 1992 Natural Features Phase 1 Background Study (for which inventories were conducted in 1991). It became clear through this process that the understanding of extent, type and significance of the natural heritage features and their flora and fauna was critical to enable and support their protection through Official Plan policy. Mapping of the extent of the features is particularly important. The Phase 2 Implementation Report (Gore and Storrie 1993) provided recommendations based on the data collected in Phase 1 that were the foundation of the Greenway System

This current project represents a major step forward in improving the understanding of the City's natural heritage features, including how the features have changed since the 1991 baseline inventories. Objectives of the study are summarized below:

- providing updated vegetation community mapping in the City;
- provide more complete lists of flora and fauna that currently occur in the City;
- refining the accuracy of Official Plan Natural Heritage mapping, thus providing a better "starting point" for the identification of areas suitable for future development;
- providing a more complete and accurate understanding of the limits and extent of natural heritage features (including flora and fauna), thus providing support for the rigorous defence and future refinement of environmental policies;
- providing data to facilitate comparison with data collected in the 1992 Natural Features Study, thus facilitating evaluation of how well the City's biodiversity has been protected;
- identifying areas where existing disturbance and or threats (e.g., encroachment, over-use, non-native species, etc.) are degrading natural heritage values, i.e., identify management needs;
- identifying areas that are special and/or outstanding with respect to biodiversity and/or condition and thus are worthy of special attention (e.g., protection and/or management);
- updating and expanding on base-line information (building on the 1992 Phase 1 Natural Features Study baseline) that can be used for future monitoring and "state of the environment" reporting;
- providing the data to enable evaluation of current policies and management programs to meet the goals and objectives of natural heritage protection as articulated in the City's Official Plan; and
- informing the development of a work plan for the future "Natural Heritage Management Strategy", including priorities for further investigation and management.

The Study is intended to provide a comprehensive assessment and update of the City's natural heritage system and will support the future mapping updates to Markham's Official Plan. A subsequent study ('Natural Heritage Management Strategy') is planned via a separate procurement process in 2022, following completion of this Natural Heritage Inventory and Assessment Study; it will provide the basis for the identification of any future study needs or additional management requirements to ensure the long term health and sustainability of City-owned natural heritage lands.

The Natural Heritage Network consists of the following components (City of Markham Official Plan Section 3.1.2.1):

a) natural heritage and hydrologic features;
b) vegetation protection zones associated with the features identified in 3.1.2.1a); and
c) hazardous lands and hazardous sites.

Key natural heritage features and key hydrologic features are defined in Section 3.1.2.10 of the Official Plan:

a) wetlands;
b) habitat of threatened and endangered species;
c) significant portions of the habitat of:
    i. special concern species in the Oak Ridges Moraine Conservation Area and Greenbelt Plan Area; and
    ii. provincially rare species in the Oak Ridges Moraine Conservation Plan Area;
d) fish habitat;
e) Life Science Areas of Natural and Scientific Interest;
f) significant valleylands;
g) significant woodlands;
h) significant wildlife habitat;
i) sand barrens, savannahs and tallgrass prairies;
j) permanent streams and intermittent streams; and
k) k) seepage areas and springs.

Key hydrologic features are described in Section 3.1.2 of this Plan and include evaluated wetlands, lakes and their littoral zones, permanent streams and intermittent streams, and seepage areas and springs.

2. Background

2.1. City of Markham Overview

The City of Markham is a lower-tier municipality located in the central part of the Greater Toronto Area (GTA). It is located at the southeast corner of York Region and is one of the nine local municipalities making up York Region. The City of Markham is approximately 21,240 hectares in size and approximately 32% of the land area is contained within the City's Greenway System. Approximately half of the City's Greenway System is located within the Rouge National Urban Park which is Canada's largest urban park.

The City of Markham is a rapidly urbanizing municipality owing to its strategic location in the Greater Toronto Area including access to two 400-series highways. Markham was formed in 1971 when the population was largely concentrated in the historic communities of Thornhill, Buttonville, Unionville

and Markham Village. Development has proceeded outwards from these heritage communities and from south-to-north. Today, most of the lands south of Major Mackenzie Drive have been urbanized while lands to the north (and to the east in the Rouge National Urban Park) remain as rural residential and agricultural.

The 1993 Natural Features Study provides a more detailed account of the past vegetation conditions in Markham. Markham was likely historically dominated by forest along with small pockets of open or successional vegetation including areas of disturbance caused by natural events (fire or windthrow), small Indigenous settlements and wetlands. As European settlers moved into southern Ontario, forest would have been cleared for timber and to prepare the land for agricultural purposes. As a result, woodland cover decreased and bottomed out around 4% in the 1950s before slowly increasing ever since.

2.2. Physical Setting: Ecoregion, Ecodistrict and Soils

The City of Markham is located largely in Ecoregion 7E, Ecodistrict 7E-4. The northeastern corner of Markham lies in Ecoregion 6E, Ecodistrict 6E-7. Ecoregions are regions where vegetation follows consistent patterns due to climate and geology (Crins et al. 2009). Ecodistricts are a subdivision of an ecoregion, characterized by distinctive assemblages of relief, geology, landforms and soils, vegetation, water, fauna, and land use. Ecodistrict 7E-4 is bounded by the south slope of the Oak Ridges Moraine in the north and contains the Peel Plain.

The northern boundary of Ecoregion 6E coincides with the contact zone between Paleozoic and Precambrian bedrock, and is also correlated with precipitation and temperature variables. Its southern boundary is correlated with temperature, elevation, geological differences, and estimated net primary productivity (Crins et al. 2009). Climate in this ecoregion is relatively mild, though not as mild as in 7E to the south.

The climate in Ecoregion 7E is one of the mildest in Canada. Ecoregion 7E is also underlain by limestone bedrock. Except for the Niagara Escarpment from Burlington south to Queenston, and some morainal deposits and drumlin fields in the north-central part of the ecoregion, the topography is flat and overlain by deep undulating deposits of ground moraine. Most substrates in the ecoregion are comprised of calcareous mineral material.

2.3. Watersheds

The study area lies mainly within the Rouge River watershed, but includes parts of the neighbouring Don River in the west, Duffins Creek and Petticoat Creek in the east and a small portion of Highland Creek in the south.

2.4. Physical Environment and Soils

The physical environment is described in detail in the Markham Natural Features Study (Gore and Storrie 1992). A brief summary is provided here.

The present day landscape, with its surficial deposits, are a result of the recession of the Wisconsin ice sheet some 13,000 years ago. Virtually all of Markham is within the Central Till Plain physiographic region. The land surface consists of gently rolling, low relief hills. The major relief of this till plain is provided by the stream valleys that are incised 6 to 15 m into the rolling plain. A relatively small area near Unionville is sand plain.

The South Slope of the Oak Ridges Moraine in the northeastern part of Markham is undulating, consisting of gravel, sand, till and other glacial materials. It contains undrained depressions. The Oak Ridges moraine is a significant groundwater recharge area, and the south slope of the Moraine forms the source area of the Rouge River and Duffins Creek watersheds within Markham.

Soils (with other factors such as microclimate and past land use) determine the type of vegetation found throughout Markham. Clay and loam are the dominant soil types. Relatively impermeable, primarily clay soils are found in northern to southwestern parts of Markham. Better-drained loam soils dominate the southeast portion of Markham and are also found in moderately sloping areas associated with watercourses throughout Markham. A small area of sandier, more permeable soils is found in the southwestern part of the City, near Unionville.

3. Methods

Study areas are mapped in **Figure 1**. Sites were generally selected for study if they:

- Were located within Markham's Greenway System; and
- Had not been surveyed within the past 10 years.

The selection generally included sites that were large and diverse, as well as certain smaller/isolated sites within the mapped Greenway system. The City also identified a selection of sites both within and outside of the current Greenway system that were of interest for one or more of the following reasons:

- Potential future additions to the mapped Greenway system;
- Recently restored areas, or areas undergoing restoration;
- Wooded areas that have not been identified as woodlands on OP mapping; or
- Stormwater management ponds that have been captured as part of the Greenway System.

Additional detail on selection of sites for different types of surveys (amphibians, Ecological Land Classification, detailed botanical surveys, reptiles and birds) are provided in the following sections.

Figure 1 | Markham Natural Features Inventory:
Location of Field Study Sites

Legend

- Markham Boundary
- Study Area
- Markham Greenway System (2014)
- Watercourses

Markham Field and Monitoring Locations

- Amphibians
- Breeding Bird Point Count
- Breeding Bird Area Search
- Detailed Botany
- ELC Disturbance
- Reptiles

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
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3.1. Rapid Ecological Land Classification

Vegetation surveys were conducted in the Study Area (**Figure 1**), with the number and seasonality of visits determined by the type of vegetation on each site identified via aerial photo interpretation. Due to the number of sites that required investigation, the field program was highly scoped to correspond with the time available for each survey. The dates for vegetation surveys are provided in **Appendix 1**.

Ecological Land Classification (ELC) surveys were conducted according to protocols developed for southern Ontario by the Ontario Ministry of Natural Resources (Lee et al. 1998), modified to a Rapid Assessment Protocol to focus on the composition of the vegetation type and condition of the site. ELC surveys were undertaken to classify vegetation to the Vegetation Type level as defined by the ELC system for Southern Ontario (Lee et al. 1998). Soil samples were not taken. ELC and disturbance information were recorded on the ESRI Survey 123 application in the field.

As noted above, information used for vegetation community mapping was obtained primarily through sampling of communities in the field in 2020 (556 polygons), interpretation of aerial photography for this study (419 polygons), from the Markham Subwatershed Study (Dougan and Associates 2014; 1574 polygons), and information collected by the Toronto and Region Conservation Authority between the years 1999 and 2017 (1640 polygons). Other background sources included:

- York Downs EIS (Beacon 2017; 61 polygons);
- 9th Line EIS (Dillon, 2020; 9 polygons)
- Angus Glen Warden Nursery MESP (Savanta & Beacon, 2019; 28 polygons) and
- Milliken Centre EIS (NSE, 2016; 6 polygons).

All polygons were reviewed and refined to represent the land condition in the 2019 orthoimagery.

Wetland mapping was received from the Ontario Ministry of Natural Resources and Forestry (MNRF) following the completion of the report draft. This mapping is discussed in Section 7.1.3.

3.2. Disturbance

Condition, as recorded during field surveys, was focused on the 20 factors listed in the ELC manual (Lee et al. 1998) to catalogue the most widespread disturbances in southern Ontario. These included 12 human-caused disturbances such as logging, presence of invasive non-native species (noted as "alien" in the field surveys for the sake of brevity), presence of tracks and trails, other recreational disturbances such as party spots, dumping and encroachment, noise, and 8 natural disturbances such as fire, ice damage, erosion, deer browse, Beaver activity, etc. Each disturbance was ranked by severity from 1 to 3, with 1 indicating high or intense, 2 indicating moderate and 3 indicating slight or light. Each disturbance was also ranked by its distribution, with 1 indicating it was local, 2 indicating widespread, and 3 indicating extensive. Information was recorded on ESRI Survey 123 in the field.

3.3. Detailed Botanical Inventories

Spring botanical surveys were scheduled before tree leaf-out (i.e. May) and targeted spring flora, including spring ephemerals, early sedges and grasses. Summer (approximately late June and July) and fall (approximately August to September) surveys were conducted in some communities to provide full coverage of the growing season and to capture the full diversity of the vegetation communities, especially in sites with floodplain and meadow communities. Dates for detailed botanical surveys are provided in **Appendix 1**. Species were recorded in the field on standard data sheets derived from those in the ELC manual for southern Ontario (Lee et al. 1998).

Uncommon, rare, special concern, threatened, or endangered species at the national, provincial, and regional scale were located with a hand-held GPS during the surveys. Plant species that could not be identified in the field were identified using Michigan Flora (Voss and Reznicek 2012), the standard text used for identification of Ontario flora.

The provincial conservation status for plant species identified during field investigations was determined using the NHIC's vascular plants checklist (2018). The regional conservation status for York Region was determined using Varga et al.'s Status of Rare Plants of the Greater Toronto Area (Varga et al. 2005). Vegetation communities in the study area were assessed using the Ecological Land Classification (ELC) system for Southern Ontario (Lee et al., 1998).

3.4. Wildlife

3.4.1. Birds

Breeding bird survey locations were selected by an avian ecologist, targeting a mixture of woodland, wetland, and open (meadow) communities throughout the Study Area. Surveys were conducted according to protocols provided by Environment Canada's Forest Bird Monitoring program (FBMP) and the Ontario Breeding Bird Atlas (2001), with point count surveys conducted in more extensive habitat and area searches conducted in smaller habitats. Surveys were undertaken in two periods to target early breeding species (May 24th – June 17th) and late breeding species (June 13th – July 10th), with at least one week apart. Point-count surveys of 10 minutes, as well as area searches, were conducted in low wind and fair-weather conditions between dawn and 10 am as specified by Environment Canada protocols. Point count locations were supplemented by area searches (searches of individual areas for sights and sounds of birds), which covered all other portions of the site. All data were recorded on the ESRI Survey 123 application in the field.

Protocols developed by Birds Canada (2001) were used to assess the probability of breeding as follows:

- Observed (O) - is defined as a species observed in its breeding season outside its nesting habitat (no evidence of breeding). Presumed migrants are recorded as Observed, as are foraging birds in non-breeding habitat.

- Possible (PO) - breeding is defined as an observation of any of the following: 1) a species observed in its breeding season in suitable nesting habitat; and/or 2) singing male heard; and/or 3) breeding calls heard, in its breeding season in suitable nesting habitat.

- Probable (PR) - breeding is defined as an observation of any of the following: 1) a pair in breeding season in suitable habitat; 2) permanent territory presumed through registration of territorial song on at least two days, a week or more apart, at the same place; or 3) courtship or display between a male and a female or two males, including courtship feeding or copulation; visiting probable nest site; agitated behaviour or anxiety calls of an adult; brood path on an adult female or cloacal protuberance on an adult male; nest building or excavation of a nest hole.

- Confirmed (C) - breeding is defined as observation of any of the following: 1) a distraction display or injury feigning; 2) used nest or egg shell found (occupied or laid within the period of the study); 3) recently fledged young or downy young, including young incapable of sustained flight; 4) adults entering or leaving nest site in circumstances indicating occupied nest (e.g. adult carrying fecal sac; adult carrying food for young); or 5) nest containing eggs, or nest with young seen or heard.

3.4.2. Amphibians

Amphibian survey locations were selected by a wildlife ecologist via air photo interpretation, targeting a mixture of open wetlands (i.e. marsh), wooded wetlands, and portions along tributaries that appeared to have pooled water. Surveys were conducted in locations where standing water provided sufficient habitat for breeding amphibians. Three amphibian surveys were conducted at each site according to protocols in the Marsh Monitoring Program (MMP) manual (Bird Studies Canada 2009). Three-minute point counts were conducted between April and June, with at least 15 days between each survey, and at least half an hour after sunset, in low wind, with minimum temperatures as follows:

- Survey 1: 15-30 April, 5° C
- Survey 2: 15-30 May, 10° C
- Survey 3: 15-30 June, 17° C

Amphibian abundance was assessed according to abundance codes derived by the MMP as follows:

- Code 1 – Individuals can be counted; calls not simultaneous
- Code 2 – Calls distinguishable; some simultaneous calling
- Code 3 – Full chorus; calls continuous and overlapping.

3.4.3. Reptiles

The focus of reptile surveys was on turtles, as the scope of the study did not provide time for dedicated snake surveys, which are labour-intensive. However, incidental observations of snakes and

other cryptic species were identified by searching under debris during other surveys where possible. Turtle surveys were scoped to a small number of areas where extensive standing water provides potential overwintering habitat that could be indicated by turtles basking in early spring. These surveys were limited primarily to Toogood Pond and Milne Park. Logs, rocks, and the water's edges was scanned during surveys during the first warm spring days, to detect basking turtles. One additional area was surveyed on the City's request based on landowner concerns about turtle road mortality along Personna Blvd. east of Woodbine Ave. The ponds north and south of Personna Blvd. were investigated for basking turtles in early spring, and the roadway and shoulder were investigated for signs of turtles crossing and/or nesting.

3.4.4. Incidental Wildlife

Incidental observations of all wildlife species (e.g., mammals, reptiles, insects and other arthropods) was documented during all site visits. Debris was searched for snakes, terrestrial salamanders, and small mammals.

3.5. Data Collection and Mapping

Data collection was completed through the use of customized mobile data collection forms on Survey123 for ArcGIS. The data records were uploaded from Survey123 in real-time to ESRI's secure cloud. Using ArcGIS Online a desktop review and QAQC of all collected records was then performed.

ELC units were digitized using ESRI's ArcGIS Pro 2.7 according to protocols developed for southern Ontario by the Ontario Ministry of Natural Resources (Lee et al. 1998). A consolidated ELC file was developed based on scoped vegetation surveys, existing data sources (TRCA and City of Markham), and aerial photo interpretation (2019).

The final datasets were displayed in interactive ArcGIS Online dashboards. The dashboards were developed as an intuitive way for users to visualize and explore the location-based analytics. The dashboards were tailored to convey the essential information required for viewing trends and decision making.

3.6. Analysis

Inventory results that had been recorded on Survey 123 (mobile data collection app) were converted to excel files for analysis. This included all wildlife species data and Rapid ELC and Disturbance survey data. Flora species data were collected using Survey 123, or recorded on hardcopy data sheets and then entered into the GIS database later. These results were also converted into an excel spreadsheet for analysis. The GIS database was used to screen the status and native or non-native origin (for all species of flora and fauna) as well as area-sensitivity and breeding evidence for fauna.

Floristic Quality Index (FQI) analysis was used to determine the quality of plant communities within the study area. The FQI is a measure used to compare natural areas (Oldham et al. 1995). The FQI is derived from the assignment of a number between 1 and 10 to each native plant according to its

habitat requirements (the Coefficient of Conservatism: abbreviated as C). The scores (for native plants only) are averaged to obtain the Native Mean C and summed and divided by the square root of the number of species to obtain the FQI. Plants found in a diversity of habitats have low scores, and plants found only in a few, highly specific habitats have high scores. Therefore, habitats where conservative species predominate have high Native Mean Cs; habitats where there is a higher diversity of conservative species have higher FQIs.

4. Inventory Results

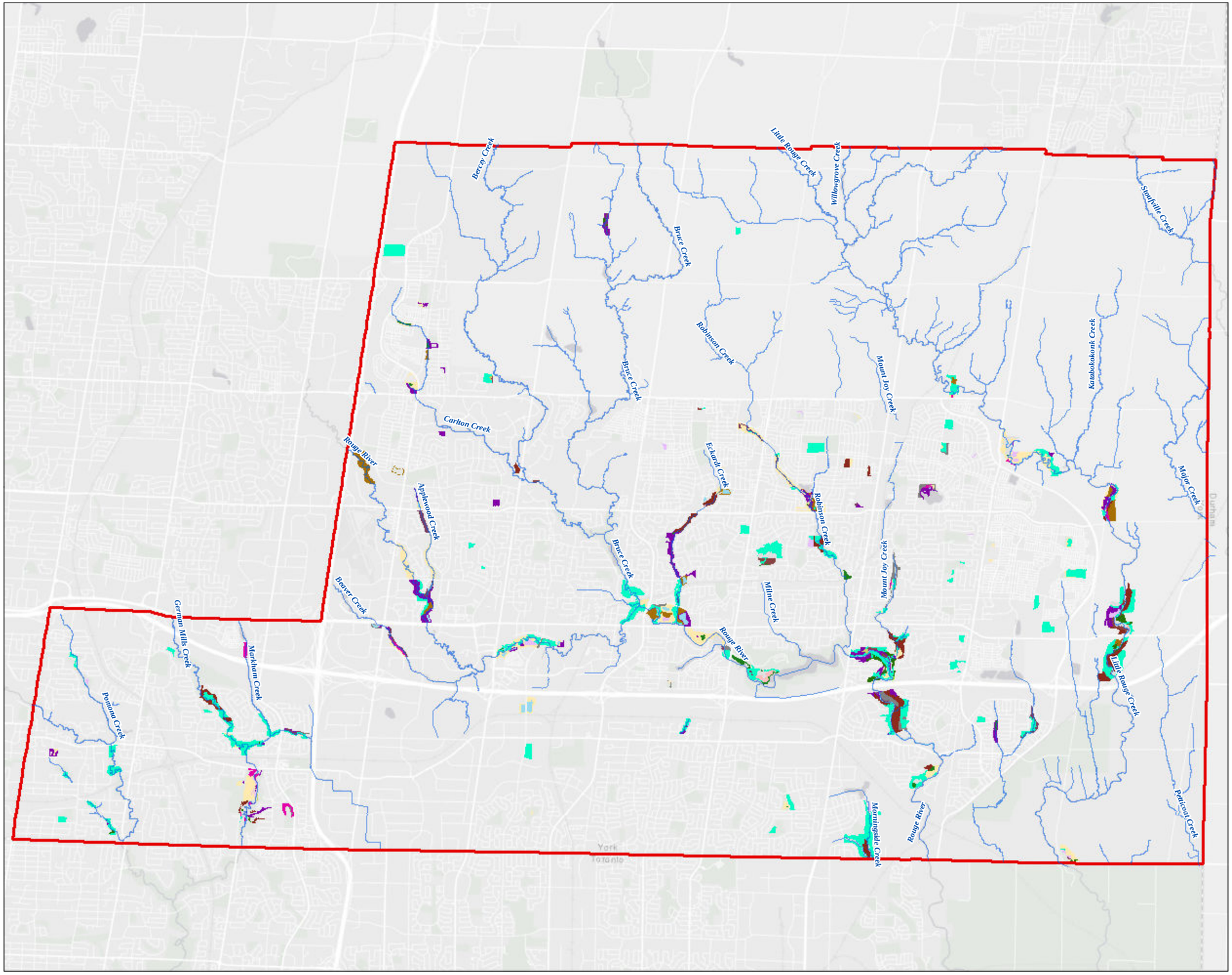
4.1. Vegetation Communities

4.1.1. Information Collected During 2020 Field Work

From the fieldwork conducted in 2020, a total 556 polygons of vegetation communities were identified and mapped, totaling 569.6 ha in area. Broad descriptions for each vegetation ecosite classification recorded are provided in **Appendix 2**, with detailed results of classification within each polygon provided in an ArcGIS On-line database. The location and distribution of surveyed vegetation communities obtained during field work is shown in **Figure 2.** The most identified major classification was woodland (61%), which includes deciduous, coniferous, and mixed forest (FOD, FOC, FOM), plantation (CUP), and cultural woodland (CUW), totaling 345 ha (**Figure 3**). Following woodlands, open space and successional (22%) was the next most identified vegetation community which included open beach (BBO), bluff (BLO), cultural meadow (CUM), cultural savannah (CUS), and cultural thicket (CUT), totaling 128 ha. Deciduous forest (FOD) was the most identified polygon classification with 213.7 ha comprised of 156 polygons, followed by Cultural Meadow CUM (90 ha), Cultural Woodland CUW (57.2 ha), and Mixed Forest FOM (53.0 ha).

Open wetland communities (**Figure 2**) including meadow marsh (MAM), shallow marsh (MAS), and thicket swamp (SWT) comprised 5% of the vegetation sampled in 2020, totaling 29 ha. Aquatic communities included open aquatic (OAO), making up 4%, totaling 21 ha. Wooded wetlands made up 6%, which included deciduous, coniferous, and mixed swamp (SWC, SWD, SWM), totaling 32 ha. Comparison with previous wetland evaluations showed that the majority (63%) of wetlands polygons surveyed in 2020 had not been recorded by MNRF.

Figure 2 | Markham Natural Features Inventory:
Vegetation Communities Recorded in 2020 Field Studies



Legend

- Municipality
- Watercourses

Ecological Land Classification

- Agriculture
- Anthropogenic
- Open Beach
- Shrub Beach
- Open Bluff
- Tree Bluff
- Cultural Meadow
- Cultural Plantation
- Cultural Savannah
- Cultural Thicket
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Meadow Marsh
- Shallow Marsh
- Open Aquatic
- Floating-leaved Shallow Aquatic
- Mixed Shallow Aquatic
- Submerged Shallow Aquatic
- Coniferous Swamp
- Deciduous Swamp
- Mixed Swamp
- Thicket Swamp
- Open Tallgrass Prairie

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Project Number	Date:	N
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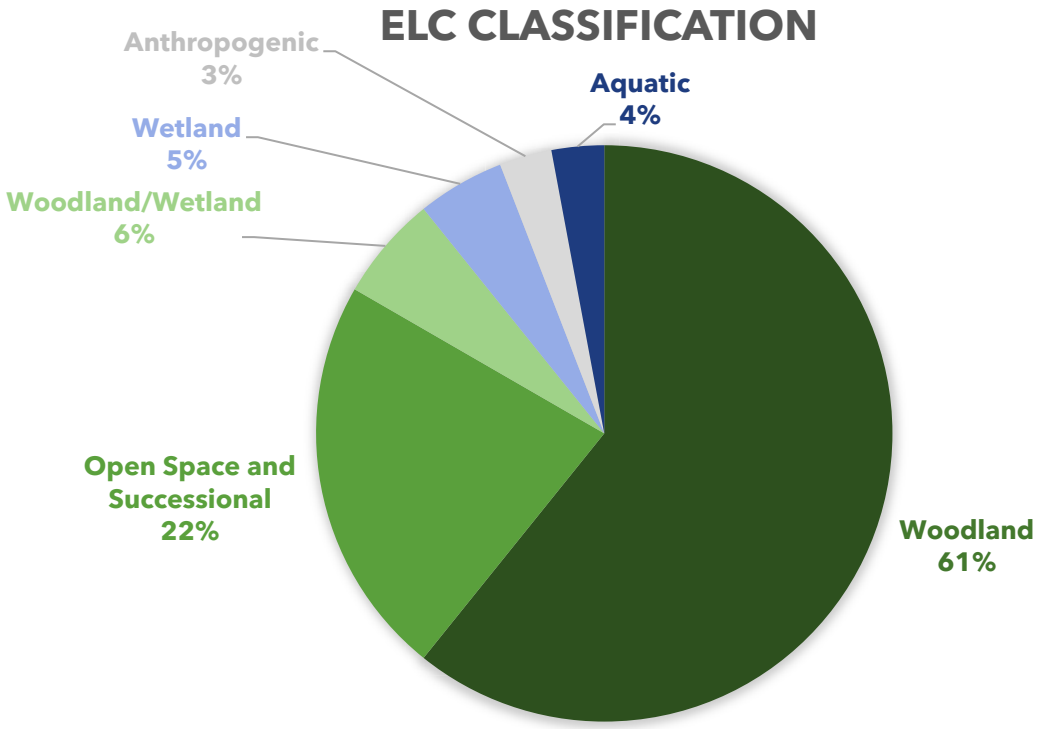

Figure 3. Percentage of total ELC classifications for all 2020 vegetation surveys completed in the study area.

4.1.1.1. Deciduous Forest

A total of 156 deciduous forest polygons were identified in 2020. Dominant species are noted in **Table 1**. Deciduous forests were largely dominated by Sugar Maple (*Acer saccharum*), Black Walnut (*Juglans nigra*), Hybrid Willow (*Salix* x *fragilis*), and Manitoba Maple (*Acer negundo*), with other common species including American Beech (*Fagus grandifolia*), Black Cherry (*Prunus serotina*) and American Basswood (*Tilia americana*). Red Oak (*Quercus rubra*) was noted as a dominant in only 10 polygons. Lowland forests, especially on floodplains, were dominated frequently by Black Walnut and Sugar Maple, with Basswood as a common component. The sub-canopies of upland forests were generally dominated by Sugar Maple, which often occurred in the shrub layer and ground layer as well. Sub-canopies of lowland forests were frequently dominated by Manitoba Maple.

Floodplains were difficult to classify. The prevalence of sugar maple as the major dominant species on many floodplains led to their classification as lowland forest rather than swamp, as Sugar Maple is considered a tree species indicative of upland habitats. These types of floodplains were quite variable, often supporting patches of understory species more indicative of swamps. In these cases, the community was classified as having inclusions of deciduous swamp. Floodplains also frequently supported patches of Hybrid Willow and Manitoba Maple, and if these species were dominant in

areas over 0.5 ha (which is noted by ELC guidelines as the smallest area that warrants separate classification), the area was classified as swamp.

Black Walnut was a common species in disturbed Markham forests, and occurred on a variety of habitats: most often on floodplains, but frequently on disturbed upper slopes as well. Sugar Maple was often a dominant in other layers, particularly the sub-canopy, but also including the shrub and ground layers.

Ash species (*Fraxinus americana*, *F. pennsylvanica*) were recorded less commonly as a canopy dominant than other species, and almost all ash in the canopy had signs of Emerald Ash Borer (*Agrilus planipennis*), a pervasive pest of southern Ontario forests. Large areas of dead ash (and/or extensive deadfall) were not often noted, probably because it was not as extensive a component of Markham forests as in some parts of southern Ontario. However, most of the larger deadfall noted in forests consisted of fallen ash. Ash was often noted in the shrub layer as seedlings in areas where dead ash had fallen and allowed in higher light levels. Small patches of upland forest surrounded by urban development were often visibly less diverse than forests that were part of larger complexes along rivers, for example.

The understory and ground layer in deciduous forests was composed of a mixture of native and non-native species. Common Buckthorn (*Rhamnus cathartica*), one of the principal non-native invasive shrubs in Canada (White et al. 1995), was the most common species (either native or non-native) noted as a dominant in the shrub layer. Dog-strangling Vine (*Vincetoxicum rossicum*) and Garlic-mustard (*Alliaria petiolata*), also highly invasive non-native species, were noted frequently but were generally patchy, though in small urban forests they were sometimes more pervasive. Native species adapted to disturbed habitats were found in most forest habitats, including Enchanter's Nightshade (*Circaea canadensis*) and Avens (*Geum*) species. Native spring-flowering species such as White Trillium (*Trillium grandiflorum*) tended to be patchy and infrequent. Generally, diversity of spring flowering species was low.

Table 1. Most common dominant species of deciduous forest and number of polygons in which they were noted in Markham surveys.

Upper Layer Species	**Poplar Species**	**Sugar Maple**	**Black Walnut**	**Manitoba Maple**	**Hybrid Willow**	**Ash species**	
Canopy	15	55	56	41	52	12	
Sub-canopy	8	55	24	71	20	26	
Lower Layer Species	**Chokecherry**	**Common Buckthorn**	**Sugar Maple**	**Ash Species**	**Native Spring Ephemerals**	**Garlic-mustard**	**Dog-strangling Vine**
Shrub Layer	46	77	18	42			
Ground Layer			22		30	36	13

Norway Maple (*Acer platanoides*), a significant non-native invasive species in much of the GTA, was rare in forest habitats, but was sometimes more prevalent in well-used parks, especially along trails and trail entrances.

4.1.1.2. Mixed Forest

A total of 35 mixed forest polygons were investigated by the study team. As shown in **Table 2**, mixed forests, often on slopes and intermediate and lower terraces along floodplains, were generally dominated by Sugar Maple, Eastern White Cedar (*Thuja occidentalis*) and Eastern Hemlock (*Tsuga canadensis*). Not as many mixed forests contained Manitoba Maple as a dominant species as found in deciduous forest. A few mixed forests were dominated by White Pine (*Pinus strobus*). Common Buckthorn was often noted as one of the dominant species in the shrub and ground layers, but was less often noted as abundant than in deciduous forests. Spring ephemeral species occurred as a dominant in nearly half of the mixed forests surveyed; generally species of more flexible habitat requirements such as Virginia Waterleaf (*Hydrophyllum virginianum*) and May-apple (*Podophyllum peltatum*). Enchanter's Nightshade occurred in most mixed forest habitats.

Table 2. Most common dominant species of mixed forest and number of polygons in which they were noted in Markham surveys.

Upper Layer Species	**Sugar Maple**	**White Pine**	**Eastern Hemlock**	**Eastern White Cedar**	**Manitoba Maple**
Canopy		3	12	11	6
Sub-canopy		0	6	14	5
Lower Layer Species		**Garlic-mustard**	**Dog-strangling Vine**	**Common Buckthorn**	**Native Spring Ephemerals**
Shrub				19	
Ground		8	1	8	14

4.1.1.3. Coniferous Forest

Only 17 polygons of coniferous forest were investigated by the study team, so generalizations were difficult to make. Forest dominated by Eastern White Cedar was the most common type of coniferous forest found. In forest dominated by Eastern Hemlock, another common coniferous species in Markham, deciduous species were a co-dominant, usually leading to a classification as mixed forest. Where cedar grew in the highest density, there was almost no sub-canopy, shrub layer or ground later. All polygons supported a shrub layer composed of Manitoba Maple, Common Buckthorn, mixed with cedar. The ground layer was largely dominated by non-native species in most coniferous forest, mainly Dog-strangling Vine, Garlic-mustard or Common Buckthorn.

4.1.1.4. Deciduous Swamp

The canopy of deciduous swamp was generally relatively open (from approximately 35-60%) and separation of canopy and sub-canopy was indistinct, so canopy and sub-canopy are grouped

together in **Table 3**. A total of 27 deciduous swamp communities was investigated by the study team. Swamps were generally dominated by Manitoba Maple and Hybrid Willow, with a mixture of Green Ash (*Fraxinus pennsylvanica*). Most ash was affected by Emerald Ash Borer, though generally the tree canopies were still alive and the ash still standing, and there were few areas of extreme blowdown.

Table 3. Most common dominant species of deciduous swamp and number of polygons in which they were noted in Markham surveys.

Upper Layer Species	**Hybrid Willow**	**Manitoba Maple**	**Ash Species**
Canopy and Sub-canopy	13	20	12
Lower Layer Species	**Manitoba Maple**	**Native ground layer species** (e.g. Stinging Nettle, Wood Nettle, Late Goldenrod, Jewelweed, sedges)	**Non-native Species** (e.g. Reed Canary-grass, Forget-me-not species, Himalayan Balsam, Creeping Bent-grass)
Shrub Layer	15		
Ground Layer		24	14

The occurrence of other swamp tree species was rare, with only one report of Freeman's Maple (*Acer* x *freemanii*) or Silver Maple (*A. saccharinum*) as a dominant, likely because these species are dominant in swamps that are inundated with water in early spring whereas Markham floodplains bore signs of only occasional flooding. There was one occurrence of Bur Oak (*Quercus macrocarpa*) as one of the dominant species in the canopy, but the abundance of Bur Oak was not considered sufficient to describe this unit as Bur Oak swamp, which is a rare vegetation community. Common Buckthorn was rare in swamps, in only four instances reported as a dominant.

4.1.1.5. Mixed and Coniferous Swamp

Eight mixed swamp communities were investigated by the study team. Dominant species are noted in **Table 4**. Eastern White Cedar was the most common species noted as a dominant. Green Ash occurred in the shrub layer as abundant seedlings, but most larger trees were affected by Emerald Ash Borer.

Table 4. Most common dominant species of mixed swamp and number of polygons in which they were noted in Markham surveys.

Upper Layer Species	**Eastern White Cedar**	**Manitoba Maple**	**Common Buckthorn**	**Green Ash**
Canopy and Sub-canopy	8	4		3
Shrub			4	3

The ground layer supported at least one native species in all eight polygons, with species noted similar to those in deciduous swamps.

Only four coniferous swamp polygons were investigated: two were dominated by Eastern White Cedar, one by Balsam Fir (*Abies balsamea*), and one by Sugar Maple, but with a dense understory of coniferous species. The understory was generally very sparse, but included patches of Bulblet Bladder-fern (*Cystopteris bulbifera*), as well as areas of Dog-strangling Vine and Jewelweed (*Impatiens capensis*).

4.1.1.6. Cultural Plantation

A total of 26 cultural plantations were investigated by the study team. Canopies of cultural plantations were particularly variable, supporting a variety of commonly planted coniferous tree species including White Pine, Eastern White Cedar, White Spruce (*Picea glauca*), Norway Spruce (*P. abies*), Scots Pine (*Pinus sylvestris*) and European Larch (*Larix decidua*). The understories of cultural plantations were generally sparse, dominated in gaps and at the edges by non-native species such as Garlic-mustard and Dog-strangling Vine.

4.1.1.7. Cultural Woodland

Cultural Woodlands were frequent in Markham, with 59 polygons investigated. They were largely dominated by non-native tree species with abundant non-natives also in the sub-canopy, shrub layer and ground layer, as shown in **Table 5**. Notably, Black Walnut was an abundant species in cultural woodland as well as deciduous forests.

Table 5. Most common dominant species of cultural woodland and number of polygons in which they were noted in Markham surveys.

Upper Layer Species	**Sugar Maple**	**Black Walnut**	**Hybrid Willow**	**Manitoba Maple**
Canopy and Sub-canopy	10	31	23	29
Lower Layer Species	**Common Buckthorn**	**Non-native Species** (e.g. Garlic-mustard, Smooth Brome Grass, Kentucky Bluegrass)	**Native Species** (e.g. Enchanter's Nightshade, Canada Goldenrod, Thicket Creeper)	
Shrub	28			
Ground		47	46	

Though native species were as frequently noted in the ground layer as non-natives, the native species were generally those characteristic of disturbed habitats.

4.1.1.8. Meadow Marsh

A total of 36 meadow marsh communities were investigated by the study team (**Figure 8**). Dominant species are shown in **Table 6**. Meadow marsh was generally dominated by an open canopy (less than 25% cover) consisting of Manitoba Maple and Hybrid Willow. Scattered shrubs also occurred in the understory, generally consisting of Red-osier Dogwood (*Cornus stolonifera*). The ground layer consisted of non-native grasses, mainly Reed Canary-grass (*Phalaris arundinacea*) with occasional stands of European Reed (*Phragmites australis*). Other common ground layer species were Joe-pye Weed (*Eutrochium maculatum*) and Jewelweed. Despite the prevalence of non-native grasses, native species were generally two or more of the dominant species in all but one of the polygons investigated.

Table 6. Most common dominant species and number of polygons in which they were noted in meadow marsh in Markham surveys.

	Hybrid Willow	Manitoba Maple	European Reed	Reed Canary-grass
Canopy and Sub-canopy	11	16		
Ground Layer			6	20

4.1.1.9. Shallow Marsh

A total of 23 shallow marsh polygons were investigated by the study team (**Figure 8**). Dominant species (**Table 7**) were similar to those in meadow marsh, except that cattail (*Typha* spp.) was the principal dominant species. The native Broadleaved Cattail (*T. latifolia*) was noted in 9 of these communities, often in conjunction with non-native Narrow-leaved Cattail (*T. angustifolia*) and the hybrid between them (*T.* x *glauca*).

Table 7. Most common dominant species and number of polygons in which they were noted in meadow marsh in Markham surveys.

	Hybrid Willow	Manitoba Maple	Cattail Species	European Reed	Reed Canary-grass
Canopy and Sub-canopy	13	7			
Ground Layer			20	5	8

4.1. Information from Greenway-wide Vegetation Mapping

As described in Section 3.1, ELC was determined for the balance of the lands in Markham's Greenway, as well as for a few areas outside the Greenway, where site visits were not conducted through aerial photo interpretation and consulting secondary data sources. This section describes the results of the Greenway-wide vegetation mapping.

The aerial coverage and number of polygons of each Ecoseries, as well as the percent cover within the study area as shown in **Figures 4A to 4D** (which mainly included the Greenway System), are provided in **Table 8**. Vegetation mapping obtained from all sources, including the 2020 surveys, aerial photography interpretation and the existing information obtained from sources noted in **Section 3.1**, are listed in **Table 8**. Mapped communities are shown in **Figures 4A to 4D**. The total cover of vegetation mapped in this study (including agricultural lands and anthropogenic areas such as parks and backyard areas) is 33%. Terrestrial vegetation comprises approximately 30% of the study area, with anthropogenic and agricultural ecosites occupying the largest proportion of that percentage. In terms of natural vegetation, forest occupies the largest percent of the City (4.3%). Wetlands occupy a slightly smaller percent of the City, at 3.7%. Most of the wetland cover is comprised of open communities such as meadow marsh, shallow marsh and open water. The "woodland" cover, which is a loose term used to describe all treed communities including forest, cultural woodland, treed swamp and treed fen, is 7.85%.

Table 8. Vegetation Ecoseries and their Areas in the Greenway System in the City of Markham

Ecoseries		Number of Polygons	Average Polygon Area (ha)	Total Area (ha)	Percent Vegetation (%)	Percent Markham (%)
WETLAND	**Wetland**	**1129**	**0.55**	**793.20**	**11.23**	**3.73**
Marsh / Aquatic		**800**	**0.38**	**501.51**	**7.10**	**2.36**
Open Water	OAO	216.00	0.80	172.34	2.44	0.81
Shallow Marsh	MAS	172.00	0.34	58.40	0.83	0.27
Meadow Marsh	MAM	382.00	0.69	264.76	3.75	1.24
Floating-leaved Shallow Aquatic	SAF	6.00	0.13	0.78	0.01	0.00
Mixed Shallow Aquatic	SAM	1.00	0.09	0.09	0.00	0.00
Submerged Shallow Aquatic	SAS	23.00	0.22	5.13	0.07	0.02
Swamp / Treed Fen	**SW / FE**	**329.00**	**0.76**	**291.70**	**4.13**	**1.37**
Deciduous Swamp	SWD	173.00	0.95	163.79	2.32	0.77
Coniferous Swamp	SWC	21.00	0.90	18.82	0.27	0.09
Thicket Swamp	SWT	84.00	0.63	52.91	0.75	0.25
Mixed Swamp	SWM	50.00	1.12	56.00	0.79	0.26

Ecoseries		Number of Polygons	Average Polygon Area (ha)	Total Area (ha)	Percent Vegetation (%)	Percent Markham (%)
Treed Fen[1]	FET	1.00	0.19	0.19	0.00	0.00
TERRESTRIAL		**3164.00**	**0.76**	**6270.56**	**88.77**	**29.48**
Anthropogenic	**Cultural**	**2261.00**	**2.31**	**5342.95**	**75.64**	**25.12**
Agricultural	AGR	275.00	11.66	3209.14	45.43	15.09
Cultural Meadow	CUM	542.00	1.44	781.63	11.07	3.68
Cultural Thicket	CUT	98.00	1.00	97.96	1.39	0.46
Cultural Savannah	CUS	104.00	1.24	128.83	1.82	0.61
Cultural Plantation	CUP	261.00	0.60	157.76	2.23	0.74
Cultural Woodland	CUW	308.00	0.90	277.36	3.93	1.30
Hedgerows	HR	154.00	0.46	71.49	1.01	0.34
Anthropogenic	ANTH	519.00	1.19	618.80	8.76	2.91
Other		**20.00**	**0.12**	**3.35**	**0.05**	**0.02**
Open Bluff	BLO	3.00	0.24	0.71	0.01	0.00
Treed Bluff	BLT	1.00	0.06	0.06	0.00	0.00
Shrub Beach / Bar	BBS	6.00	0.11	0.66	0.01	0.00
Open Beach / Bar	BBO	7.00	0.18	1.29	0.02	0.01
Open Tallgrass Prairie[2]	TPO	3.00	0.02	0.62	0.01	0.00
Forest	**FO**	**883.00**	**1.06**	**924.26**	**13.08**	**4.35**
Deciduous Forest	FOD	620.00	1.01	626.82	8.87	2.95
Coniferous Forest	FOC	110.00	0.82	90.55	1.28	0.43
Mixed Forest	FOM	153.00	1.35	206.89	2.93	0.97
Total		**4293.00**	**1.05**	**7063.77**	**100.00**	**33.21**

[1] Treed fen should be verified as this would be extremely rare in Markham
[2] All prairie noted in Markham has been planted; this community is not native

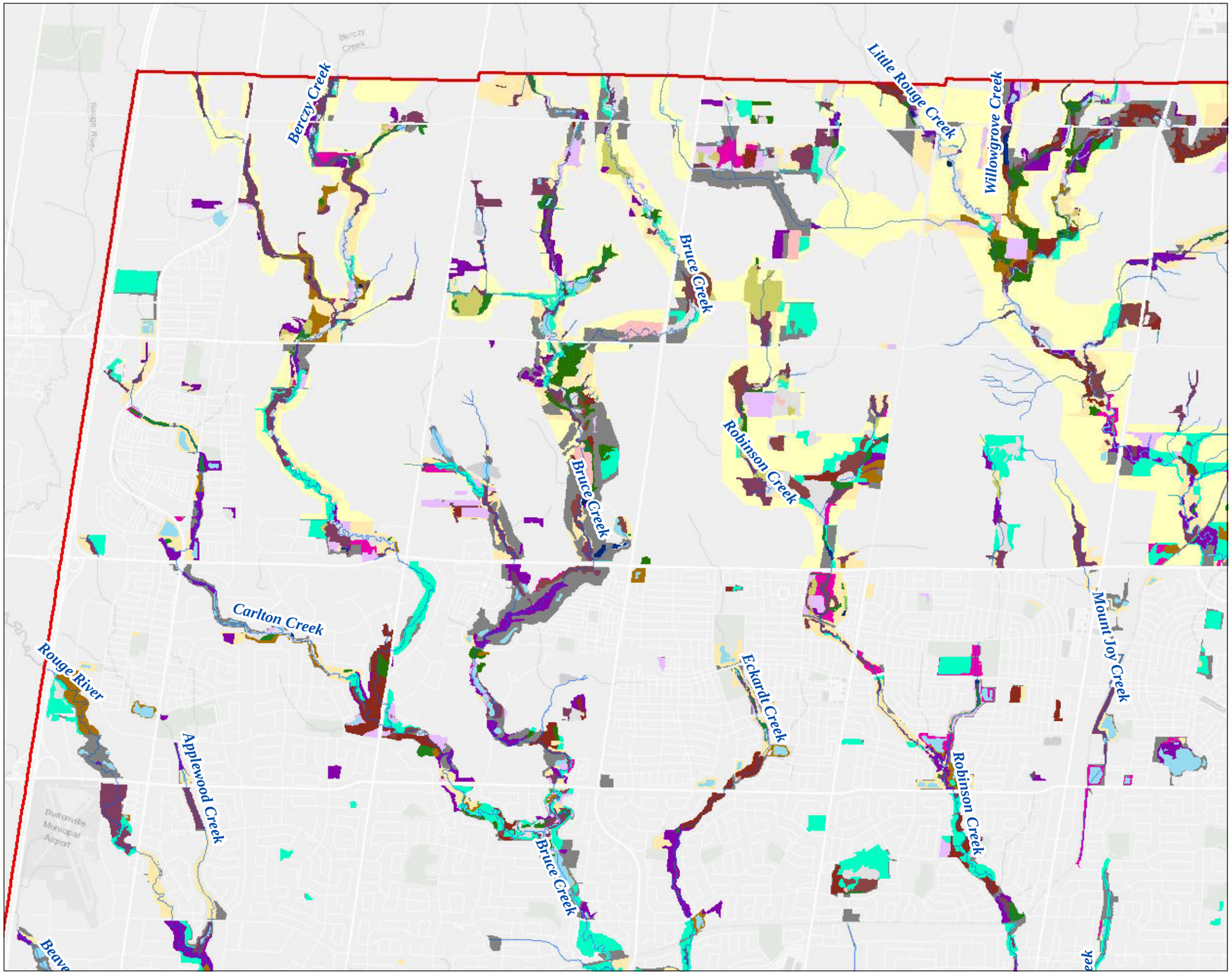

Figure 4A | Markham Natural Features Inventory:

Ecological Land Classification within the Study Area from All Sources: Northwest Markham

Legend

- Municipality
- Watercourses

Ecological Land Classification

- Agriculture
- Anthropogenic
- Open Beach
- Shrub Beach
- Open Bluff
- Tree Bluff
- Cultural Meadow
- Cultural Plantation
- Cultural Savannah
- Cultural Thicket
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Meadow Marsh
- Shallow Marsh
- Open Water
- Floating-leaved Shallow Aquatic
- Mixed Shallow Aquatic
- Submerged Shallow Aquatic
- Coniferous Swamp
- Deciduous Swamp
- Mixed Swamp
- Thicket Swamp
- Open Tallgrass Prairie

0 0.5 1 1.5 2 2.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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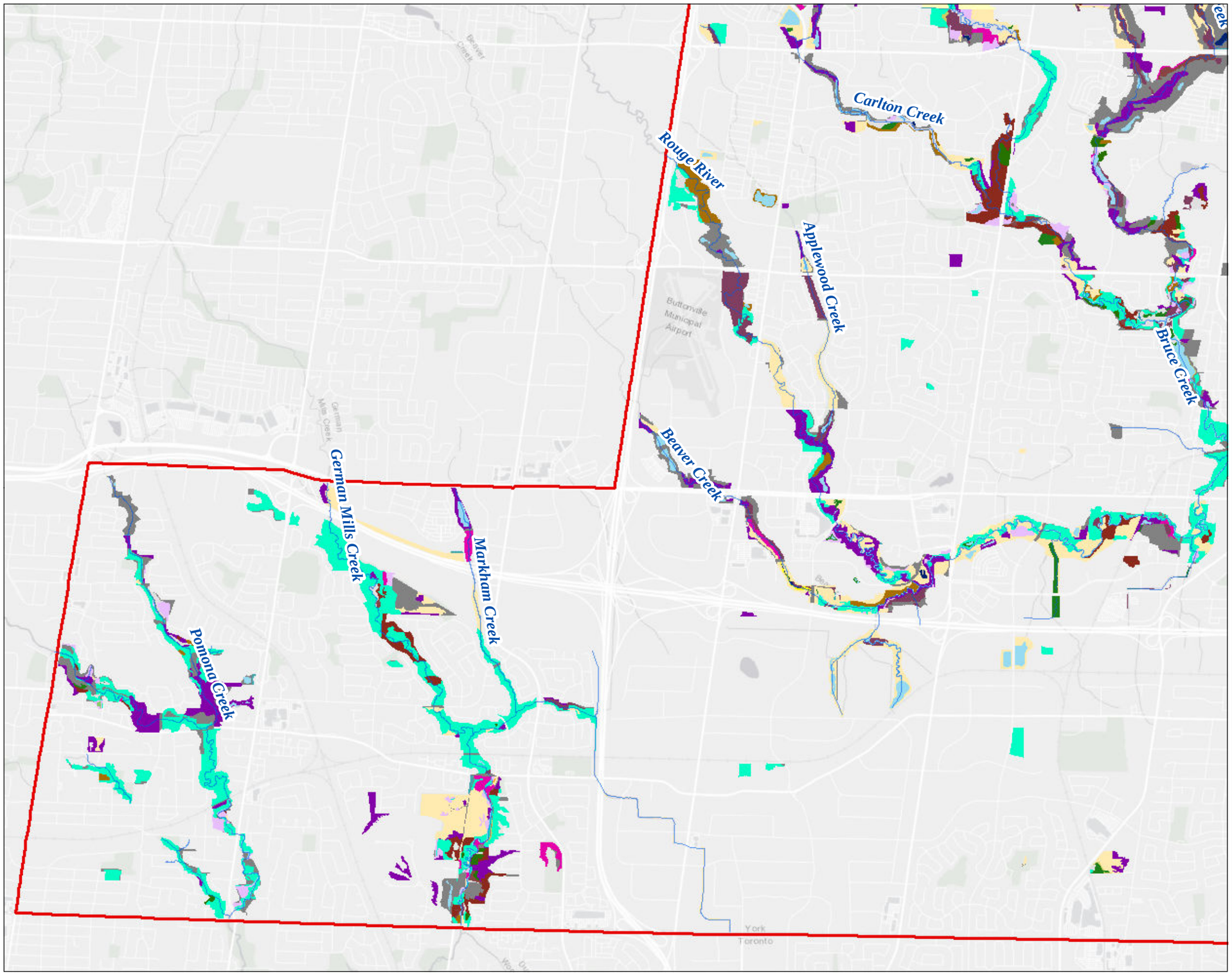

Figure 4B | Markham Natural Features Inventory:

Ecological Land Classification within the Study Area from All Sources: Southwest Markham

Legend

- Municipality
- Watercourses

Ecological Land Classification

- Agriculture
- Anthropogenic
- Open Beach
- Shrub Beach
- Open Bluff
- Tree Bluff
- Cultural Meadow
- Cultural Plantation
- Cultural Savannah
- Cultural Thicket
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Meadow Marsh
- Shallow Marsh
- Open Water
- Floating-leaved Shallow Aquatic
- Mixed Shallow Aquatic
- Submerged Shallow Aquatic
- Coniferous Swamp
- Deciduous Swamp
- Mixed Swamp
- Thicket Swamp
- Open Tallgrass Prairie

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Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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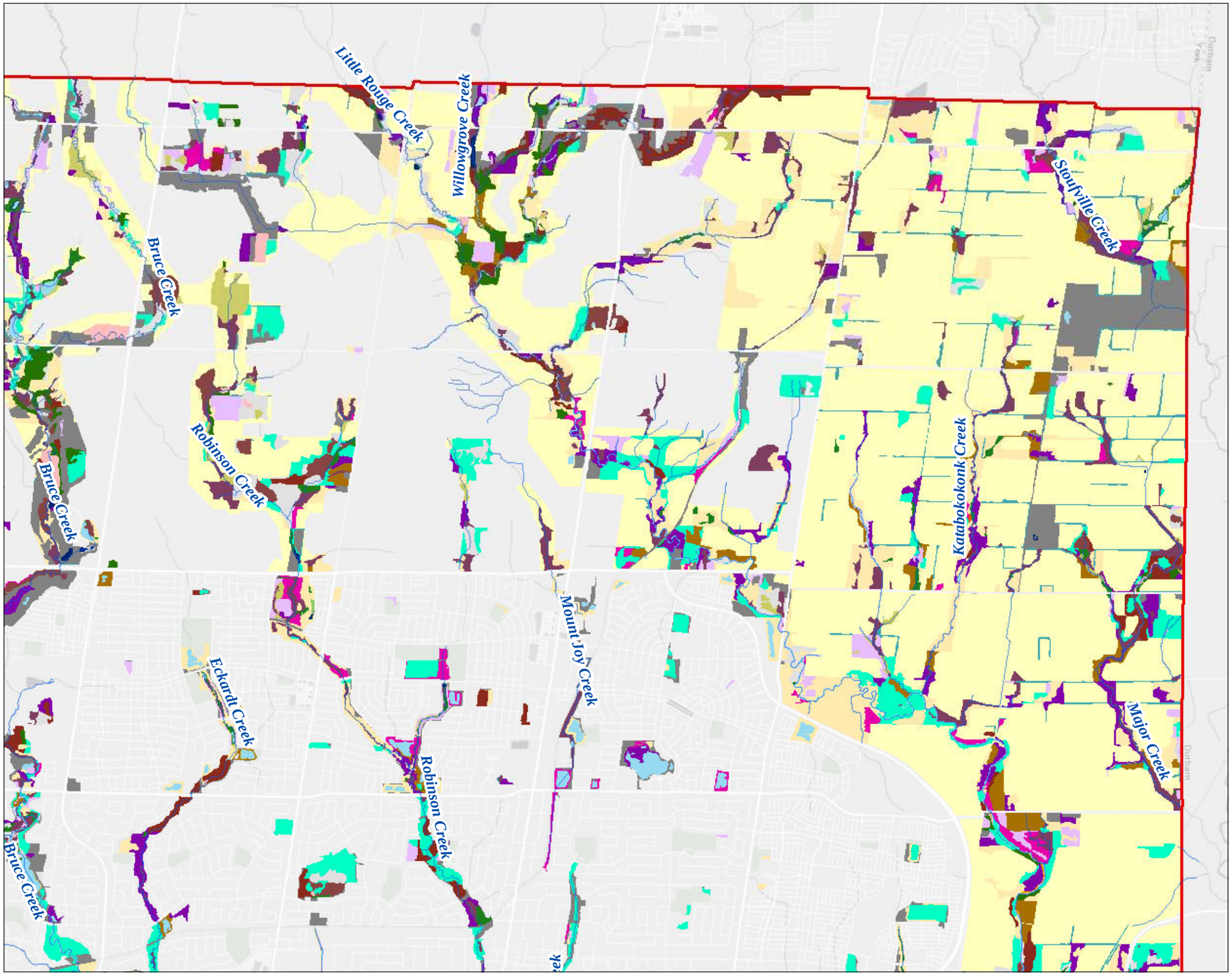

Figure 4C | Markham Natural Features Inventory:

Ecological Land Classification within the Study Area from All Sources: Northeast Markham

Legend

- Municipality
- Watercourses

Ecological Land Classification

- Agriculture
- Anthropogenic
- Open Beach
- Shrub Beach
- Open Bluff
- Tree Bluff
- Cultural Meadow
- Cultural Plantation
- Cultural Savannah
- Cultural Thicket
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Meadow Marsh
- Shallow Marsh
- Open Water
- Floating-leaved Shallow Aquatic
- Mixed Shallow Aquatic
- Submerged Shallow Aquatic
- Coniferous Swamp
- Deciduous Swamp
- Mixed Swamp
- Thicket Swamp
- Open Tallgrass Prairie

0 0.5 1 1.5 2 2.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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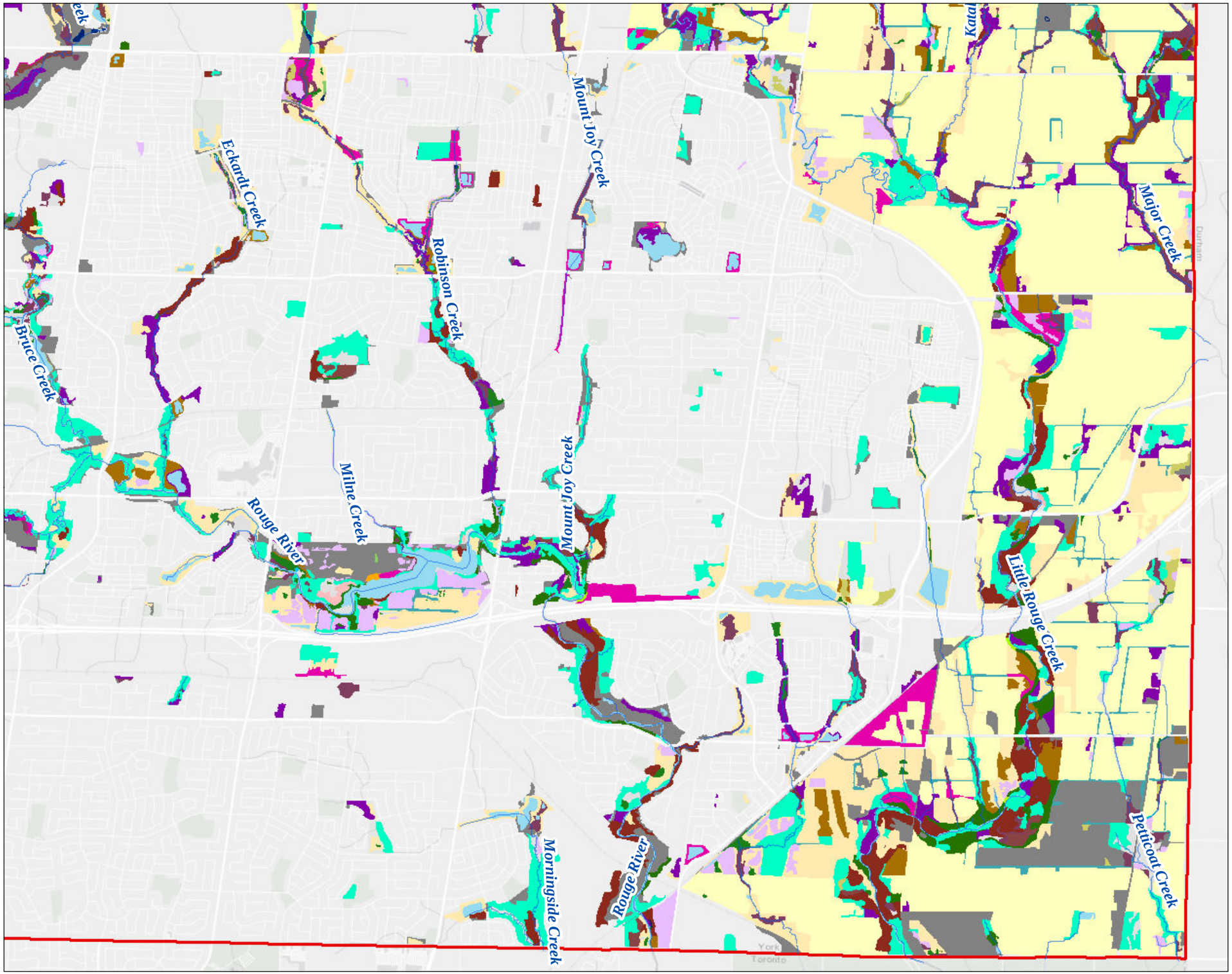

Figure 4D | Markham Natural Features Inventory:

Ecological Land Classification within the Study Area from All Sources: Southeast Markham

Legend

- Municipality
- Watercourses

Ecological Land Classification

- Agriculture
- Anthropogenic
- Open Beach
- Shrub Beach
- Open Bluff
- Tree Bluff
- Cultural Meadow
- Cultural Plantation
- Cultural Savannah
- Cultural Thicket
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Meadow Marsh
- Shallow Marsh
- Open Water
- Floating-leaved Shallow Aquatic
- Mixed Shallow Aquatic
- Submerged Shallow Aquatic
- Coniferous Swamp
- Deciduous Swamp
- Mixed Swamp
- Thicket Swamp
- Open Tallgrass Prairie

0 0.5 1 1.5 2 2.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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4.2. Flora and Floristics

A total of 478 species of flora were identified in the detailed botanical surveys, with an additional 43 identified to genus only. Of the 478 species, 319 (67%) were native species and 159 (33%) were non-native and/or introduced species.

Areas of biodiversity hotspots (according to results obtained during 2020 detailed botanical surveys) were determined according to the following criteria:

- Numbers of species noted, as illustrated in **Figure 5A**; using a natural breakdown of species numbers, areas with the highest diversity tended to have between approximately 48 and 109 species; and
- Numbers of Regionally and locally rare species noted (**Figure 5B**), with areas of highest diversity having between 9 and 24 species.

The highest diversity of native plant species was noted largely in the eastern part of the study area, but there were other areas of high biodiversity as well throughout Markham (**Figure 5A**), notably the Raymerville Woodlot (actually a mosaic of forest and swamp), and Morningside Creek (a tributary of the Rouge River) near Eastvale Drive and Steeles Avenue East, both in a highly urban area. Additional areas of high biodiversity have been noted in Markham, for example the Rouge River in Markham Centre, and Robinson Swamp Provincially Significant Wetland; but additional surveys would be needed to provide a comprehensive picture of high biodiversity throughout the City.

Table 9 provides a comparison of the vegetation quality and number of significant species in Markham's communities. Floristic quality (as measured by the Floristic Quality Analysis, described in Section 3.6) was highest in deciduous and mixed forest communities. The quality of mixed swamps was also high. Cultural woodland communities supported an unusually high FQI, likely because they were extensive and occurred on many types of terrain.

Deciduous forests also supported the highest number of regionally significant species. Wetlands supported high numbers of regionally significant species for their size: wetlands only occupied 11% of the landscape but several open and wooded wetland community types supported between 11 and 21 significant species. Cultural woodlands supported 18 regionally significant species, because of their wide extent and their occurrence in a variety of microclimatic locations.

Table 9. Ecosite Summaries of Species Recorded During Detailed Botanical Surveys

Ecosite	Total Species	Number of Native Species	Number of Introduced Species	Number of Significant Species*	FQI Native spp.
BLO	23	13 (57%)	10 (43%)	1	7.21
BOO1	10	7 (70%)	3 (30%)	2	9.45

Ecosite	Total Species	Number of Native Species	Number of Introduced Species	Number of Significant Species*	FQI Native spp.
CUM	42	23 (57%)	17 (43%)	3	14.39
CUM1	81	41 (51%)	40 (49%)	3	20.30
CUP3	31	20 (65%)	11 (35%)	1	16.10
CUS	45	29 (64%)	16 (36%)	1	18.76
CUS1	42	28 (67%)	14 (33%)	3	16.25
CUT	27	12 (44%)	15 (56%)	0	6.93
CUW	112	76 (68%)	36 (32%)	4	30.97
CUW1	163	110 (67%)	53 (33%)	18	41.09
FOC1	15	12 (80%)	3 (20%)	1	9.53
FOC2	18	17 (94%)	1 (6%)	0	17.71
FOC3	8	6 (75%)	2 (25%)	0	10.21
FOC4	49	38 (78%)	11 (22%)	3	26.60
FOD	66	45 (68%)	21 (32%)	4	27.58
FOD3	20	13 (65%)	7 (35%)	1	9.15
FOD4	48	32 (67%)	16 (33%)	3	20.15
FOD5	181	138 (76%)	43 (24%)	21	53.80
FOD6	114	85 (75%)	29 (25%)	11	40.46
FOD7	176	120 (68%)	56 (32%)	16	44.46
FOM	52	40 (77%)	12 (23%)	3	22.93
FOM3	12	11 (92%)	1 (8%)	0	14.77
FOM4	57	46 (81%)	11 (19%)	5	27.28
FOM5	12	8 (67%)	4 (33%)	1	11.67
FOM6	107	90 (84%)	17 (16%)	6	44.17
FOM7	72	55 (76%)	17 (24%)	5	31.15

Ecosite	Total Species	Number of Native Species	Number of Introduced Species	Number of Significant Species*	FQI Native spp.
MAM	34	18 (53%)	16 (47%)	1	11.08
MAM2	168	109 (65%)	59 (35%)	18	39.18
MAS2	86	66 (77%)	20 (23%)	11	29.67
OAO	16	11 (69%)	5 (31%)	1	11.76
SWC1	30	23 (73%)	7 (27%)	2	14.28
SWC3	48	35 (73%)	13 (27%)	6	26.20
SWD2	25	22 (88%)	3 (12%)	2	19.61
SWD3	77	55 (71%)	22 (29%)	4	28.86
SWD4	121	87 (72%)	34 (28%)	14	38.27
SWM1	131	99 (76%)	32 (24%)	11	43.72
SWT	19	15 (79%)	4 (21%)	0	12.14
SWT2	71	51 (72%)	20 (28%)	5	26.47

*Significant species: S1-S3, TRCA (L1-L3), GTA (R, R1), RM York (R, R1-9), Species at Risk (SC, THR, END), full species status ranking in **Appendix 1**

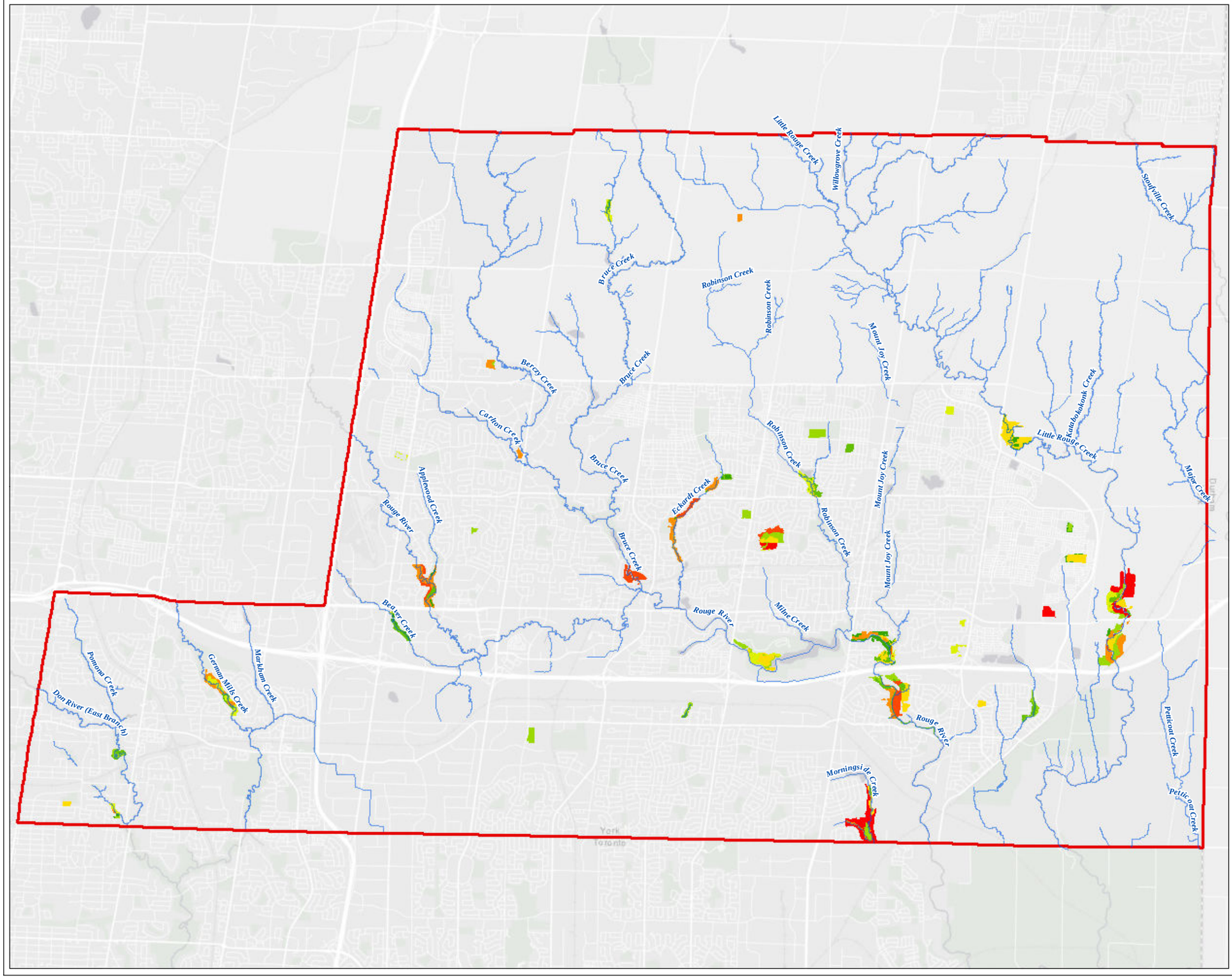

Figure 5A | Markham Natural Features Inventory:
Distribution of Native Flora Biodiversity Hotspots Determined from Detailed Botanical Surveys

Legend

- Markham Boundary
- Watercourses

Native Species Occurence

- 1 - 10
- 11 - 20
- 21 - 28
- 29 - 36
- 37 - 47
- 48 - 62
- 63 - 79
- 80 - 109

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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4.3. Significant Flora

Three provincially significant species were recorded (**Table 10**). Their distribution is shown in **Figure 5B**. Diversity of significant species is concentrated along the Little Rouge River. Butternut was the most encountered provincially significant species. This species is endangered because of a canker, and all specimens recorded were badly cankered. Large Toothwort (*Cardamine maxima*) was noted in several forest polygons in one location in the Little Rouge Valley. Black Ash (*Fraxinus nigra*) has recently been evaluated as a threatened species according to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), but has not been given official status according to Canada's Species at Risk Act or Ontario's Endangered Species Act. It was found at two wetland sites (shallow marsh and deciduous swamp).

Seventy-three regionally and/or locally significant species were recorded by the study team: including 43 species rare in York Region (R, R1-R9), 35 species rare in the GTA (R, R1), and 47 species of conservation concern in the TRCA (L1-L3) watershed. Most of these are common in Ontario, but have become rare in York Region and/or in the TRCA watershed as urbanization of these areas has continued. Thirty-nine of these species are associated with wetland and riparian habitats. Thirty-four are species of forest habitat.

4.4. Significant Vegetation Communities

Two provincially significant vegetation communities have been documented within Markham. Three polygons are mapped as Tallgrass Prairie by TRCA. Tallgrass Prairie is a provincially and globally significant vegetation community. All tallgrass prairies in Markham have been planted. These communities were not visited by the study team. They were documented by TRCA as a mixture of native and non-native grasses.

Over 20 communities were reported to be dominated by Black Walnut, and were classified as Fresh – Moist Black Walnut Lowland Deciduous Forest Type, which is provincially rare with a status of S2S3. However, this community was generally highly disturbed, and did not appear to represent good examples of this vegetation type.

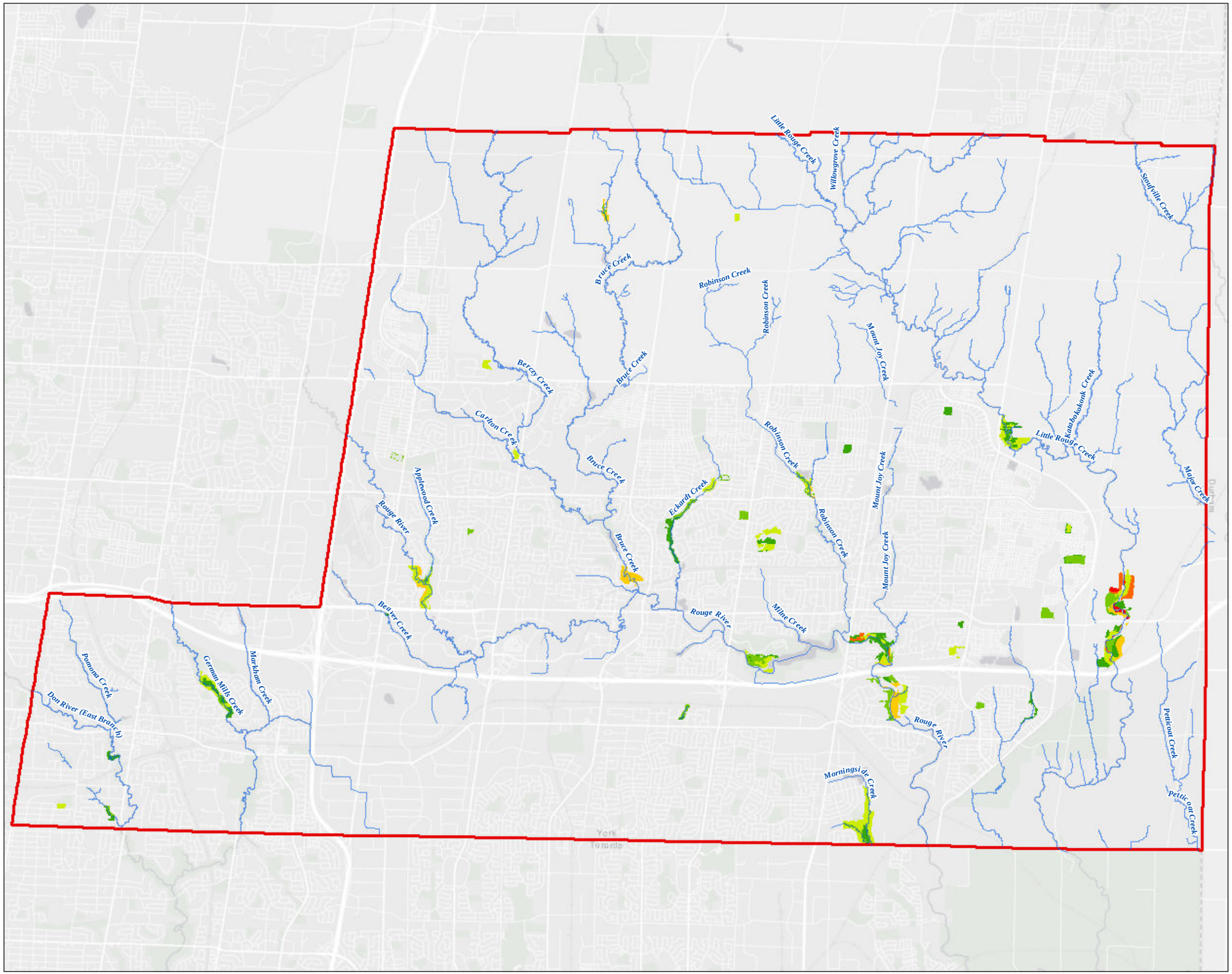

Figure 5B | Markham Natural Features Inventory:
Distribution of Significant Flora Biodiversity Hotspots Determined from Detailed Botanical surveys

Legend

- Markham Boundary
- Watercourses

Significant Species Occurences

- 2
- 3 - 4
- 5 - 8
- 9 - 12
- 13 - 16
- 17 - 24

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-23	

north-south ENVIRONMENTAL

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Table 10. Rare species including Species at Risk (THR, END) and S1-S3 for all sites and communities.

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	TRCA
Cardamine maxima	Large Toothwort	---	G5	NNR	---	S3	L4
Fraxinus nigra	Black Ash	THR	G5	N5	---	S4	L4
Juglans cinerea	Butternut	END	G4	N3N4	END	S2?	L4

L1-L3: species of regional conservation concern

Table 11. Regionally and/or locally significant species for GTA (R, R1), TRCA (L1-L3), and RM York (R, R1-9).

Scientific Name	Common Name	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA
Acer nigrum	Black Maple	G5	NNR		S4?		R4	L4
Agrostis perennans	Upland Bentgrass	G5	N5		S4?	R	R3	L3
Alisma subcordatum	Southern Water-plantain	G5	N5		S4?			L3
Alnus incana	Speckled Alder	G5	N5		S5			L3
Anemone americana	Round-lobed Hepatica	G5	NNR		S5	R	R5	L2
Anemone quinquefolia	Wood Anemone	G5	N5		S5	U	R3	L4
Angelica atropurpurea	Great Angelica	G5	N5		S5	R	R9	L3
Aralia racemosa	American Spikenard	G4G5	N5		S5	U	U	L3
Bolboschoenus fluviatilis	River Bulrush	G5	N5		S4S5	R	R3	L3
Bromus latiglumis	Broad-glumed Brome	G5	N5		S4	U	R5	L4
Cardamine concatenata	Cut-leaved Toothwort	G5	N5		S5			L3
Carex albursina	White Bear Sedge	G5	N5		S5	U	U	L3
Carex cephaloidea	Thin-leaved Sedge	G5	N5		S4	U	R9	L4
Carex flava	Yellow Sedge	G5	N5		S5	U	U	L3
Carex grayi	Gray's Sedge	G4	NNR		S4	R	R2	L3
Carex interior	Inland Sedge	G5	N5		S5			L3

Scientific Name	Common Name	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA
Carex laevivaginata	Smooth-cone Sedge	G5	N4		S4	R	R9	L3
Carex laxiculmis	Spreading Sedge	G5	N4		S4	R	R4	
Carex leptalea	Bristle-stalked Sedge	G5	N5		S5	U	U	L3
Carex lurida	Sallow Sedge	G5	N5		S4S5	R1	R2	L3
Carex plantaginea	Plantain-leaved Sedge	G5	N5		S5		U	L3
Caulophyllum thalictroides	Blue Cohosh	G5	N5		S5	R	R	L3
Chelone glabra	White Turtlehead	G5	N5		S5	U	U	L3
Chrysosplenium americanum	American Golden-saxifrage	G5	N5		S4	R	R6	L3
Dichanthelium implicatum	Slender-stemmed Panicgrass	G5	N5		S5	R	R3	L4
Elymus riparius	Eastern Riverbank Wildrye	G5	N4		S4	R	R5	L4
Elymus villosus	Hairy Wildrye	G5	N4		S4	R	R3	L2
Epilobium coloratum	Purple-veined Willowherb	G5	N5		S5	R	R6	L5
Equisetum fluviatile	Water Horsetail	G5	N5		S5			L3
Equisetum pratense	Meadow Horsetail	G5	N5		S5	R	R8	L3
Euonymus obovatus	Running Strawberry Bush	G5	N5		S4			L3
Floerkea proserpinacoides	False Mermaid	G5	N4	NAR	S4	R	R1	L2
Geranium maculatum	Spotted Geranium	G5	N5		S5	U	R2	L4
Glyceria septentrionalis	Eastern Mannagrass	G5	NNR		S4	R	U	L3
Hackelia virginiana	Virginia Stickseed	G5	N5		S5	U	R8	L5
Heracleum maximum	Cow-parsnip	G5	N5		S5	R	R9	L5

Scientific Name	Common Name	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA
Hydrophyllum canadense	Bluntleaf Waterleaf	G5	N4		S4	R	R5	L3
Ilex verticillata	Black Holly	G5	N5		S5			L3
Iris versicolor	Harlequin Blue Flag	G5	N5		S5			L3
Juglans cinerea	Butternut	G4	N3N4	END	S2?			L3
Juglans nigra	Black Walnut	G5	N4		S4?		R	L5
Leersia virginica	Virginia Cutgrass	G5	N4N5		S4	R	R4	L4
Lobelia siphilitica	Great Blue Lobelia	G5	NNR		S5	U	U	L3
Lonicera canadensis	Canada Fly Honeysuckle	G5	N5		S5			L3
Lonicera villosa	Mountain Fly Honeysuckle	G5	N5		S5	R	R1	
Menispermum canadense	Canada Moonseed	G5	N4N5		S4	U	R5	L3
Muhlenbergia frondosa	Wirestem Muhly	G5	NNR		S4	R	R2	L4
Nuphar variegata	Variegated Pond-lily	G5T5	N5		S5	U	U	L3
Parthenocissus quinquefolia	Virginia Creeper	G5	N4N5		S4?	R	R1	L5
Persicaria pensylvanica	Pennsylvania Smartweed	G5	N5		S5	R	R3	L4
Physalis heterophylla	Clammy Ground-cherry	G5	N4		S4	R	R7	L5
Physalis virginiana	Virginia Ground-cherry	G5	NNR		SU	R		LU
Phytolacca americana	Common Pokeweed	G5	N4		S4	R	R1	
Pilea fontana	Springs Clearweed	G5	N4		S4	R	U	L4
Pontederia cordata	Pickerel Weed	G5	N5		S5	R	R3	L2
Potamogeton foliosus	Leafy Pondweed	G5	N5		S5	R	U	L4
Potamogeton natans	Floating Pondweed	G5	N5		S5	U	U	L3
Quercus alba	White Oak	G5	N5		S5		R6	L3
Ribes triste	Swamp Red Currant	G5	N5		S5	U	U	L3

Scientific Name	Common Name	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA
Rudbeckia laciniata	Cut-leaved Coneflower	G5	N5		S5	U	R4	L4
Rumex britannica	Water Dock	G5	N5		S5	U		L3
Solidago juncea	Early Goldenrod	G5	N5		S5	U	R6	L4
Solidago patula	Round-leaved Goldenrod	G5	N5		S4	R	R5	L3
Sparganium eurycarpum	Broad-fruited Burreed	G5	N5		S5	U	U	L3
Symphyotrichum pilosum var. pilosum	Old Field Aster	G5T5	N5		S5	R	R3	L2
Taxus canadensis	Canadian Yew	G5	N5		S4			L3
Toxicodendron radicans var. rydbergii	Western Poison Ivy	G5	N5		S5		R6	L5
Triosteum aurantiacum	Orange-fruited Horse-gentian	G5	N5		S4S5	R	R9	L3
Ulmus rubra	Slippery Elm	G5	N5		S5		U	L3
Viburnum acerifolium	Maple-leaved Viburnum	G5	N5		S5			L3
Viburnum opulus ssp. trilobum	Highbush Cranberry	GNR	NNR		S5			L3
Zizia aurea	Golden Alexanders	G5	N5		S5	R	R1	L3

4.5. Wildlife

As shown in **Table 12**, 103 wildlife species were noted during field surveys in 2020. Bird species were much more diverse than any other group.

Table 12. Total fauna species per type

Fauna Type	Total Species
Bird	75
Amphibian	7
Reptile	4
Mammal	12
Butterflies	4
Damselfly	1
Total	**103**

4.5.1. Amphibians

Seven amphibian species were identified during field surveys, six of which were observed during Nocturnal Animal Calling Surveys (NACS) (**Table 13**). An additional species, the Eastern Red-Backed Salamander (*Plethodon cinereus*), was observed under debris during an ELC survey.

Most surveys of calling amphibians recorded only a few individuals at each station. The only species for which full choruses were heard was Green Frog (*Rana clamitans*), which was heard at full chorus at five locations. This species is highly adaptable. It can breed in ponds with either permanent or temporary standing water, and was often noted in human-made ponds. No amphibians were observed at 18 (49%) of the 37 NACS station sites. Stations that had no observed amphibians during the first visit, no standing water, or lack of appropriate habitat, were not included in the second round of visits.

Table 13. Breeding Amphibians identified during NACS.

Common Name	Scientific Name	G Rank	SARA	COSEWIC	ESA	S Rank	Area Sensitivity	TRCA
American Toad	*Anaxyrus americanus*	G5	---	---	---	S5	---	L4
American Bullfrog	*Lithobates catesbeianus*	G5	---	---	---	S4	AS	L2
Green Frog	*Lithobates clamitans*	G5	---	---	---	S5	---	L4
Northern Leopard Frog	*Lithobates pipiens*	G5	---	NAR	NAR	S5	---	L3
Wood Frog	*Lithobates sylvaticus*	G5	---	---	---	S5	---	L2
Spring Peeper	*Pseudacris crucifer*	G5	---	---	---	S5	---	L2
Gray Treefrog	*Hyla versicolor*	G5				S5		L2

Potential amphibian breeding habitat was occasionally noted during vegetation or bird surveys, particularly in woodlands, that was not surveyed in amphibian surveys. Gray Treefrog was noted at

two stations, but it was not mapped as it was heard at a distance and so the location of the breeding habitat was not certain. Amphibian breeding habitat was concentrated in the northern and eastern parts of Markham, with additional concentrations on Toogood Pond and Milne Park (**Figure 5**).

4.5.2. Reptiles

Four reptile species were identified during field surveys, 3 of which, the Midland Painted Turtle (*Chrysemys picta marginata*), Pond Slider (*Trachemys scripta*), and Snapping Turtle (*Chelydra serpentina*), were observed during reptile surveys. Additionally, an Eastern Gartersnake (*Thamnophis sirtalis sirtalis*) was observed during an ELC survey (**Table 14**). TRCA has also recorded Dekay's Brownsnake, in 2003 and 2010, and Northern Red-bellied Snake, several times between 2003 and 2013. Turtles were observed basking in Toogood Pond and Milne Park in spring, and were likely overwintering there.

Evidence of nesting turtles and eggs, both intact and predated, was also observed and recorded.

Table 14. Reptile species identified during field surveys.

Common Name	Scientific Name	G Rank	SARA	COSEWIC	ESA	S Rank	Area Sensitivity	TRCA
Eastern Gartersnake	*Thamnophis sirtalis sirtalis*	G5T5	---	---	---	S5	---	L4
Midland Painted Turtle	*Chrysemy picta marginata*	G5T5	---	SC	---	S4	---	L3
Pond Slider	*Trachemys scripta*	G5	---	---	---	SNA	---	L+
Snapping Turtle	*Chelydra serpentina*	G5	SC	SC	SC	S3	---	L3

4.5.3. Birds

A total of 77 bird species were observed during all surveys, including Breeding Bird Surveys, vegetation surveys, and incidentals. Of the 77 species, there was evidence of breeding for 75: plus one migrant (Blackpoll Warbler) and one flyover (Ring-billed Gull).

4.5.3.1. Breeding Bird Surveys

Seventy-five species of birds from 1221 identified individuals were observed during Breeding Bird Surveys (point counts and area searches). Of the 75 species observed, 13 species were confirmed (C) breeding and 32 species were probable (PR) breeding (**Appendix 4**). Others were considered possible breeding species.

4.5.3.2. Species at Risk Birds

Six Species at Risk (SAR) birds were observed during all surveys (**Table 15**). Three species are dependent on forest habitat (Canada Warbler, Eastern Wood-pewee and Wood Thrush), and two are dependent on open successional habitat (Barn Swallow, which is also dependent largely on farm buildings for nest sites, and Eastern Meadowlark). Common Nighthawk was observed displaying in late April, and so was exhibiting territorial behaviour, but this species begins nesting in mid-May and so may not have nested. The Canada Warbler could have been a late migrant, as this species is sometimes noted as transient in June, but it was in suitable breeding habitat at a suitable time of year so was recorded as a possible breeding species. Wood Thrush and Eastern Wood-pewee exhibited territorial behaviour and so were considered probable breeding species. Eastern Meadowlark was observed only at one location in Markham.

Table 15. Species at Risk Bird Species

Common Name	Scientific Name	Resident/Migrant	G RANK	SARA Status	COSEWIC	ESA Status	S Rank	Area Sensitivity	TRCA
Canada Warbler	*Cardellina canadensis*	Resident	G5	THR	THR	SC	S4B	AS	L2
Common Nighthawk	Chordeiles minor	Resident	G5	THR	SC	SC	S4B	---	L3
Eastern Wood-Pewee	*Contopus virens*	Resident	G5	SC	SC	SC	S4B	---	L4
Barn Swallow	*Hirundo rustica*	Resident	G5	THR	THR	THR	S4B	---	L4
Wood Thrush	*Hylocichla mustelina*	Resident	G5	THR	THR	SC	S4B	---	L3
Eastern Meadowlark	*Sturnella magna*	Resident	G5	THR	THR	THR	S4B	AS	L3

4.5.4. Mammals

Twelve species of mammals were identified during field surveys. Targeted surveys for mammals were not completed, but signs and sightings were recorded whenever they were encountered.

There were no species at risk, rare (S1-S3), or area sensitive species observed. One species, Hairy-tailed Mole (*Parascalops breweri*), is listed as locally rare (L3) within the TRCA watershed (**Appendix 4**).

4.5.5. Odonates and Lepidopterans

Targeted surveys for dragonflies, damselflies, butterflies and moths were not conducted. However, five species were noted in incidental surveys. These included four butterflies: Black Swallowtail (*Papilio polyxenes*), Cabbage White (*Pieris rapae*), Eastern Comma (*Polygonia comma*), Monarch (*Danaus plexippus*) and one damselfly: Ebony Jewelwing (*Calopteryx maculata*). None is considered

rare in Ontario except Monarch, a species listed as Special Concern in Ontario. This species was noted nectaring on a variety of flowers in open areas of Markham, especially along the Rouge River.

4.5.6. Significant Wildlife

Thirty-six significant wildlife species were recorded during field surveys, including the following categories (some of which overlap): six bird Species at Risk (SAR), two turtle SAR species, 16 area-sensitive species (15 birds as well as American Bullfrog) and 23 TRCA L1-3 locally rare species, of which five were frogs, two were turtles, one was a mammal and 15 were birds. One insect SAR was also noted (Monarch). Significant species for which locations were readily available, i.e. those recorded in 2020 surveys as well as 2014 SWS surveys by the study team, are listed in **Table 16**, and distribution of significant wildlife in all areas where information was available throughout the Greenway System, is shown on **Figure 6**. Significant species were generally concentrated in the northern and eastern parts of the study area, but with significant concentrations at Milne Park and other discrete locations as well, especially German Mills Creek. Morningside Creek, a tributary of the Rouge River near Eastvale and Steeles Avenue, was a particular concentration area for significant bird species; an unusual finding in such a highly urban surrounding. There may be other areas of hotspots for which information on location was not available, so they could not be mapped in this study.

Table 16. Significant wildlife in Markham's Greenway System: Species at Risk (SAR), Area Sensitive species, and species of concern in the TRCA watershed (L1-3).

Type	Common Name	Scientific Name	G Rank	SARA Status	COSEWIC	ESA	S Rank	Area Sensitivity	TRCA
Bird	Cooper's Hawk	*Accipiter cooperii*	G5	---	NAR	NAR	S4	AS	L4
Bird	Great Blue Heron	*Ardea herodias*	G5	---	---	---	S4	---	L3
Bird	Canada Warbler	*Cardellina canadensis*	G5	THR	THR	SC	S4B	AS	L2
Bird	Common Nighthawk	*Chordeiles minor*	G5	THR	SC	---	S4B	---	L3
Bird	Yellow-billed Cuckoo	*Coccyzus americanus*	G5	---	---	---	S4B	---	L3
Bird	Black-billed Cuckoo	*Coccyzus erythropthalmus*	G5	---	---	---	S5B	---	L3
Bird	Eastern Wood-Pewee	*Contopus virens*	G5	SC	SC	SC	S4B	---	L4
Bird	Hairy Woodpecker	*Dryobates villosus*	G5	---	---	---	S5	AS	L4
Bird	Pileated Woodpecker	*Dryocopus pileatus*	G5	---	---	---	S5	AS	L3
Bird	Alder Flycatcher	*Empidonax alnorum*	G5	---	---	---	S5B	AS	L4
Bird	Least Flycatcher	*Empidonax minimus*	G5	---	---	---	S4B	AS	L4
Bird	Mourning Warbler	*Geothlypis philadelphia*	G5	---	---	---	S4B	---	L3

Type	Common Name	Scientific Name	G Rank	SARA Status	COSEWIC	ESA	S Rank	Area Sensitivity	TRCA
Bird	Barn Swallow	*Hirundo rustica*	G5	THR	THR	THR	S4B	---	L4
Bird	Wood Thrush	*Hylocichla mustelina*	G5	THR	THR	SC	S4B	---	L3
Bird	Wild Turkey	*Meleagris gallopavo*	G5	---	---	---	S5	---	L3
Bird	Savannah Sparrow	*Passerculus sandwichensis*	G5	---	---	---	S4B	AS	L4
Bird	Scarlet Tanager	*Piranga olivacea*	G5	---	---	---	S4B	AS	L3
Bird	Blue-gray Gnatcatcher	*Polioptila caerulea*	G5	---	---	---	S4B	AS	L4
Bird	Virginia Rail	*Rallus limicola*	G5	---	---	---	S5B	---	L3
Bird	Magnolia Warbler	*Setophaga magnolia*	G5	---	---	---	S5B	AS	L3
Bird	Chestnut-sided Warbler	*Setophaga pensylvanica*	G5	---	---	---	S5B	---	L3
Bird	Pine Warbler	*Setophaga pinus*	G5	---	---	---	S5B	AS	L4
Bird	American Redstart	*Setophaga ruticilla*	G5	---	---	---	S5B	AS	L4
Bird	Red-breasted Nuthatch	*Sitta canadensis*	G5	---	---	---	S5	AS	L4
Bird	White-breasted Nuthatch	*Sitta carolinensis*	G5	---	---	---	S5	AS	L4
Bird	Clay-colored Sparrow	*Spizella pallida*	G5	---	---	---	S4B	---	L3
Bird	Eastern Meadowlark	*Sturnella magna*	G5	THR	THR	THR	S4B	AS	L3
Bird	Brown Thrasher	*Toxostoma rufum*	G5	---	---	---	S4B	---	L3
Amphibian	American Bullfrog	*Lithobates catesbeianus*	G5	---	---	---	S4	AS	L2
Amphibian	Northern Leopard Frog	*Lithobates pipiens*	G5	---	NAR	NAR	S5	---	L3
Amphibian	Wood Frog	*Lithobates sylvaticus*	G5	---	---	---	S5	---	L2
Amphibian	Spring Peeper	*Pseudacris crucifer*	G5	---	---	---	S5	---	L2
Amphibian	Gray Treefrog	*Hyla versicolor*	G5	---	---	---	S5	---	L2
Reptile	Snapping Turtle	*Chelydra serpentina*	G5	SC	SC	SC	S4	---	L3
Reptile	Midland Painted Turtle	*Chrysemy picta marginata*	G5T5	---	SC	---	S4	---	L3
Mammal	Hairy-tailed Mole	*Parascalops breweri*	G5	---	---	---	S4	---	L3
Insect	Monarch	*Danaus plexippus*	G4	SC	END	SC	S2N, S4B		

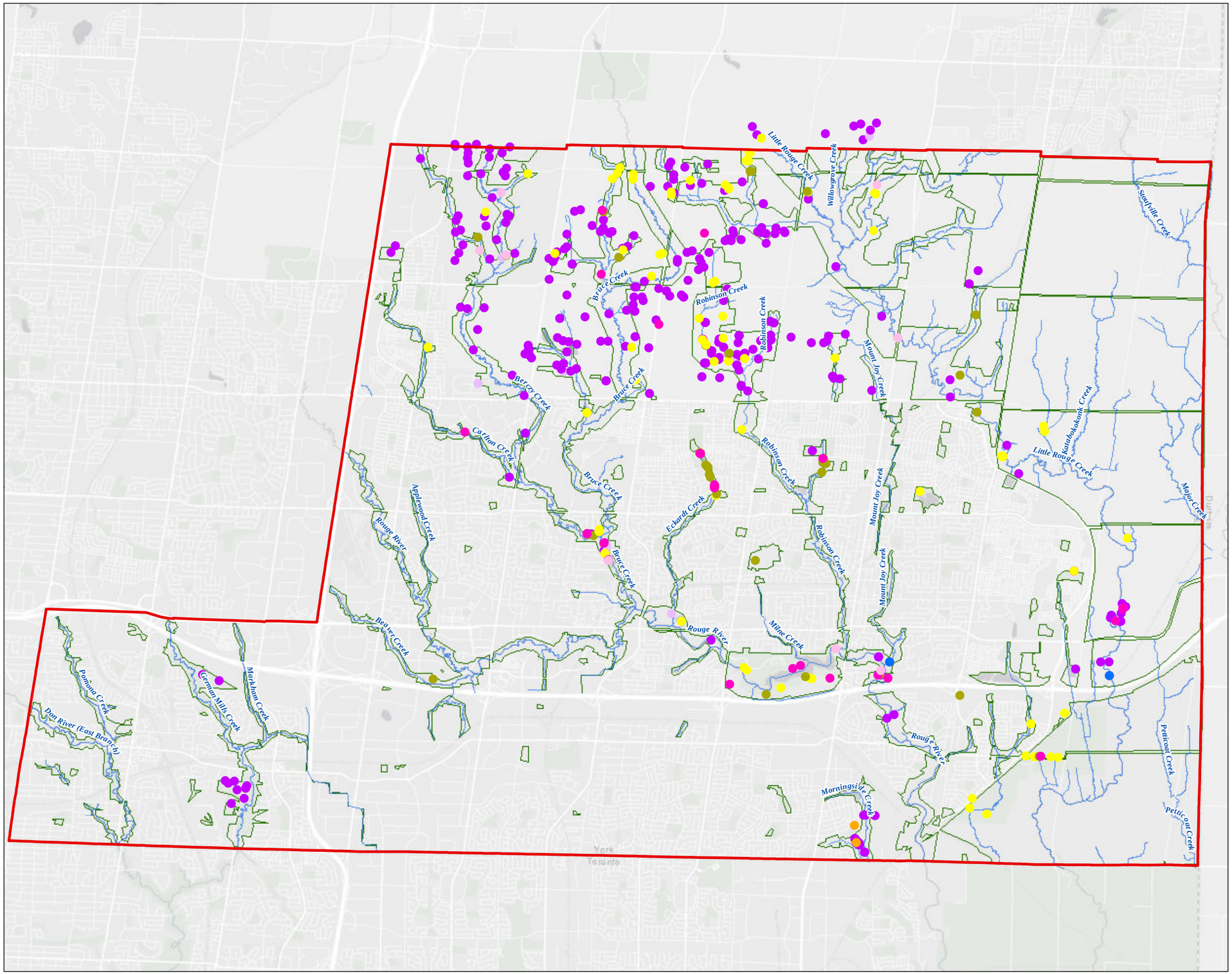

Figure 6 | Markham Natural Features Inventory:
Distribution of Significant Wildlife in all areas where Location Data were Available.

Legend

- Markham Boundary
- Markham Greenway System (2014)
- Watercourses

Amphibians : Significant Rankings
- S3, L2
- L2
- L3

Reptiles: Significant Rankings
- S3, L3
- L3

Birds: Significant Rankings
- L3
- L2

Mammals: Significant Rankings
- L3

Butterflies: Significant Rankings
- S2

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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5. Condition

5.1. Overall health, Condition and Ecological Integrity

In general, condition was perceived by the study team as higher than was expected of urban habitats in the Greater Toronto Area. There were many communities that were largely dominated by native species. Upland forest communities were most frequently dominated by Sugar Maple, unlike, for example, in the City of Toronto, where forests, especially in ravines, are frequently dominated by invasive non-natives such as Norway Maple. Trails (both formal marked trails and informal trails created by users) were frequent in Markham and impacts such as trampling were frequently observed near trails.

The following sections summarize disturbances that were observed by the study team, **Figure 7** shows areas of abundant or dominant invasive species, and **Figure 8** shows areas of high levels of the most significant disturbances observed: tracks and trails, dumping and recreational use. Encroachment, also a significant impact adjacent to residential development (see Section 5.1.19), is not mapped as it was not always recorded, since it did not have a dedicated field in Survey 123 (i.e. it was an incidental observation).

5.1.1. Tree Removal

Cut stumps and other signs of tree removal were recorded as "logging" in the data entry application as this is the term used by the ELC manual. However, tree removal primarily appeared to be related to removal of individual trees where they created a hazard. Tree cutting was recorded because it can have profound affects on a forest community by creating higher levels of light and allowing penetration of drying winds. There were 38 observations of recent logging (within 30 years), out of 440 communities where disturbance was recorded. **Table 17** summarizes the number of instances where logging within the past 30 years was observed. Logging intensity and extent were generally observed as being light and local. Most recent logging was associated with cutting of hazard trees along trails, especially ash trees that are affected by Emerald Ash Borer. As could be expected, most recent logging was observed in deciduous forest.

Table 17. Number of instances of logging within the past 30 years noted in vegetation communities in Markham

Vegetation Ecosite	Number of Observations
Cultural Meadow	5
Cultural Plantation	1
Cultural Thicket	4
Cultural Woodland	1
Coniferous Forest	3
Deciduous Forest	18
Mixed forest	3

Vegetation Ecosite	Number of Observations
Shallow Marsh	3

5.1.2. Maple Sugar Harvest

Signs of maple sugar harvest (e.g. taps on maple trees, tubing strung between trees, and presence of containers for collecting sap) would have been recorded if present because sugar harvesting can be a source of disturbance related to soil trampling and clearing of pathways. There were no observations of maple sugar harvest by the study team.

5.1.3. Canopy Gaps

Gaps in woodlands can be a sign of disease or extensive logging disturbance. As noted above, loss of canopy trees can allow increased light and penetration, which can be accompanied by increases in non-native invasive species and drying of soils. Large canopy gaps were observed in two forest communities: one in a lowland forest and one in a deciduous swamp. Intermediate canopy gaps were noted in 52 communities. Most observations of intermediate canopy gaps were recorded in lowland forest (FOD7), with 36 observations. Canopy gaps were likely a result of death of ash due to Emerald Ash Borer, but since ash trees were a relatively small component of Markham forests, and were in early stages of decline, there were few instances of large gaps recorded.

5.1.4. Livestock Use

Livestock are an important cause of disturbance to vegetation, as cattle browse and graze intensively, trample roots and compact soils. There was only one instance of historic livestock grazing observed, in a cultural woodland community, located south of Major Mackenzie Drive East and Ninth Line

5.1.5. Invasive Non-native Species

The abundance and pervasiveness of non-native invasive species were recorded because they can out-compete native species, depriving other species of light and nutrients, and invasion by non-native species can be accompanied by a decrease in diversity. Individual species were not recorded; the measure recorded the perceived frequency of the most invasive species. Though non-native species were a frequent component of vegetation communities investigated in Markham, they were perceived as dominant or abundant in a little over half (57%) of the 440 polygons where this type of disturbance was recorded. Observations of "abundant" or "dominant" invasive species were recorded in 52% of forest communities, 51% of swamp communities and 46% of marsh communities, as shown in **Table 18**. Areas of abundant and dominant invasive species are shown in **Figure 7**. Observations of "abundant" or "dominant" invasive species were recorded in 68% of cultural communities, as would be expected, as these communities are characteristically dominated by non-native species in southern Ontario. Non-native invasive species were particularly concentrated along portions of the Rouge

River, especially in high use areas, in the upper portion of the Little Rouge River, and along Berczy Creek.

Table 18. Occurrences where abundant or dominant non-native invasive species were observed in Markham vegetation communities.

Vegetation Community	Total Number of Communities Investigated	Number of polygons where occasional or no invasive species were noted	Number of polygons where dominant or abundant invasive species were noted
Deciduous Forest	140	62	78
Coniferous Forest	15	7	8
Mixed Forest	33	21	12
Swamp	39	19	20
Marsh	54	29	25
Cultural Communities	147	47	100

The most commonly recorded invasive species were Hybrid Willow, Common Buckthorn, Dog-strangling Vine and Garlic-mustard. Other commonly recorded species were Burning Bush (*Euonymous* spp.) and White Poplar (*Populus alba*). Surprisingly, other non-native invasive species that are extremely prevalent in other parts of the GTA such as Norway Maple, Black Alder and Glossy Buckthorn were infrequent in Markham.

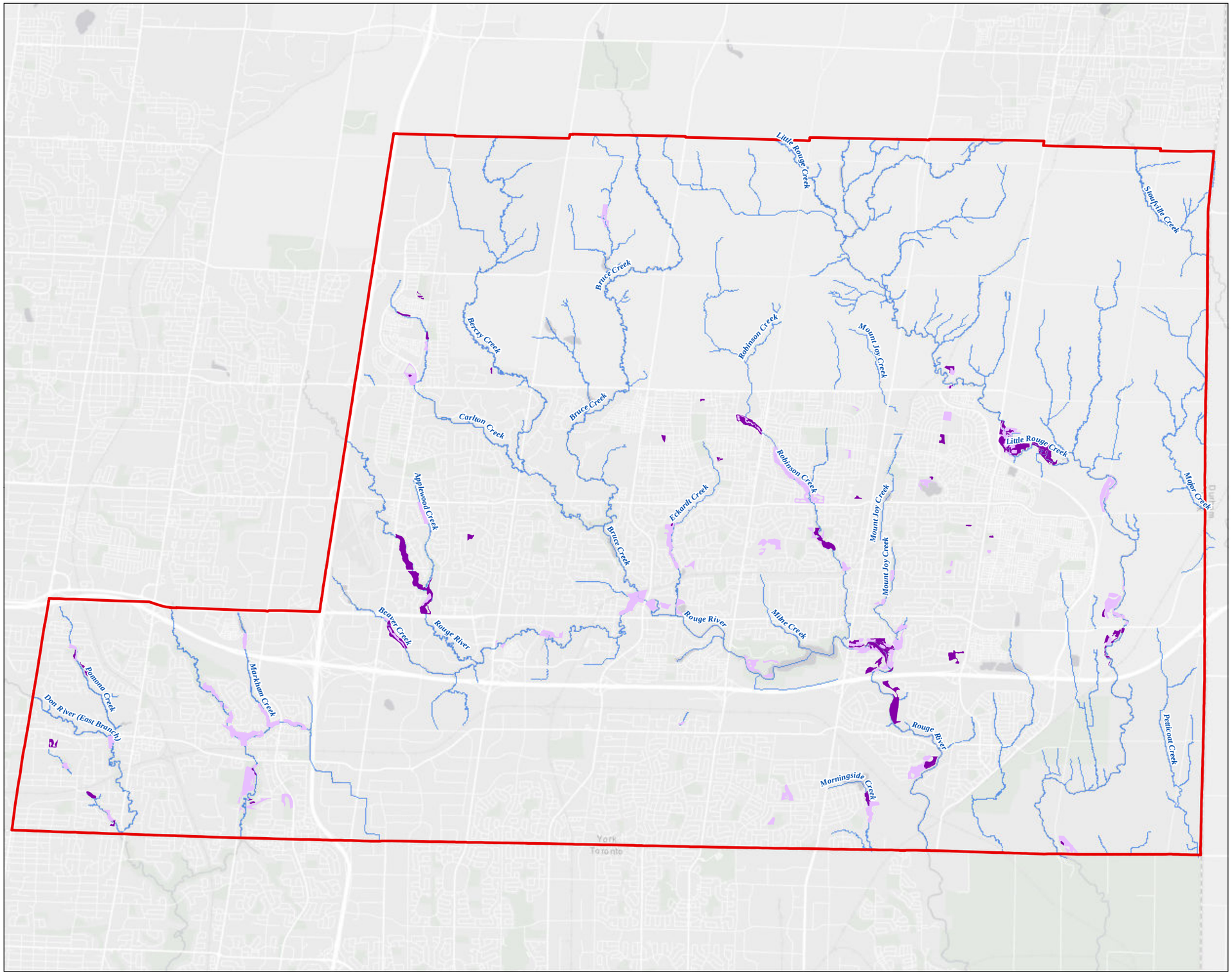

Figure 7 | Markham Natural Features Inventory:
Invasive Species Distribution Observed During 2020 ELC Investigations

Legend

- Markham Boundary
- Watercourses

Invasive Species

- Abundant
- Dominant

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

DOUGAN & ASSOCIATES

5.1.6. Planting

Planting was recorded as it is generally accompanied by large-scale disturbance, or can be an indication of previous cultural origins for a community. Planting was reported as abundant to dominant in 26 polygons, all but 3 of which were cultural communities.

5.1.7. Tracks and Trails

Tracks and trails were recorded as they generally indicated the intensity of recreational use in an area. Formal trails were not differentiated from informal trails as a well-marked trail was usually accompanied by the same level of disturbance, whether it was a wide formal or informal trail. Tracks and trails were reported as well-marked, or tracks or roads, in 96 polygons, of which 48 polygons had extensive and widespread trails. Trails were reported as local and faint in 90 polygons. No trails were reported in 222 polygons. Areas where well-marked trails, or tracks or roads, were observed are shown in **Figure 8**.

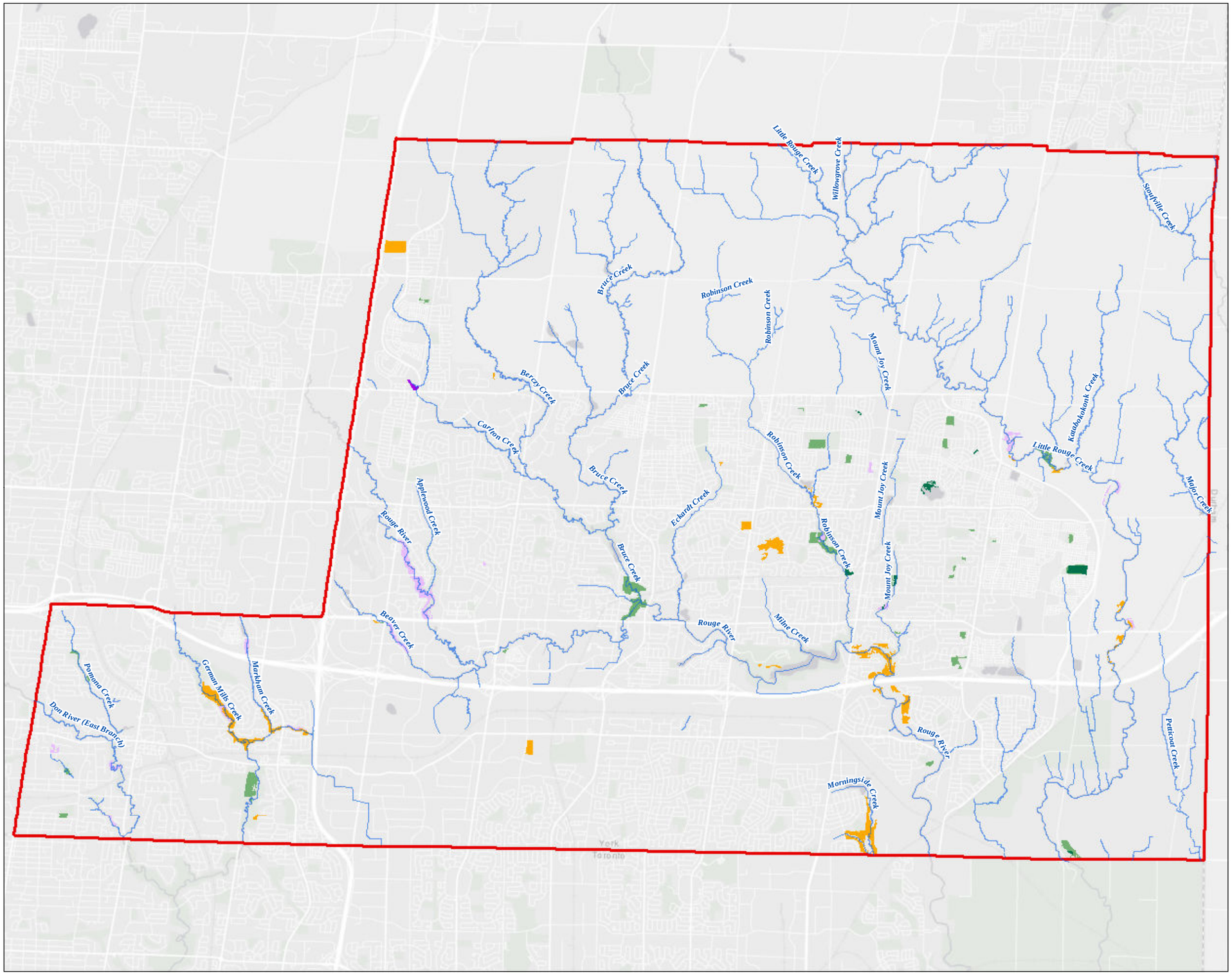

Figure 8 | Markham Natural Features Inventory:
Records of Moderate and High Levels of Disturbances Recorded during 2020 ELC Investigations

Legend

- Markham Boundary
- Watercourses

Recreation

- Moderate
- Heavy

Dumping

- Moderate
- Heavy

Tracks and Trails

- Well Marked
- Tracks or Roads

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

DOUGAN & ASSOCIATES

5.1.8. Dumping

Dumping is an indicator of disturbance as it is associated with compaction of soils and potential for introduction of non-native species. It was indicated by piles of dead leaves, building debris, litter and compost piles. Dumping was recorded as heavy or moderate in 39 polygons, and light in 274. There were 127 polygons where no dumping was recorded. Areas where heavy or moderate dumping was recorded are shown in **Figure 8**.

5.1.9. Earth Displacement

Earth displacement was recorded if signs of site alteration were noted such as excavation or piles of soil. These are important indicators of disturbance as site alteration can compact soils, promoting the spread of non-native species. Very few instances of earth displacement were recorded. Moderate earth displacement was recorded in 9 polygons, with no instances of heavy displacement recorded. Light displacement was recorded in 8 polygons.

5.1.10. Recreational Use

Recreational use was generally recorded separately from tracks and trails. Signs of recreational use are an indicator of disturbance because they indicate areas of soil disturbance that can trample vegetation and promote the spread of non-native species and are areas where there is potential for disruption of breeding in wildlife species as well. Recreational use documented party spots, trampling, vegetation removal, BMX bike jumps and other signs of human presence. Heavy or moderate recreational use was recorded in 63 polygons, while light recreational use was reported in 23 polygons. No recreational use was reported in 188 polygons. Areas where moderate to heavy recreational use was noted are shown in **Figure 8**.

5.1.11. Noise

Noise is a significant disturbance as it can alter the ability of wildlife species to broadcast calls, important for advertising territory and fitness for reproduction. Bird nesting density has been shown to be reduced adjacent to major highways, and frogs may alter their calls in areas with high noise levels. Intense noise levels were generally only reported in polygons in close proximity to roads (particularly Highway 407). These totaled 109 polygons. Slight or no noise was recorded in 377 polygons.

5.1.12. Disease

Disease (which included pests) is an important factor in determining vegetation communities, particularly forests, because there are several diseases that cause widespread tree death in southern Ontario forests, increasing the potential for drying winds and increased light levels, and promoting the growth of non-native invasive species. Diseases reported incidentally during Markham surveys included Emerald Ash Borer (the most prevalent disease), Beech Bark Disease (which is caused by a

combination of an introduced beech scale insect (*Cryptococcus fagisuga*) from Europe, coupled with a nectria fungus), and Dutch Elm Disease (*Ophiostoma ulmi* and *Ophiostoma novo-ulmi*).

Disease was recorded as heavy or moderate in 49 polygons, with light or none in 391.

5.1.13. Windthrow

Windthrow is used to describe areas where trees have been blown down, usually in a discrete patch, by strong winds. Windthrow can be an indicator of a variety of often interacting disturbances such as tree death or morbidity and changes in soil conditions so they are less stable. Moderate windthrow was noted in 31 polygons. Light or no windthrow was noted in 409. Windthrow was not noted as heavy in any polygons in Markham.

5.1.14. Browse

Deer browse (by White-tailed Deer; *Odocoileus virginianus*) has been highlighted as an indicator of disturbance as the presence of large numbers of deer can be associated with soil trampling and suppression of vulnerable plant species, which in turn provide opportunities for non-native, invasive plant species. In areas with unusually large numbers of deer, especially in winter, a "browse line" can become visible as deer remove the lower levels of trees and shrubs which are within their reach. Visible browsing was noted in 30 polygons. Of these, it was noted as moderate only in two, with light browsing in the remainder. Heavy browsing was not noted.

5.1.15. Beaver Activity

Beavers are a source of change in habitat and increase in diversity, damming up streams which then flood, and causing areas of forest to succeed to swamp. Beavers tend to abandon flooded areas after a few years as the watercourses accumulate silt and these areas then return back to forest. This type of disturbance is often reduced in urban environments because it can lead to property damage. Beaver (*Castor canadensis*) activity was noted in a total of 18 polygons (all adjacent to watercourses), but was only moderate in two of those. No heavy beaver activity was recorded.

5.1.16. Flooding

Flooding is largely a natural disturbance, that can maintain wetlands in areas where, for example, it is of long enough duration, sufficient depth and occurs in certain seasons. Flooding duration and depth can change due to upstream human influences. Heavy or moderate flooding was recorded in 36 polygons, most of which were wetlands adjacent to watercourses, as would be expected. Flooding was reported in five forest and cultural communities.

5.1.17. Fire

Fire was previously a natural disturbance (or an indigenous-created one) that maintained open habitat that promoted habitat for certain shade-intolerant tree species such as oak, created forest openings and removed woody debris. However, impacts of fires are much reduced in southern Ontario as they

tend to cause damage to human property. Fire impacts were reported as "light" in one forest polygon in Markham, but no other evidence of fire was recorded.

5.1.18. Ice Damage

Ice damage is a natural disturbance that can maintain unvegetated areas on shorelines and allow colonization by certain rare ephemeral species that germinate in the fall only in these conditions. Ice damage was reported in one polygon (an open beach, which was likely kept unvegetated by ice scour as well as erosion by water).

5.1.19. Other Disturbances

Other disturbances were recorded during the course of surveys if they were noted by the investigator and did not fall under the fields dedicated to the disturbances described above. **Table 19** summarizes the other disturbances noted in Markham, with the number of times they were recorded. The most common disturbance recorded was encroachment on the natural area from the adjacent residences, which varied from planting of horticultural species, cutting shrubs and other vegetation, dumping (particularly compost piles but also including building debris) and mowing.

Table 19. Additional disturbances noted during investigations in Markham, and the number of polygons in which they were observed.

Type of Disturbance	Number of Polygons Noted
Encroachment (mowing, planting, cutting, dumping adjacent to residences)	135
Party Spots (encampments, structures, bike jumps, fire pits)	12
Hazard Tree Cutting (generally ash infected by Emerald Ash Borer)	12

6. Trends in Ecological Health and Condition (Comparison with 1991 Inventory results)

Health and condition were reported very generally in the 1992 report, so comparison of specific types of impact are difficult to make. The extent of natural vegetation and cultural vegetation was described in detail, and this is compared in Section 5.2.2.1. However, there are general comments in the 1992 report regarding vegetation that can be used to compare the composition in 1991 to the composition of vegetation in the present.

Comparison of vegetation with 1991 observations is complicated by the fact that in 1991, the classification of vegetation was not yet standardized. It was based on the observer describing vegetation as they saw it (Bakowsky 2021, pers. comm.). Generally, the principles were similar: the observer named the vegetation type by the dominant species, in decreasing order of dominance. This would apply to both open and treed vegetation. For example, sometimes for a treed vegetation type, the observer might break it down into layers (e.g. red maple - balsam poplar/spicebush/sensitive fern vegetation type); but sometimes the community was described by naming only the trees (Bakowsky 2021, pers. comm.). Standard vegetation protocols were introduced in 1998 (Lee et al. 1998). The classification of some communities may not always be comparable, particularly swamps and forests. The "Lowland Forest" category in the 1998 manual is often used to classify floodplain communities that are indeterminant between swamp and forest, so that this classification may have replaced some areas mapped as swamp in 1991.

6.1. Wetland Description

Palustrine vegetation (the broad term used to describe wetlands) noted the following (Page 4-1, Gore and Storrie 1992):

"*Fairly extensive marshes cattail marshes occur at Toogood Pond and Milne Park, while elsewhere they are of smaller size and local on the table lands and valley bottoms. Sites with less water, but with wet or saturated soils, typically support marsh dominated by grasses and herbs.* [Wasyl Bakowsky (2021, pers. comm.), who conducted the surveys of vegetation in Markham in 1991, notes that the grass was almost always the non-native species of Reed Canary-grass]. *This is the most common marsh type in Markham, occupying extensive areas along riverbanks, floodplains and terraces, and the natural tributary drains of agricultural lands*."…"*Deciduous swamps occur in areas with high water tables and springtime surface ponding. Characteristic species include Crack Willow [*now considered a hybrid of Crack Willow with a variety of other non-native willow tree species*], Manitoba Maple, white elm, and Silver Maple [*now considered likely a hybrid between Silver Maple and Red Maple: known as Freeman's Maple*]. Similar topographic situations may be dominated by coniferous species, primarily White Cedar, or mixtures of this species and deciduous species*."

The prevalence of meadow marsh (marsh dominated by grasses and herbs) still applies to the current natural vegetation composition. Cattail marsh still occupies small areas, with larger areas at Toogood Pond and Milne Park. Grasses and herbs still dominate saturated soils along river edges, mainly the non-native species Reed Canary-grass in 2020.

Swamps are largely dominated by the same species described in the 1992 report. The exception to this is that the 2020 study team found very few communities dominated by the hybrid Freeman's Maple (formerly identified as Silver Maple). As noted above, in recent surveys, Silver Maple was noted as a dominant in only one polygon. In addition, there is no mention of Black Walnut, found in 2020 as a common associate of these species on floodplains. The prevalence of Black Walnut appears to have increased in most vegetation communities throughout Markham.

6.2. Terrestrial Vegetation

Terrestrial vegetation described in 1991 included cultural vegetation, which was described as occurring on naturally regenerating old fields which develop on abandoned agricultural land and pastures. Old fields were dominated by grasses and herbs, with a high percentage of non-native species, and this is still the case. Cultural plantations were described as dominated by conifers such as White Pine, Red Pine (*Pinus resinosa*) and Scots Pine, with occasional deciduous species such as Black Locust (*Robinia pseudoacacia*), whereas in the 2020 field work the most common species observed were White Spruce, White Pine, Scots Pine and Norway Spruce. There were few areas of extensive invasive non-native species noted in 1991. Bakowsky (2021, pers. comm.) remembers seeing only one patch of very young Common Buckthorn seedlings in a disturbed area along a creek. Few areas of European Reed or Dog-strangling Vine were present in 1991. He noted that the most common invasives were species of cultural meadow such as Yellow Bedstraw (*Galium verum*).

Cultural vegetation was considered distinct from successional vegetation, which was used to classify species on eroding slopes, gravel and sand bars and regularly flooded banks. These communities would likely be classified as thicket swamp (SWT) in the current ELC protocols. Only two of these communities were noted of this type in Markham in 2020. Vegetation previously classified as successional on floodplains has likely now succeeded to lowland forest dominated by Black Walnut, Manitoba Maple and Hybrid Willow, with abundant Common Buckthorn.

It was noted in 1992 that "*successional deciduous forests are widespread in Markham and are dominated by shade-intolerant species such as aspen, ash, White Elm and Manitoba Maple. In some instances, particularly along stream slopes, successional coniferous forests dominated by White Cedar are found*". Though Manitoba Maple is still common in successional forests, there were few areas dominated by ash or aspen. Again, there is no mention of Black Walnut in 1991, which was ubiquitous in successional forests in 2020. Bakowsky (2021 pers. comm.) stated that Black Walnut was certainly present in 1991, and was noted as fairly widespread, but was not dominant in any areas. White Elm has become in 2020 a minor element of successional forests, and elms are generally small trees eventually killed off by successive waves of Dutch Elm Disease.

The description of mature deciduous forests in Gore and Storrie (1992) read: "*Mature forests are dominated by mature trees, and generally support an understory of forest species, with few introduced species present…Mature deciduous forests are dominated by shade-tolerant sugar maple and beech, and typically contain a number of spring ephemeral species*." Bakowsky (2021, pers comm.) particularly remembers the native Pubescent Sedge (*Carex hirtifolia*) as abundant in almost all upland forests, ascribing this to the moisture-retentive clay-loam soils. In 2020 surveys, Sugar Maple was observed as the principal dominant in the canopy, sub-canopy and sometimes the shrub and ground layers as well. American Beech, Black Cherry were common components. Black Walnut was frequently a component of deciduous forest. However, in most areas except the high-quality forest along the Little Rouge River at the eastern edge of the study area, the shrub layer was frequently dominated by Common Buckthorn. Spring ephemerals were patchy and infrequent, and the ground was often

dominated by non-native invasives such as Garlic-mustard, Dog-strangling Vine, and weedy native species such as Enchanter's Nightshade. Pubescent Sedge was noted occasionally (particularly in the eastern part of the study area along the Little Rouge River) but was never observed as a dominant or abundant species.

The description of mature coniferous forests noted: "*Mature coniferous forests may be variously dominated by white pine, eastern hemlock and white cedar. The understory vegetation is generally sparse in this community type, and often contains species of more northern floristic affinity. Coniferous forests may be found on north and east-facing slopes. Mature forests of both coniferous and deciduous species are also present in Markham. Other deciduous trees present in this type (in addition to sugar maple and beech) include white birch, yellow birch, black cherry and basswood*." In 2020 surveys, the vegetation in mature coniferous forests was very similar, with some of the highest-quality examples along the Little Rouge River at the eastern edge of the study area. The understory remained sparse. Fewer non-native species were noted in these areas than in other parts of the study area. White Birch (*Betula papyrifera*) was noted only rarely (possibly because it is a short-lived species and may have died out since the surveys in 1992), but Yellow Birch (*Betula alleghaniensis*) was noted occasionally in 2020, and Basswood and Black Cherry were relatively common.

6.3. Comparison of Vegetation Areas

Table 20 provides a comparison of the areas of different vegetation types recorded in 1991 and 2020. The area of "natural" vegetation (roughly, vegetation that is not anthropogenic or agricultural land) within Markham has increased slightly since 1991, from 13.7% to 14.9%. The area of open water measured in 2020 is much larger than the open water area measured in 1991, probably mainly because watercourses were mapped as lines in the past, rather than polygons (Bakowsky 2021, pers. comm.) The area of shallow marsh has increased. It is also possible that the area of open water in watercourses has increased, because of increased runoff from urban areas. The reason for this is not clear, but it is possible that stormwater treatment facilities contribute to this total. The area of meadow marsh is similar in 1991 and 2020.

Areas of deciduous, coniferous and mixed swamp have decreased from 2020 to 1991. As noted above, this may be due to differences in classification between those years. However, it is also possible that floodplains have become drier due to climate change (more intense but less lengthy flooding events, higher temperatures), and increased growth of shrubs (mainly Common Buckthorn) and trees that create increased evapotranspiration of moisture from soils.

Table 20. Comparison of 1991 and 2020 extent of vegetation types (based on all data sources)

Vegetation Type	1998 Equivalent	Area (ha)		Percent of Vegetation		Percent of Markham	
		1991	2020	1991	2020	1991	2020
PALUSTRINE	**Wetland**	**833.87**	**793.01**	**28.76**	**25.07**	**3.93**	**3.73**
Marsh	**MA**	**360.54**	**554.41**	**12.43**	**17.53**	**1.70**	**2.61**
Open Water	OAO, SA (S, M, F))	40.86	178.34	1.41	2.52	0.19	0.84
Cattail	Shallow Marsh MAS	11.10	58.41	0.38	0.83	0.05	0.27
Grass-Herb	Meadow Marsh MAM	268.60	264.76	9.26	3.75	1.27	1.24
Shrub	Thicket Swamp SWT	39.98	52.91	1.38	0.75	0.19	0.29
Swamp	**SW**	**473.33**	**238.60**	**16.32**	**7.54**	**2.23**	**1.12**
Deciduous	Deciduous Swamp SWD	234.92	163.79	8.10	2.32	1.11	0.77
Coniferous	Coniferous Swamp SWC	74.91	18.82	2.58	0.27	0.35	0.09
Mixed Coniferous-Deciduous	Mixed Swamp SWM	163.50	56.00	5.64	0.79	0.77	0.26
TERRESTRIAL		**2065.62**	**2369.74**	**71.24**	**74.93**	**9.74**	**11.14**
Anthropogenic	**Cultural**	**1487.58**	**1166.17**	**51.30**	**36.87**	**7.02**	**5.48**
Old Field	Cultural Meadow CUM	1075.65	781.63	37.10	11.07	5.07	3.68
Shrub-rich Old Field	Cultural Thicket, Cultural Savannah CUT, CUS	299.95	226.78	10.34	3.21	1.41	1.07
Plantation	Cultural Plantation CUP	111.98	157.76	3.86	2.23	0.53	0.74
Successional		**242.29**	**279.31**	**8.36**	**8.83**	**1.14**	**1.31**
Gravel Bar	Open Beach BBO	0.98	1.29	0.03	0.018	0	0.006
Shrub Thicket	Shrub Beach BBS	7.58	0.66	0.26	0.0094	0.04	0.003
Successional Woodland	Cultural Woodland CUW	233.73	277.36	8.06	3.93	1.10	1.30
Mature Forest	**FO**	**335.75**	**924.26**	**11.58**	**29.22**	**1.58**	**4.35**
Deciduous	Deciduous Forest FOD	153.77	626.82	5.30	8.87	0.73	2.95
Coniferous	Coniferous Forest FOC	53.08	90.56	1.83	1.28	0.25	0.43

Vegetation Type	1998 Equivalent	Area (ha)		Percent of Vegetation		Percent of Markham	
		1991	2020	1991	2020	1991	2020
Mixed Coniferous-Deciduous	Mixed Forest FOM	128.90	206.89	4.45	2.93	0.61	0.97
Total		**2899.49**	**3162.76**	**100**	**100**	**13.70**	**14.87**

Areas of cultural meadow, cultural thicket/cultural savannah decreased from 1991 to 2020, while cultural woodland and cultural plantation increased, as might be expected as early-successional areas grown over by woody species. Mature forest increased, mainly due to a large increase in deciduous forest because of growth of woody species in previously open areas, but also due to classification of floodplain areas as lowland forest in 2020, rather than swamp as in 1991, when the category of lowland forest was not widely used.

6.4. Comparison of Biodiversity

6.4.1. Plant Biodiversity

A total of 506 plant species were listed in 1991. Slightly fewer (479) species were found in 2020, likely because the inventories were highly scoped to fewer sites. The number of native species in 1992 was 365 (72%), while the number of native species in 2020 was 350 (67%), a slight decline that may not be significant. Twenty-five species rare in York Region were found in 1992, while 43 were found in 2020 (though rare species in 1991 and 2020 were not all the same, as the status was revised in 2000, as well as several times subsequently).

The number of plant species found in 1991 was similar to the number found in 2020 (20 more species were found in 1991, likely because of the larger area searched). Numbers of natives and non-natives were similar and numbers of significant species of York Region were higher. Species listed as rare in York Region in 1991 were different from those found in 2020; partly because the distribution of some species has been re-evaluated since 1991 and additional species are now considered rare.

Areas of high biodiversity were mapped in the 1991 studies, as high biodiversity of plants and animals was one of the criteria for designation of Locally Significant Areas (LSAs). LSAs are discussed in Section 6.5. Areas of high biodiversity are mapped in **Figures 5A and 5B** according to numbers of species and according to concentrations of regionally and locally significant species recorded in 2020. However, biodiversity mapping could only be conducted in areas surveyed by the study team for which species data were available (in Detailed Botany sites), and these areas did not include all LSAs. Additional surveys would need to be conducted to provide a City-wide analysis.

6.4.2. Animal Biodiversity

6.4.2.1. Birds

The number of bird species noted in 2020 was slightly lower than in 1992: 77 were noted (for which breeding evidence was available) in 1992 while 75 were noted in the current surveys (**Appendix 4** shows the species recorded in both years). Great Blue Heron was included in this list (in both 1991 and 2020): though no definitive breeding evidence was obtained such as nests, juvenile herons were observed, and it is possible they were breeding somewhere in Markham.

Table 21 provides a summary of the breakdown of the guilds (suites of habitat preferences) of birds seen in both years. Guild analysis was conducted as part of the 1992 report, so the same classifications were used. For species that were recorded only in 2020, guild classification was applied through interpretation of habitat requirements shown in Appendix G of the Significant Wildlife Habitat Technical Guide (MNR 2000), and the personal experience of the study team. Guild classification for each species is shown in **Appendix 4**.

Table 21. Comparison of Guilds Recorded in Markham in 1991 and 2020.

Habitat Guild	Number of Species	
	1991	**2020**
Forest edge or interior near wetlands	10	5
Open areas near wetlands	3	2
Open marsh	4	4
Sandy banks near water	3	2
Cliff ledges or bridges near water	1	1
Forest interior	2	9
Forest edge or interior	20	18
Forest edge or successional	25	29
Open areas	5	3
Anthropogenic	4	2
Total	**77**	**75**

Birds noted in 2020 included more generalist species of forest edge and successional habitats, and more species of forest interior habitats, than in 1991, Notable forest interior birds recorded only in 2020 were Scarlet Tanager, Common Raven, Canada Warbler, Magnolia Warbler and Pine Warbler. Canada Warbler and Pine Warbler could have been late migrants as they tend to be seen sporadically in southern Ontario in early June, during the breeding bird season window, but generally move on after a short time. The other species were noted more than once during the breeding season, indicating probable breeding. Some of the forest and late-successional birds seen only in 2020 included several for which range expansions have been seen since 1991, including Red-bellied Woodpecker, Common Raven, Orchard Oriole and Blue-gray Gnatcatcher. The list also included species of mid-to late-successional habitats that had not been recorded previously, such as Clay-

coloured Sparrow, Field Sparrow, American Redstart and Blue-gray gnatcatcher, probably reflecting the advance of succession in the 20 years since the first survey.

Birds seen only in 1991 included several waterfowl species that nest in successional habitats near wetlands. The five species of forest edge and interior near wetlands noted in 1991, which were not noted in 2020, were Carolina Wren, Green-winged Teal, Northern Waterthrush, Osprey and Wood Duck. Birds of anthropogenic habitats recorded only in 1991 were Rock Pigeon (which may have been missed as it is primarily a species of urban buildings), Purple Martin and Chimney Swift, which have undergone steep population declines in recent years (Cadman et al. 2005).

6.4.2.2. Amphibians

Six species of frogs were recorded in both 1991 and 2020 (**Table 22**), with some species only recorded in one of those years. Wetland breeding amphibians were noted in both years, including Bullfrog, Green Frog and Northern Leopard Frog, which breed in human-made lakes and ponds in Markham. Woodland-breeding amphibians were recorded in both years, including Gray Treefrog (on only one occasion), and Wood Frog. However, Spring Peeper was not recorded in 1991. Evening surveys were not conducted in 1991, probably explaining why Spring Peeper was not recorded in that year. Since amphibian surveys were conducted on three occasions in 2020, including the calling time for Gray Treefrog, it is puzzling that Gray Treefrogs were not observed more often in 2020. The most recent record for this species was in 2014, during surveys by Natural Resource Solutions Inc (NRSI).

The record of Eastern Red-backed Salamander is the only one for Markham in records obtained for this study. This salamander is an inconspicuous species that is generally found under decaying logs. While incidental searches would have been conducted for this species in 1991, it is possible that it was overlooked. It was not recorded in other surveys by TRCA and consultants in Markham between 2000 and 2014. However, this species is particularly dependent on large woody debris over 35 cm dbh in closed canopy forests (Strojny and Hunter 2010), so it may have become more widespread as forest cover has matured in Markham, especially as large ash die and fall.

Table 22. Amphibians noted in 1991 and 2020

Species	1991	2020
American Toad	Y	Y
Spring Peeper	N	Y
Gray Treefrog	Y	Y
Bullfrog	Y	Y
Green Frog	Y	Y
Wood Frog	Y	Y
Northern Leopard Frog	Y	Y
Eastern Red-backed Salamander	N	Y

Reptiles

The only reptile species noted in 1991 was Eastern Gartersnake, while three species of turtles were also noted in 2020. However, there were dedicated surveys for turtles in 2020, which were not conducted in 1991.

Mammals

The suite of mammal species recorded in 1991 was similar to those recorded in 2020, consisting of urban-adapted species often recorded in surveys of urban habitat.

6.5. Locally Significant Areas

The 1991 report included a description of 13 Locally Significant Areas (LSAs). Boundaries are shown in **Figure 9**. Differences in survey effort do not allow comparisons of species lists, as surveys may not have been conducted in 2020 because of the focus on areas for which information was scarce and over 10 years old. However, qualitative comparisons are shown in **Table 23.** Where comparison could be made, several broad differences between past and present LSA quality:

- 96.5% of the LSAs are encompassed by the Greenway System. The largest portions not included in the Greenway occur along the Rouge River and Little Rouge River, within the Highway 407 corridor. Most other differences are due to slightly different mapping of boundaries due to differences in recent ortho-rectified aerial photography.
- Communities noted within LSAs in 2020 were largely still extant, though with an increase in non-native species presence; especially noted was Common Buckthorn as a dominant in the shrub layer;
- In several areas, lowland forest was classified where previously swamps had been recorded. It is possible that this was because of differences in classification, as lowland forest was not an explicit category in previous classification schemes. However, it is also possible that increased evapotranspiration due to tree growth and reduced flooding have resulted in a decrease in soil moisture along floodplains, with a change from swamp to lowland forest.
- Evidence of human disturbance has increased in some areas, such as dumping, encroachment and trails; and
- Conversion of some marsh communities to stormwater facilities has resulted in increase in non-native species and increase in disturbance.

Table 23. Comparison of Locally Significant Areas of Markham in 1991 and 2020

LSA #	Locally Significant Area	1991	2020
1	Toogood Pond	This area is extensive and contains a diversity of biological communities and associated plants and animals. Most of this area consists of mixed coniferous-deciduous swamp, old field and open-water marsh. There is also a relatively large cattail marsh here. 8 types of vegetation documented: 4 palustrine and 4 terrestrial types.	15 Ecoseries documented in recent surveys;8 wetland and 7 terrestrial types (4 cultural). Mixed swamp and several deciduous swamps noted; loss of organic soil (exposed tree roots) reported in mixed swamp; many non-native species noted. Encompassed by Greenway System.
2	Milne Park	One of the largest natural areas in Markham, with extensive cattail marshes, open water marsh, and high-quality swamps. Large areas of upland forests and coniferous plantations contribute further to habitat diversity. 6 types of palustrine vegetation and 8 types of terrestrial vegetation documented.	Mixed swamps dominated by native species reported; diversity and high-quality vegetation documented in wetland evaluations. 2020 surveys indicated 16 vegetation ecoseries, including 7 wetland and 10 terrestrial (including 5 cultural) types. Rare communities include 1 beach and 1 tallgrass prairie unit. MNRF Wetland Evaluation notes the Milne Park wetlands are in generally good condition. There is some issue with stormwater runoff directly into some of the wetlands. The aquatic community in Milne Lake has been negatively impacted on by the introduced Common Carp. The invasive plants, European Alder (*Alnus glutinosa*), Purple Loosestrife (*Lythrum salicaria*), True Forget-me-not (*Myosotis scorpioides*) and introduced buckthorns (*Rhamnus cathartica*, *Rhamnus*

LSA #	Locally Significant Area	1991	2020
			frangula) occur in some of the wetlands. Encompassed by Greenway System.
3A	Little Rouge River South	One of the largest continuous natural areas in Markham, with extensive, high-quality examples of mature, terrestrial forests, floodplain and seepage slope, swamps and extensive old-field and shrub-rich old field. Nice beds of submerged aquatic vegetation along portions of the river. 5 types of palustrine vegetation and 10 types of terrestrial vegetation make it the most diverse area in Markham with the best wildlife habitat in Markham.	This area was noted in 2020 as still one of the largest, most continuous and highest-quality areas of Markham. The northern part of this area is still surrounded by farmland and there are few impacts of excessive use, trails, or encroachment, and few non-native species. High diversity of vegetation types with 7 wetland and 11 terrestrial ecoseries noted (6 cultural); rare ecoseries include beach and bluff. Small area within the Highway 407 corridor outside Greenway System.
3B	Little Rouge River North	Extensive area that contains a diversity of biological communities noted, with 5 types of palustrine vegetation and 8 types of terrestrial vegetation. The vegetation along most of the valley consists of old-field and grass-herb marsh. Deciduous swamp, shrub-rich old field and successional deciduous forest are also prevalent.	Wide variety of forest, swamp and cultural types present; encompassed by Greenway System.
4	German Mills Creek	Extensive area of high-quality, mature, "spectacular" mixed coniferous-deciduous forest along the valley slopes and mature	7 terrestrial ecoseries (4 cultural) and 4 wetland ecoseries; several instances of encroachment and disturbance noted including wooden

LSA #	Locally Significant Area	1991	2020
		deciduous forest on the tableland; 4 types of palustrine vegetation and 6 types of terrestrial vegetation are represented	structure, mowing and litter, hazard tree removal drainage pipe from a backyard draining into creek. Encompassed by Greenway System.
5	Warden Hemlock Woods	Plant communities of high quality including best example of mature mixed coniferous deciduous forest in Markham and excellent examples of deciduous swamp and floodplain mixed coniferous-deciduous swamp composed of white cedar and white ash; 3 types of palustrine vegetation and 6 types of terrestrial vegetation present.	5 wetland and 7 terrestrial (4 cultural) ecoseries recorded; Hemlock – Sugar Maple mixed forest and mixed swamp described as good quality in 2020 – Common buckthorn noted as one of the dominants in the shrub layer of both communities; report that a portion of deciduous swamp was destroyed by construction; largely encompassed by Greenway System except for small portions between the two creeks and a narrow tongue of vegetation that extended west are outside the Greenway System.
6	Robinson Creek Headwater Swamp	Natural vegetation consists mostly of swamps, grass-herb marsh, and old-field vegetation. Although much of this vegetation is disturbed, there are a number of areas which were probably never grazed, and high-quality vegetation is present here. 4 types of palustrine vegetation and 4 types of terrestrial vegetation.	Not studied in 2020 but there is recent data from the Subwatershed Study and TRCA; 6 wetland and 9 terrestrial (6 cultural) communities recorded with Black Ash, Eastern White Cedar and Swamp Maple-dominated swamp reported, but no information on dominants in lower layers, meadow is still mapped but some of the meadow has succeeded to more treed communities including

LSA #	Locally Significant Area	1991	2020
			cultural savannah and woodland. Encompassed by Greenway System.
7	Milnesville Swamp	Excellent example of mature deciduous swamp, dominated by extremely massive specimens of silver maple. The northern and southern sections of this natural area consists of deciduous swamp. The area between these is dominated by old-field, grass-herb marsh, and shrub-rich old field Number of communities is not reported.	3 wetland and 4 terrestrial (3 cultural) ecoseries noted; swamp dominated by Silver Maple, meadow marsh dominated by Reed Canary-grass and cultural communities in varying states of succession catalogued within this area by TRCA and the Subwatershed Study but recent field work not specifically noted. Encompassed by Greenway System.
8	Robinson Creek	This area contains high quality mixed coniferous-deciduous swamp on seepage slopes and along the floodplain, and deciduous swamps along the floodplains. There are coniferous plantations on the tableland adjacent to either side of the creek, and a small but good-quality cattail marsh occurs along the floodplain. Number of communities is not reported.	2 wetland and 4 terrestrial (2 cultural) ecoseries noted, with several lowland forest communities recorded (including deciduous and cedar-hardwood) but swamp communities not recorded; non-native invasive species reported as occasional to dominant in polygons studied in 2020; extensive trails and dumping in some areas, Common Buckthorn reported as a dominant in both the shrub layer and ground later of many communities; cattail shallow marsh reported to be a stormwater management facility with abundant invasives and other disturbances. Encompassed by Greenway System.

LSA #	Locally Significant Area	1991	2020
9	Rouge River Markham	High-quality examples of mature deciduous forest on tableland and mature mixed coniferous – deciduous slope forest; 4 types of palustrine vegetation and 8 types of terrestrial vegetation present.	No recent field data but ELC mapping shows a variety of forest and swamp types; encompassed by Greenway System except along Highway 407 corridor and a small area along east edge north of Highway 407.
10	Morningside Creek	Exceptional example of mature mixed coniferous-deciduous forest and floodplain, and interfluvial tableland forest. High-quality deciduous swamps are found along the floodplains	3 wetland and 4 terrestrial (3 cultural) ecoseries recorded, which include mixed forest dominated by native species (including White Ash); community classifications include lowland forest but no swamp communities; quality not recorded. Encompassed by Greenway System.
11	Rouge River South	An excellent example of mixed coniferous-deciduous swamp on a seepage slope, and mature deciduous, coniferous and mixed deciduous-coniferous forest on the slope and toe of the west bank; old-field vegetation occurs between the swamps and the river.	5 wetland and 6 terrestrial (four cultural) ecoseries recorded, including white cedar-hardwood mixed swamp, and fresh-moist white cedar – sugar maple mixed forest. Encompassed by Greenway System.
12	Box Grove Forest	The largest stand of mature deciduous forest in Markham is found here. It is of excellent quality, showing little evidence of human disturbance. Mixed coniferous-deciduous and deciduous swamp occur to the north and along the creek floodplain; a	3 wetland and 7 terrestrial (including 4 cultural) ecoseries; several lowland forests and deciduous swamp described but no mixed swamps recorded; non-native species reported as abundant to dominant in forest communities; Common Buckthorn and ash species reported

LSA #	Locally Significant Area	1991	2020
		large area of successional deciduous forest occurs in the northwestern section.	as one of the dominants in the understory in several communities; dumping, tracks and trails recorded as light; moderate recreation impacts in mixed forest. Encompassed by Greenway System.
13	Petticoat Creek Swamp	A high-quality deciduous swamp is found here. There is also mature deciduous forest, successional forests and shrub-rich old-field present	Forest and swamp mapped in recent ELC but no detailed data available. Encompassed by Greenway System.

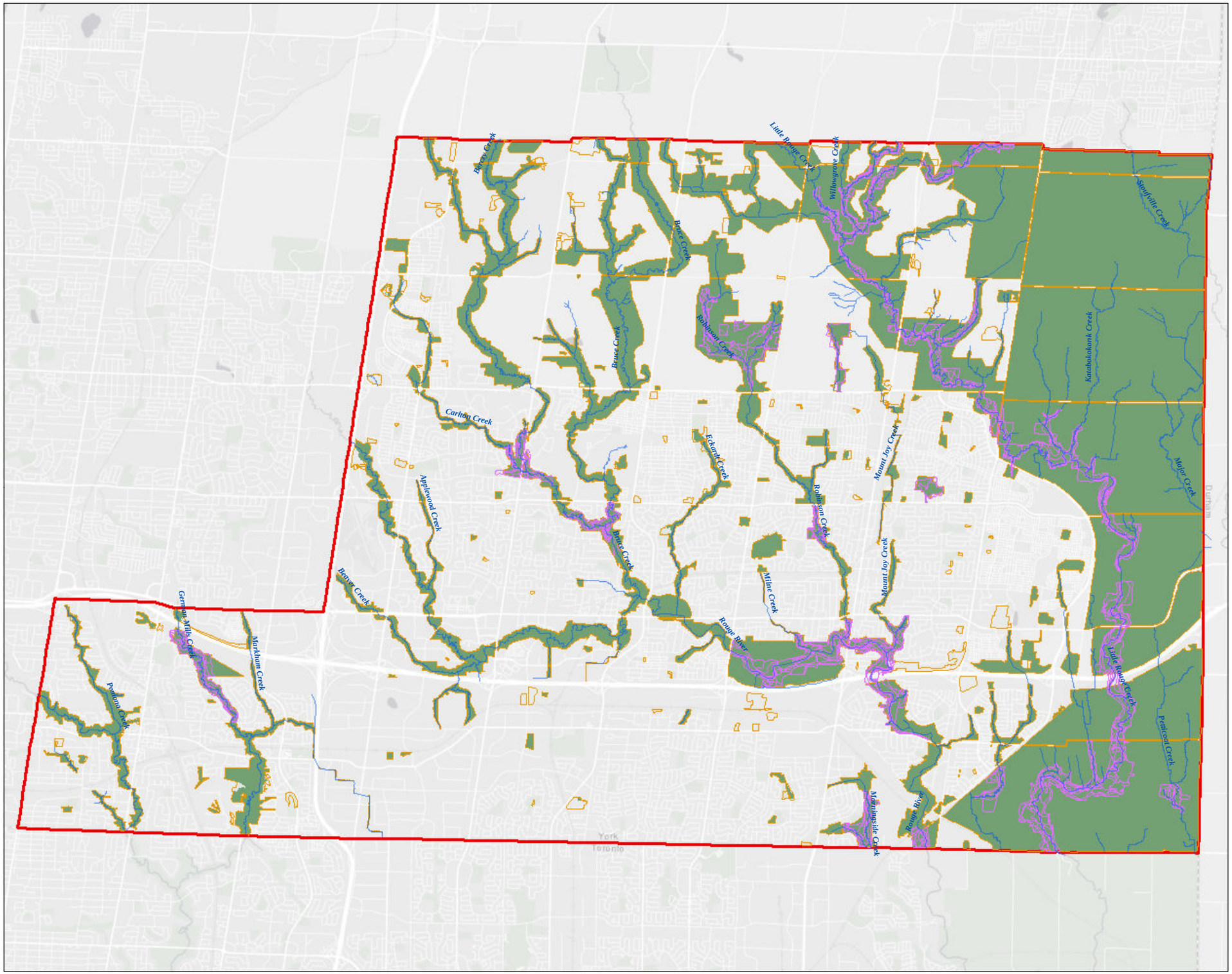

Figure 9 | Markham Natural Features Inventory:
Locally Significant Areas Mapped in 1991 Relative to Markham's Greenway System

Legend

- Markham Boundary
- Locally Significant Areas
- Study Area
- Markham Greenway System (2014)
- Watercourses

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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7. Evaluation of the Greenway System

7.1. Comparison with Federal, Provincial and Municipal Standards

The third edition of Environment Canada's "How Much Habitat is Enough" provides some standards by which the amount of habitat protected by the Greenway System can be assessed. Guidelines for assessing Significant Woodlands, Significant Valleylands and Significant Wildlife Habitat provide an assessment of whether the Greenway System incorporates some or all of the features that are of highest priority for protection in the Provincial context.

7.1.1. Federal Standards

Table 24 provides guidelines for the type and amount of habitat that should be protected according to Environment Canada's "How Much Habitat is Enough?", according to the amount of habitat that remains and proximity of watercourses, wetlands and terrestrial vegetation. These guidelines are meant to apply to non-urban watersheds (Environment Canada 2013), and so are not directly applicable at a city-wide scale in a highly urbanized landscape like Markham, but they provide valuable principles for protection. Reviewing these benchmarks within the remaining rural landscape can be done as future development proceeds (as was done in the Markham Future Urban Area Subwatershed Study) and can be a useful step to understand the potential strengths and threats to the Greenway System. Most of Markham is within the Rouge River watershed.

Table 24. Wetland, Riparian, Forest and Grassland Guidelines Recommended by Environment Canada 2013

Habitat	Natural Heritage Network
The greater of a) 10% of each major watershed and 6% of each subwatershed or b) 40% of the historic watershed wetland coverage, should be protected and restored	This extent of watershed protection is not possible in Markham's most urban areas, but the eastern part of the watershed is still agricultural, and these principles can provide guidance
Particular wetland functions can be achieved by rehabilitating wetlands in key locations, such as headwater areas, floodplains and coastal wetlands	Naturally-vegetated headwaters and floodplains are largely protected within the Greenway System
Protection Zones should protect the wetlands from stressors. Recommended widths should consider sensitivities of the wetland and the species that depend upon it, as well as local environmental conditions, vegetative structure of	Wetlands along watercourses are bordered by forests, meadows and successional areas within the Greenway System. In some cases, development along forest edges is encroaching on forest function, and this will have indirect effects on wetland function.

Habitat	Natural Heritage Network
the Protection Zone, and nature of the changes in adjacent land uses.	Markham's policies require inclusion of wetlands as Key Natural Heritage Features.
Wetlands that are in close proximity to each other, based on their functions, or that are in close proximity to other natural heritage features, should be given a high priority in terms of landscape planning	Wetlands in close proximity along watercourses are protected within the Greenway System
Capture the full range of wetland types, areas and hydroperiods that occurred historically within the watershed. Swamps and marshes of sufficient size to support habitat heterogeneity are particularly important, as are extensive swamps with minimum edge and maximum interior habitat to support area-sensitive species	All of the swamps and marshes identified as the largest, most diverse and highest quality in 1991 have been protected within Markham's Greenway System. Several wetlands with high interior-to-edge ratios are included, such as Toogood Pond and Milne Park.
Focus on restoring marshes and swamps	All marshes and swamps identified in the 1992 Natural Features Study are included in Markham's Greenway System.
Riparian Habitat	
Both sides of streams should have a minimum 30-m-wide naturally vegetated riparian area to provide and protect aquatic habitat. The provision of highly functional wildlife habitat may require total vegetated riparian widths greater than 30 m	Larger, high quality streams (the Rouge River and Little Rouge River) have a naturally vegetated riparian area that is wider than 60 m for most of their length. In many cases, riparian corridors extend further than 30 m from streams. Many smaller tributaries and streams in the western part of Markham have riparian habitat that extends less than 30 m
75% of stream length should be naturally vegetated	The Greenway System protects streams in a naturally vegetated corridor
Urbanizing watersheds should maintain less than 10% impervious land cover in order to preserve the abundance and biodiversity of aquatic species	Urbanized parts of Markham are well over 10% impervious. It is likely not possible to maintain less than 10% impervious cover in the urbanizing areas of Markham even in watersheds within the Greenway System.

Habitat	Natural Heritage Network
	However, increase in impervious cover is being limited within the Greenway System in less urbanized parts of Markham, especially along the Little Rouge River.
Forest Habitat	
30% forest cover at the watershed scale is the minimum forest cover threshold.	Overall, Markham has 7.85% forest cover; the legacy of farming and subsequent urbanization precludes restoration of this minimum forest cover.
A watershed or other land unit should have at least one, and preferably several, 200 ha forest patches (measured as forest area that is more than 100 m from an edge)	Forest patches of that size are not found in Markham. The largest patch of natural habitat in the Greenway System is over 600 ha (located in northeast Markham surrounding the Little Rouge Creek and Reesor Road), and though this patch contains agricultural land, there may be context for creating forest patches of this size.
To be of maximum use to species such as forest breeding birds that are intolerant of edge habitat, forest patches should be circular or square in shape	Forest patches that are circular or square in shape occur along the Little Rouge River and Rouge River, as well as sporadically in the western part of Markham. The Greenway System agglomerates several patches with the ultimate goal of restoring well-configured forest patches in Markham
The proportion of the watershed that is forest cover and 100 m or further from the forest edge should be greater than 10%	The legacy of urbanization in Markham has meant that this proportion of forest cover is not achieved in Markham
To be of maximum use to species such as forest birds and other wildlife that require large areas of forest habitat, forest patches should be within two km of one another or other supporting habitat features. "Big Woods" areas, representing concentrations of smaller forest patches as well as larger forest patches, should be a cornerstone of	The Greenway System protects linkages of forest patches within two km of each other and supporting habitat features, with several nodes that encompass potential "big woods" areas

Habitat	Natural Heritage Network
protection and enhancement within each watershed or land unit	
Connectivity width will vary depending on the objectives of the project and the attributes of the forest nodes that will be connected. Corridors designed to facilitate species movement should be a minimum of 50 to 100 m in width. Corridors designed to accommodate breeding habitat for specialist species need to meet the habitat requirements of those target species and account for the effects of the intervening lands (the matrix)	Over 99% of the Greenway System is connected by corridors over 60 m in width. Connectivity within the Greenway System is greatest in the eastern part of the Rouge and Little Rouge watersheds, with corridors over 200 m wide; corridors in the western watersheds and western portion of Rouge watershed are primarily narrower than this.
Watershed forest cover should be representative of the full diversity of naturally occurring forest communities found within the ecoregion. This should include components of mature and old growth forest	All forest types identified by the 1992 Markham Natural Features study, which likely included a broad cross-section of historic vegetation communities present on the landscape during the agricultural period, are found in the vegetation mapping in the 2020 natural features study.
Grassland Habitats	
Focus on restoring and creating grassland habitat in existing and potential grassland landscapes	Large areas of grassland persist along the Rouge River and Little Rouge River; enhancement areas in the Greenway System promote the persistence of grasslands in the short term
Maintain, restore and create native grassland patches to their historic extent and type at a county, municipal and/or watershed scale considering past presence and current conditions	Opportunities persist in the eastern part of the Little Rouge watershed to restore some grassland habitat
Grassland habitat patches should be clustered or aggregated, and any intervening land cover should be open or semi-open in order to be permeable to species movement.	Grassland patches are clustered in the eastern part of the Greenway where agricultural land persists

Habitat	Natural Heritage Network
Maintain and create small and large grassland patches in existing and potential local grassland landscapes, with an average grassland patch area of greater than or equal to 50 ha and at least one 100 ha patch.	The large areas within the Greenway System create opportunities for grassland restoration though this must be balanced with the fact that most of the Markham watersheds were forested prior to settlement; grasslands likely occurred as small openings
Some grassland habitat should be located adjacent to hedgerows, riparian and wetland habitats for species that require different habitat types in close proximity	Grassland patches occur in a primarily agricultural landscape where there is a mosaic of different habitats.

7.1.2. Provincial Standards

Natural heritage features of provincial significance are set out in the Provincial Policy Statement. Guidelines and criteria for determining features of provincial significance are set out in the Natural Heritage Reference Manual (MNR 2010), the Greenbelt Plan Technical Papers, and the Oak Ridges Moraine Technical Papers. Since determination and mapping of Significant Woodlands is a municipal task, the Region of York's Significant Woodland criteria interact with provincial guidance. Other supporting documents include the Ecoregion Schedules for determining Significant Wildlife Habitat (MNR 2015), as well as guidance in the Significant Wildlife Habitat Technical Guide (MNR 2000). Many areas within the Greenway System meet the criteria for significant areas, including Significant Woodlands, Significant Valleylands, and Significant Wildlife Habitat. Provincially Significant Wetlands have been mapped by MNRF within the City of Markham (**Figure 8**). **Table 25** provides a summary of provincially significant features within the City of Markham, as well as the amount of habitat for features that have been mapped.

Table 25. Provincially Significant Features within the City of Markham

Feature	Area	Comment
Significant Wetlands	510 ha	Mapped by the Ontario Ministry of Natural Resources and Forestry; **Figure 8.** 98% are mapped within the Greenway System
Significant Woodlands	1313 ha	Mapped on the basis of aerial photography; 94% of Woodlands in Markham that may qualify as significant woodlands on the basis of preliminary significant

Feature	Area	Comment
		woodland mapping (using GIS analysis only) are encompassed by the Greenway System
Significant Valleylands	Not Mapped	Not Mapped; however all large river valleys are encompassed by the Greenway System.
Significant ANSIs	Candidate Life Science ANSI: 72.24 ha	Mapped by the Ontario Ministry of Natural Resources and Forestry; all encompassed by the Greenway System
Significant Wildlife Habitat	Not Mapped	The following types of SWH were noted in the Greenway System in Markham surveys, though habitat is not mapped: • Turtle wintering areas (Toogood Pond, Milne Park) • Rare vegetation communities (Tallgrass Prairie) • Woodland Raptor Nesting Habitat • Seeps and Springs • Amphibian breeding habitat (wetlands) • Area-sensitive breeding bird habitat • Marsh breeding bird habitat • Habitat for special concern and rare wildlife species • Background information indicates there are other types of SWH within the Greenway System as well, such as Waterfowl Stopover and Staging Areas (Aquatic), • The Greenway likely supports SWH for bat maternity roost habitat and reptile hibernacula

Despite amphibian surveys that surveyed the same habitat multiple times, no Significant Wildlife Habitat for breeding woodland amphibians was noted. Amphibian breeding habitat for wetland species mainly met the criteria for SWH because they provided breeding habitat for American Bullfrog, but the numbers of species and individuals was not sufficient to indicate SWH for other wetland amphibian species.

7.1.2.1. Provincially Significant Wetlands

The following wetlands have been evaluated as Provincially Significant by MNRF, according to the Ontario Wetland Evaluation System protocols for southern Ontario. They are shown in relation to Markham's wetland cover and the Greenway System in **Figure 10**. A brief summary of the wetland significance as described by MNRF is provided below. MNRF has recently mapped additional wetlands in the City of Markham, and this mapping is provided in Appendix 5.

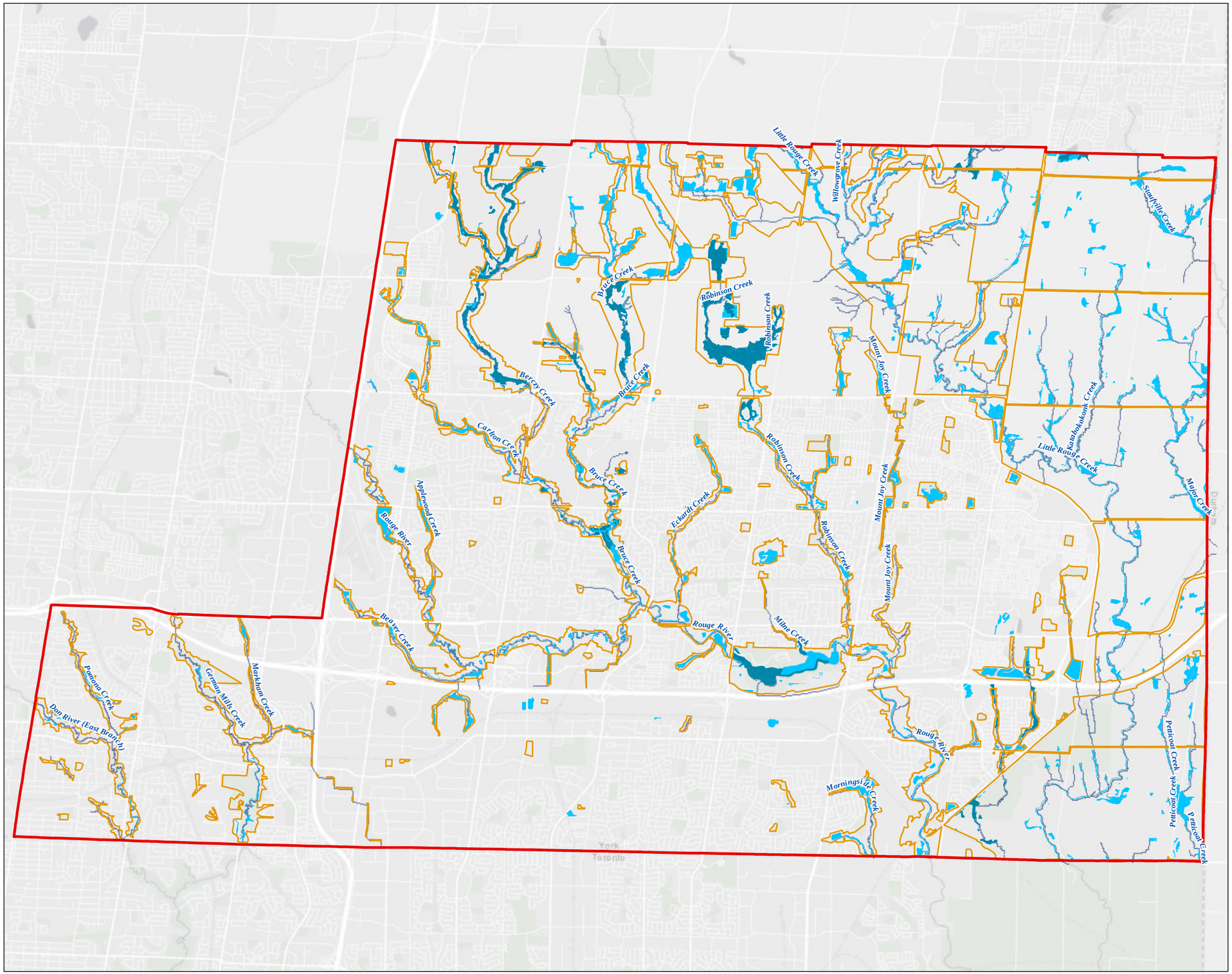

Figure 10 | Markham Natural Features Inventory:
Wetland Cover and Provincially Significant Wetlands Relative to Markham's Greenway System

Legend

- Markham Boundary
- Markham Greenway System (2014)
- Watercourses
- Wetlands (Ecological Land Classification)
- Provincially Significant Wetlands (LIO)

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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- Bruce & Berczy Creek Wetland Complex
    - The wetland complex captures the diversity of wetland types along the Bruce and Berczy Creeks. It consists largely of riverine wetlands with scattered isolated wetlands, and a few palustrine wetlands mostly on clay loams. The creeks support coldwater Rainbow Trout (*Oncorhynchus mykiss*) and Redside Dace (*Clinostomus elongatus*) habitat maintained by numerous seeps. The dominant wetland vegetation forms are deciduous swamps and graminoid marshes followed by herbaceous marshes, cattail marshes, coniferous swamps, and, and the occasional thicket swamps and open water aquatic communities. The wetlands support a diversity of 40 vegetation communities, as well as 456 plant species and 87 breeding bird species in the wetlands and adjacent lands.
- Cedar Grove Wetland Complex
    - The wetland complex captures the diversity of wetland types along the entire section of a major tributary of the Little Rouge Creek. It consists entirely of palustrine wetlands, all of which occur on loams. The dominant wetland vegetation forms are deciduous swamps followed by narrow-leaved emergent marshes. Less frequent are thicket swamps, cattail marshes, herbaceous marshes, and free-floating open water marshes. The wetlands support a diversity of 67 vegetation communities (37 vegetation forms), as well as 552 plant species, 75 breeding bird species, 45 dragonfly and damselfly species, and 17 reptiles and amphibians in the wetlands and adjacent lands.
- Little Rouge Creek at Stouffville Wetland Complex
    - The wetland complex captures the diversity of wetland types along the upper portion of Little Rouge River. It largely consists of groundwater-fed palustrine and riverine wetlands on loams with the dominant vegetation deciduous swamp and narrow-leaved emergent marsh followed by conifer swamp, robust emergent marsh, ground cover marsh, tall shrub swamp, and unvegetated open water.
- Milne Park Wetland Complex
    - The wetland complex captures the diversity of wetland types along this mid-section of the Rouge River watershed. It consists largely of riverine wetlands on bottomland clay loams. The dominant wetland vegetation forms are submergent open water marshes, followed by a conifer-dominated swamp, cattail or robust-emergent marshes, deciduous swamps and graminoid or narrowleaved emergent marshes. The wetlands and adjacent lands support 8 different vegetation communities, as well as 272 plant species, 38 breeding bird species and a warmwater fisheries.
- Unionville Marsh Wetland Complex
    - The wetland complex captures the diversity of wetland types along this mid-section of the Rouge River watershed. It consists of palustrine and riverine wetlands, largely on loam soils. The dominant wetland vegetation forms are robust-emergent marshes, followed by narrow-leaved emergent (graminoid) marshes, ground cover (herbaceous)

marshes, deciduous swamps, tall shrub (thicket) swamps, submerged open water marshes, and free-floating open water marshes.

Two additional wetlands have been evaluated by MNRF as locally significant:

- Greensborough Wetland Complex
    - The wetland complex captures the diversity of wetland types in the Greensborough neighbourhood. It supports 7 vegetation communities on clay loams. The dominant wetland vegetation forms are deciduous swamps, followed by a thicket swamp and a robust emergent marsh.
- Milnesville Wetland Complex
    - The wetland complex includes three individual wetlands, consisting of deciduous swamp, thicket swamp and shallow marsh, dominated largely by native species, including the marsh which was dominated by native cattail. The marsh does not contain significant amounts of open water.

7.1.2.2. Areas of Natural and Scientific Interest (ANSIs)

ANSI's (Areas of Natural and Scientific Interest) are polygon features that represent lands and waters containing important natural landscapes or features that are important for natural heritage, protection, appreciation, scientific study or education. One Candidate Life Science ANSI is situated in Markham: the Robinson Swamp. It is shown in **Figure 11**. ANSIs are selected by MNRF using an established approach. Life Science ANSIs are selected to encompass the most intact vegetation communities that best represent significant landform/vegetation associations in a given Ecodistrict using the following five criteria: representation, condition, diversity, other ecological considerations (e.g., ecological and hydrological functions, connectivity, size, shape, proximity to other important areas), and special features (e.g., populations of species at risk, rare habitats).

7.1.2.3. Significant Woodlands

Significant Woodlands are protected by the Provincial Policy Statement. Significant woodland mapping is a municipal responsibility, and is based on the application of significant woodland definitions in the York Region and Markham Official plans and confirmed through an Environmental Impact Studies. The City of Markham has previously mapped woodlands using sources such as York Region's woodland mapping, TRCA mapping and Markham mapping. Woodland cover (a term used to encompass all wooded communities, including swamps, cultural woodlands and forests) is shown for the study area in **Figure 12**. Additional areas of woodlands occur outside the study area, but they have not been recently mapped.

Figure 11 | Markham Natural Features Inventory:
Candidate ANSIs Relative to Markham's Greenway System

Legend

- Markham
- Markham Greenway System
- Candidate ANSI: Life
- Watercourses

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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7.1.3. Municipal Standards

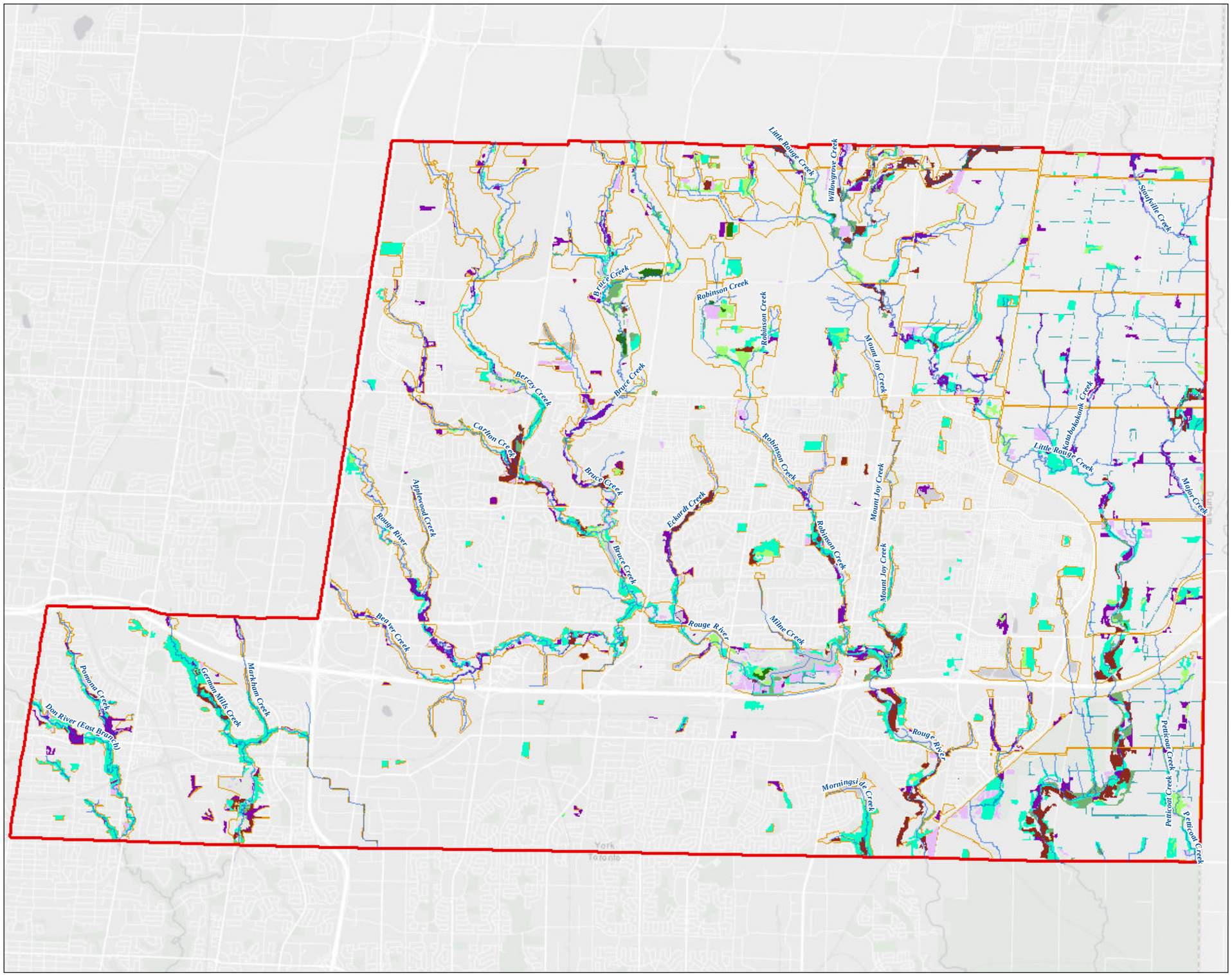
7.1.3.1. Markham's Greenway Criteria

The City of Markham's Official Plan policies state that the Greenway should encompass a) natural heritage and hydrologic features; b) vegetation protection zones associated with the features identified in 3.1.2.1a); and c) hazardous lands and hazardous sites.

Key hydrologic features include wetlands, lakes and their littoral zones, permanent streams and intermittent streams, and seepage areas and springs. These features continue to form the core of the Greenway System.

Key natural heritage features include the habitat of endangered and threatened species, and habitat of special concern species including provincially rare species as provided for in the Greenbelt Plan and Oak Ridges Moraine Conservation Plan, fish habitat, wetlands, Life Science Areas of Natural and Scientific Interest, significant valleylands, significant woodlands, significant wildlife habitat, and sand barrens, savannahs and tallgrass prairies. **Table 26** indicates that of the habitat types documented in the City (excluding anthropogenic habitat such as manicured and mowed areas), 97% occur within the Greenway. This includes 95% of wetlands (98% of Provincially Significant Wetlands), 97% of woodlands, and 93% of cultural communities (with the caveat that there may be cultural vegetation outside the Greenway System that is not mapped). Large amounts of agricultural lands remain within the Greenway (associated with the Greenbelt Plan). These habitats provide habitat for the majority of endangered, threatened and special concern species, significant wildlife habitat, and provincially rare species in Markham.

Figure 12 | Markham Natural Features Inventory:
Woodland Cover Relative to Markham's Greenway System



Legend

- Markham Boundary
- Markham Greenway System (2014)
- Watercourses

Wooded Area (Ecological Land Classification)

- Tree Bluff
- Cultural Plantation
- Cultural Woodland
- Treed Fen
- Coniferous Forest
- Deciduous Forest
- Mixed Forest
- Hedgerow
- Coniferous Swamp
- DeciduousSwamp

0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 Km

Project Number	Date:	N
20-1131	2021-04-22	

north-south ENVIRONMENTAL

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Table 26. Areas of vegetation ecoseries within and outside the Greenway (note that the analysis for areas outside the Greenway System is approximate as current vegetation mapping was not available, so the analysis relied on older sources of data)

Vegetation Type	Area within Greenway (ha)	Area Outside Greenway (Ha)
Marsh		
Open Water and Aquatic (OAO, SA (S,M, F))	170.52	7.82
Shallow Marsh (MAS)	58.40	1.52
Meadow Marsh (MAM)	238.71	26.05
Thicket Swamp (SWT)	51.56	1.35
Treed Fen (FET)	0.19	0
Swamp		
Deciduous Swamp (SWD)	161.44	2.34
Coniferous Swamp (SWC)	18.82	0
Mixed Swamp (SWM)	54.62	1.38
Cultural		
Cultural Meadow (CUM)	722.50	59.13
Cultural Thicket/ Cultural Savannah (CUT, CUS)	208.81	17.97
Cultural Plantation (CUP)	155.62	2.14
Cultural Woodland (CUW)	258.50	18.86
Beach/Bar and Bluff		
Gravel Beach/Bar (BBO)	1.29	0
Shrub Beach (BBS)	0.66	0
Open Bluff (BLO)	0.44	0.27
Treed Bluff (BLT)	0.06	0
Mature Forest		
Deciduous (FOD)	605.43	21.39
Coniferous (FOC)	90.33	0.23
Mixed Coniferous-Deciduous (FOM)	204.99	1.89
Anthropogenic		
Agriculture (AGR)	3195.71	unknown
Hedgerow	70.53	unknown
Prairie (TPO) (Planted)	0.62	0

8. Connectivity

The Greenway System consists of a mosaic of woodlands, successional habitat and wetlands, connected by riparian habitat along watercourses. Over 78% of the Greenway System habitat patches

are linked by corridors that are a minimum of 50 m wide, as recommended by Environment Canada (2013), and 62% of habitat patches are linked by corridors 100 m wide. There are approximately 41 patches that are not linked making up roughly 103.5 ha or 1.5 % of the Greenway. The protection of larger nodes of habitat, and connections between nodes, as well as the width of the riparian areas, has been critically important to the protection of biodiversity. However, one of the bird guilds that appears to be declining is those species that breed along open riparian corridors. Protection of additional areas along watercourses would provide additional habitat for these species.

Corridor function could also be improved by ensuring that buffers are implemented adjacent to habitat areas, and along watercourses, increasing the width of corridors and providing additional successional areas and space for breeding birds; as well as other less well-studied organisms that provide a foundation for the ecosystem such as small mammals and insects.

East-west connections are also important for connectivity. Individual linear north-south corridors along creeks and rivers that encompass much of Markham's natural heritage were somewhat connected in the past by farmland. While farmland did not provide a sufficient linkage for the full range of movement of animals and plants, in spring, soils were moist and there were many depressions that would provide habitat for small, sedentary species that needed to cross to other watercourses, especially from those that are narrow and have low diversity. The growth of crops in the summer provided cover for wildlife movement. As urban habitat surrounds north-south corridors, the connection between the corridors is severely impaired as there is little potential for movement of animals across the extensive roads and impervious landscape. East – west linkages are critical for providing connectivity between corridors and avoiding species loss as riparian corridors become more isolated. East-west connections are rare in Markham, but occur in the central part of the watershed along the Rouge River, through Milne Park.

The City has established a major east-west linkage north of Elgin Mills Road identified as Natural Heritage Network Enhancement Lands – Core Linkage Enhancements in the Official Plan 2014. This linkage is intended to provide wildlife corridors and mitigate the reduction in connectivity among natural features as agricultural land are urbanized.

The connectivity of Markham's Greenway System to the natural heritage systems of neighbouring municipalities should continue be considered in policies for maintenance and enhancement of the Greenway System.

9. Areas of Ecological Importance

The importance of Little Rouge River and the Rouge River corridors cannot be overstated. The Little Rouge River corridor, in particular, is still largely surrounded by farmland, which affords greater connectivity between habitat than urban development. The habitat nodes along these watercourses are larger than elsewhere in Markham, and more diverse. These two corridors are also important from the perspective of aquatic and riparian habitat. Policies on methods of protecting and improving

water quality and preventing erosion in these systems should be expanded to ensure the long term health of these corridors. Other areas of exceptional diversity and quality include Morningside Creek in the southern part of the City.

Wetlands harbour high diversity in relation to their size, and each additional wetland that can be brought into the Greenway System contributes to biodiversity. However, all parts of the Greenway System contribute to the biodiversity of the system as a whole.

Areas of Local Significance (as described in Section 6.5) continue to harbour special features, some of which have been degraded by encroachment from adjacent residential development, use of wetland features as stormwater treatment facilities, and non-native species invasion.

10. Long-Term Monitoring Framework

More regular monitoring of natural areas would help the City to ensure the long-term health and sustainability of natural areas. Monitoring can be used to evaluate the results of future management strategies including any efforts to manage invasive species and undesirable disturbances and encroachment, A long-term monitoring framework, conducted every five years, should contain the following elements:

1. Rigorous monitoring of non-native invasive species should be conducted at selected locations as part of a scientifically-designed invasive species management plan (See Section 11.2).
2. Compliance monitoring should continue to be conducted to monitor the after-effects of development: including compliance with recommendations of development agreements and adherence to municipal policies. Monitoring should particularly include:
    - Aerial photo monitoring to determine whether buffers have been respected, by developers during construction and, following occupation, by neighbouring residents, and determine the most severe areas of impacts of encroachment from neighbouring development, particularly residential development. Where impacts are taking place, consideration should be given to managing the edge impacts by constructing fences, screening natural vegetation, or educating landowners.
    - Monitoring on the ground to determine the impacts of people on natural areas, including monitoring user-created trails, unauthorized bicycle and vehicle impacts, off-leash dogs, dumping, party spots and associated trampling and vegetation destruction.
3. Effectiveness Monitoring should be conducted to determine the efficacy of mitigation measures. A long-term biological monitoring program should be designed to monitor biodiversity within a selection of small and large sites, including, for example,
    a. diversity of native spring ephemerals, tree cover and other measures of forest and wetland change,
    b. biodiversity within areas that have been identified as hotspots of flora biodiversity in this study and in the 1992 study;
    c. breeding birds, and

   d. woodland-breeding amphibians in sites where they were found. Additional effort should be made to find and monitor new amphibian monitoring sites to determine if there is additional diversity of species, especially woodland breeding amphibians, within the Greenway System. Citizen Science monitoring databases may help in collection of new data, but it must be acknowledged that there are some difficulties with using these databases for monitoring: the methods used to find species may not be consistent, the documentation of species and conditions may not include enough information for comparison, and skills of observers may not be consistent. However, if guidance is provided on documentation and survey methods, valuable information can be derived from these sources.

4. Monitoring of road crossings within the Greenway System should be conducted to determine whether there is evidence of road-kill, particularly of amphibians and reptiles. This monitoring entails night-time patrolling of roads and identification of road-killed animals, so it should be done by experienced individuals. Should high levels of mortality be observed at road crossings, consideration should be given to facilitating the crossing and implementing crossing structures to reduce mortality.

A framework for reporting monitoring results, and for the City to review monitoring results, should be implemented. The framework should include thresholds used as indicators of problems, with a rigorous plan of next steps that need to be implemented, should monitoring indicate that the Greenway System is not functioning as required.

11. Conclusions and Recommendations

11.1. Conclusions

Natural vegetation in Markham is largely centred around watercourses, as it was in 1992. Biodiversity of fauna and flora in Markham has remained similar to what was reported in 1992, with similar numbers of species reported. The less-developed eastern part of the study area along Little Rouge River is responsible for approximately 60% of the habitat areas recorded. Similar to the findings in the 1992 study, forests are largely dominated by Sugar Maple and Eastern White Cedar, with little forest dominated by shade-intolerant species such as oak. Swamps are largely dominated by non-native species (Hybrid Willow and Manitoba Maple), while marshes are limited, mainly dominated by the non-native species Reed Canary-grass, as in 1992. One change in forest composition appears to have occurred since 1992: Black Walnut is a common component of forest in 2020, but was not common in 1992. This species was widely planted by farmers, likely in the 1960s and 1970s, and so may have increased in size to the point where it became dominant only in recent years. However, this species is also spread by Grey Squirrel (*Sciurus caroliniensis*) (BhaduriHauck 2015), which may be more abundant than in 1992 as it is well adapted to urban areas.

All significant areas (e.g. Provincially Significant Wetlands and Candidate ANSIs, Locally Significant Areas) identified in the 1992 study have remained undeveloped, though some areas show impacts of trails, encroachment, dumping and stormwater development.

Fewer farms occur adjacent to Markham's watercourses than in the past, and there were few farming-related disturbances were noted within the Greenway System such as livestock grazing and fuel-wood logging. However, non-native invasive species have become much more prevalent since the 1992 study. However, there continue to be areas where vegetation quality is very high, particularly along Little Rouge River on the eastern side of Markham, along Morningside Creek (a tributary of the Rouge River) in the southeastern part of Markham. Some of the invasive tree species reported in other parts of the GTA have not invaded Markham to the same degree, most notably Norway Maple, Black Alder, European Birch and Glossy Buckthorn. However, some of the invasive ground-layer species (Common Buckthorn, Dog-strangling Vine and Garlic-mustard) are common and widespread, though they have not become as pervasive as they are within the GTA.

Most of the wetlands and woodlands, and the habitat for significant species that they support, are protected within the Greenway System. Grasslands largely occur within the eastern part of the Greenway System, within the Rouge River Urban Park.

11.2. Recommendations

11.2.1. Inclusion of Areas and Adjustments in the Greenway System

The Greenway System encompasses approximately 33 percent of the land base in Markham, comprised of Natural Heritage Network lands, Natural Heritage Network Enhancement Lands, Rouge Watershed Protection Area lands, Oak Ridges Moraine Conservation Plan Area lands, Greenbelt Plan Area lands and certain naturalized stormwater management facilities as identified in Markham's Official Plan (2014).

It is recommended that the City review the natural heritage data provided in the study against the City's current database, particularly the ELC and wetland data (including MNRF's recent wetland mapping provided in Appendix 5) and determine where adjustments to the Greenway System should be considered in the next review of the Official Plan. Opportunities should particularly be sought to incorporate all wetlands outside the Greenway System into the System, including those mapped by MNRF in Appendix 5. If possible, opportunities should be explored to link isolated portions of the Greenway System. For example, the isolated evaluated wetlands at Milnesville Swamp could be connected to the northeast with the Mount Joy Creek and Little Rouge Creek corridors. East-west linkages should be created where opportunities exist. For example, there is a major east-west connection north of Elgin Mills Road in the north between the Bruce Creek, Berczy Creek, Robinson Creek and Little Rouge River. The City should continue to support and actively implement the major east-west ecological corridor identified as Natural Heritage Network Enhancement Lands: Core linkage Enhancements in the Official Plan 2014.

It is also recommended that the City consider a policy protection framework for the most significant areas of successional lands remaining in the City, as successional habitat is associated with additional faunal diversity, especially of open- or thicket-nesting bird species that are declining due to habitat loss. Criteria would need to be developed and protection of successional areas would need to be balanced against other municipal priorities for growth management. In addition, it would need to be recognized that maintenance of successional areas may be inappropriate in many successional areas as prior to settlement, most of Markham was likely forested, with few areas remaining naturally open unless maintained by fire or indigenous people. Maintenance of successional vegetation may be prohibitively labour-intensive in the long term. The management of successional areas may be most appropriate as interim management (for example, to remove non-native invasive shrubs) prior to their succession to forest. With this in mind, successional areas could include areas strategically located to contribute to forest function, such as larger buffers and stormwater management areas. Criteria within the Ecoregion Schedules for Ecoregion 6E and 7E may provide guidance on successional areas to consider, such as grassland areas of 30 ha or larger and thickets of 10 ha or larger. The City should review opportunities where these lands could support locations identified in the Official Plan for natural heritage core area and/or core linkage enhancement lands. The City should also review where successional lands overlap the Greenway System and adjacent tablelands and explore feasible options to expand the Greenway System to include successional lands. It is recognized that Markham experiences high growth pressures and that successional landscapes are not identified as significant by the Province, but with Markham's generally low forest cover, successional lands can play a vital role in enhancing overall natural heritage function and contributing to biodiversity over time.

11.2.2. Management of Biodiversity Hotspots

It is recommended that the City prioritize formal identification, monitoring and management of sites of high biological diversity to maintain their integrity. The City should consider maintaining a data base on biodiversity hot spots through acceptance of EIS and other environmental studies.

11.2.3. Non-native invasive Species Management Plan for the City of Markham

The City of Markham has an ongoing partnership program with TRCA to manage certain invasive species. Currently, noxious weeds such as Giant Hogweed, Poison Ivy and Wild Parsnip are managed in high-risk areas and a pilot project to control Dog strangling vine has been undertaken over the past two years through the release of a biological control agent. The City should review the data obtained through this study and determine if any changes or enhancements to the management programs including locations would be warranted. A non-native invasive species management plan should include the following elements:

- Monitoring for non-native species that are highly invasive in other parts of the GTA, but are not commonly found in Markham, such as Norway Maple, Black Alder, European Birch and Glossy

Buckthorn. Priorities should be developed for management of these species before they become more pervasive.

- Management of highly invasive species such as Common Buckthorn, Garlic-mustard and Dog-strangling Vine, in the areas of highest quality and areas with a high concentration of significant species where habitat is potentially threatened by non-native species.
- Particular attention should be paid to invasive species that are presented in isolated patches and to begin replacing the dominant buckthorn understory in the woodlands with appropriate native equivalents to protect the future health of these systems.

11.2.4. Edge Management and Encroachment Plan

The study team identified many occurrences of encroachment of private uses onto public lands including mowing, cutting and dumping. Edge management should be considered in the areas where encroachment is threatening natural features and ecological function. Edge management could include, for example:

- Fencing adjacent to areas of encroachment;
- Planting of species that screen natural areas from physical edge effects such as Eastern White Cedar and dense shrubs;
- Providing information to landowners that back on to natural areas, to inform them of the sensitivity of the natural heritage beyond their boundaries; and
- Enforcement where landowners have altered the landscape behind their boundaries, placed pipes to conduct swimming pool water into the natural system, constructed sheds and other structures, etc.

Minimizing trails in the Greenway system and revising trail strategies to limit the impacts of future trails is strongly advised. Where development is occurring adjacent to natural areas, trails should be planned outside of the buffers, or at a minimum, at the outermost extent of the buffers where there are space constraints.

Where new development is proposed, the impacts of encroachment and degradation due to edge effects should be rigorously considered, and scientific rationale required for reduction in buffer widths. The current standards with regards to buffers to natural features should be considered as the minimum requirement and it is recommended that policy be developed to encourage the expansion of the buffers where possible. It is recommended that the City develop enforcement tools to manage encroachment and edge effects on city-owned natural areas.

11.2.5. Long-term Monitoring Framework

Monitoring program are a significant tool to ensure the long-term health and sustainability of natural areas. Overuse, trampling and invasive species can quickly damage the integrity of natural areas. Ongoing monitoring should ensure problems and impacts can be identified early and addressed quickly creating a cost-effective management system for protected public spaces. A long-term

monitoring plan that includes compliance and effectiveness monitoring should be developed as noted in Section 10.

11.2.6. Improve Connections across Roads

Markham has numerous existing and planned road crossings across the Greenway System. Road-kill was not surveyed in this study, but animal movement is highly constrained in Markham to follow linear corridors along watercourses, and is likely to become more constrained as urbanization proceeds, as farmland is developed. Roads will become busier. Animal movement across roads will certainly increase. Road-kill is a major impact of roads, particularly for amphibians (Puky 2005) and small to medium sized mammals, but also for birds (e.g. Forman and Alexander 1998).

Where road upgrades are required, these opportunities could be used to increase the safety of road crossings for animal species. As noted in Section 10, selected major road crossings across the Greenway System should be monitored to provide a baseline for road mortality. Opportunities should be sought for future road crossings to incorporate span bridges, crossing structures and oversized culverts where feasible. It is recommended that the City work with the conservation authorities and transportation agencies to review priorities and opportunities to address road mortality and provide for wildlife crossing were necessary.

11.2.7. Restoration of Natural Cover

The City should continue efforts to restore natural heritage features to increase natural cover. The focus of the City and TRCA has been on woodland and wetland restoration. Woodland restoration should build upon existing forest patches to increase both size and shape of woodland patches to support birds/species that rely on interior forest habitat. As noted above, grassland restoration is recommended where grasslands could be retained to enhance diversity of adjacent habitat, though likely as an interim measure, as maintenance of grasslands may only occur with dedicated resources. Wetland restoration should focus on low-lying areas that can most easily be converted into wetlands and on expanding existing wetlands. Many wetlands in Markham have a fringe of wet soils that are periodically ploughed on drier years that could easily be restored back to wetland.

Amphibian habitat restoration should be incorporated to future improvement efforts to try and address the low numbers of calling amphibians.

11.2.8. Review of Targets

The City of Markham should review existing natural heritage targets established by senior levels of government and determine appropriate local targets to ensure the continued protection and enhancement of natural features.

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APPENDIX 1 | Species Status Ranks and Field Survey Information

Appendix page

Species Status Ranks

G Rank Global Conservation Rank

GX Presumed Extinct (species) – Not located despite intensive searches and virtually no likelihood of rediscovery.

Presumed Collapsed (ecosystems, i.e., ecological communities and systems) – Collapsed throughout its range, due to loss of key dominant and characteristic taxa and/or elimination of the sites and ecological processes on which the type depends

GH Possibly Extinct (species) or Possibly Collapsed (ecosystems) – Known from only historical occurrences but still some hope of rediscovery. Examples of evidence include (1) that a species has not been documented in approximately 20-40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is extinct or collapsed throughout its range.

G1 Critically Imperiled – At very high risk of extinction or collapse due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.

G2 Imperiled – At high risk of extinction or collapse due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

G3 Vulnerable – At moderate risk of extinction or collapse due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

G4 Apparently Secure – At fairly low risk of extinction or collapse due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

G5 Secure – At very low risk or extinction or collapse due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

S Rank Provincial Rank

S1 Critically Imperiled in Ontario because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.

S2 Imperiled in Ontario because of rarity due to very restricted range, very few populations (often 20 or fewer occurrences) steep declines or other factors making it very vulnerable to extirpation.

S3 Vulnerable in Ontario due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

S4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors. S5 Secure—Common, widespread, and abundant in Ontario.

SX Presumed Extirpated – Species or community is believed to be extirpated from Ontario.

SH Possibly Extirpated – Species or community occurred historically in Ontario and there is some possibility that it may be rediscovered.

SNR Unranked—Conservation status in Ontario not yet assessed

SU Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNA Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

COSEWIC (Committee on the Status of Endangered Wildlife in Canada):

END Endangered – A wildlife species facing imminent extirpation or extinction.

THR Threatened – A wildlife species likely to become endangered if limiting factors are not reversed.

SC Special Concern – A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

NAR Not At Risk – A wildlife species that has been evaluated and found to be not a risk of extinction given the current circumstances.

SARA *Species at Risk Act* - Schedules (1), (2), (3)

END Endangered – A species that is facing imminent extirpation or extinction.

THR Threatened – A species that is likely to be endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

SC Special Concern – A species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.

ESA *Endangered Species Act*

END Endangered – Lives in the wild in Ontario but is facing imminent extinction or extirpation.

THR Threatened – Lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address factors threatening it.

SC Special Concern – lives in the wild in Ontario, is not endangered or threatened, but may become threatened or endangered due to a combination of biological characteristics and identified threats.

TRCA (Toronto Region Conservation Authority)

From: Toronto and Region Conservation. 2007. Terrestrial Natural Heritage System Strategy.

L rank (Local Rank) – A rank assigned by TRCA to a species, vegetation community, or habitat patch which describes its rank and level of conservation concern in the TRCA Region. Local rank of L1 to L3 is a species of concern, according to the TRCA methodology.

Rank level of conservation concern of flora and fauna in TRCA Region (TRCA 2007)

L5 Generally secure; may be a conservation concern in a few specific situations. Contributes to natural cover. Able to withstand high levels of disturbance, generally secure throughout the jurisdiction, including the urban matrix.

L4 Of concern in urban matrix; generally secure in rural matrix; able to withstand some disturbance.

L3 Of concern regionally; generally secure in natural matrix; able to withstand minor disturbance.

L2 Of concern regionally; probably rare in TRCA jurisdiction; generally occur in high-quality natural areas, in natural matrix; unable to withstand disturbance.

L1 Of concern regionally; almost certainly rare in TRCA jurisdiction; generally occur in high-quality natural areas, in natural matrix; unable to withstand disturbance.

LX Extirpated from the TRCA region with remote chance of rediscovery. Presumably highly sensitive. Not scored.

LH Hybrid between two native species. Usually not scored unless highly stable and behaves like a species.

L+ Exotic. Not native to TRCA jurisdiction. Includes hybrids between a native species and an exotic. Not scored.

L+? Origin uncertain or disputed, (i.e. may or may not be native). Not scored.

Greater Toronto Area (GTA) Rank – City of Toronto Plant List

From: Varga, S., Leadbeater, D., Webber, J., Kaiser, J., Crins, B., Kamstra, J., Banville, D., Ashley, E., Miller, G., Kingsley, C., Jacobsen, C., Mewa, K., Tebby, L., Mosley, E., and Zajc, E. 2000. The Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources, Aurora, ON. 103 pp.

"Plant rarity is based on the number of locations for a native plant species" and also takes into account native species restricted to specialized rare habitats. For the Greater Toronto Area column, "A species is considered rare in the Greater Toronto Area if it is rare or uncommon in a least four of... Halton, Peel, Toronto, York, and Durham".

Codes are defined as follows:

X Present

U Uncommon native species

R Rare native species

R# Number of stations for a rare native species

E Extirpated native species

+ or I Introduced species

X+ Introduced in municipality

SR Sight record

LR Literature record

RM York – Local Status

From: Varga, S., Leadbeater, D., Webber, J., Kaiser, J., Crins, B., Kamstra, J., Banville, D., Ashley, E., Miller, G., Kingsley, C., Jacobsen, C., Mewa, K., Tebby, L., Mosley, E., and Zajc, E. 2000. The Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources, Aurora, ON. 103 pp

U Uncommon

R1-R10 Rarity Status (1-10 denotes number of stations at which a locally rare species is found) (Varga et al. 2000).

Table A1-1. Ecological Land Classification (ELC), Disturbance Assessment, and Detailed Botanical Survey.

Survey Date	Surveyor 1	Surveyor 2	Polygon ID	Survey Type
May-27-20	Christina Myrdal	Summer Graham	1.29, 1.30, 1.31, 1.67, 2.12, 2.13	ELC, Disturbance Assessment
May-29-20	Sarah Mainguy		1.02, 1.65, 1. 73	ELC, Disturbance Assessment, Detailed Botany
June-01-20	Sarah Mainguy		1.19, 1.58, 1.64	ELC, Disturbance Assessment, Detailed Botany
June-02-20	Mary Anne Young	Other	1.03, 1.04, 1.05, 1.06, 1.07, 1.08, 1.16, 2.02	ELC, Disturbance Assessment
June-03-20	Christina Myrdal	Summer Graham	2.11	ELC, Disturbance Assessment
June-04-20	Carl-Adam Wegenschimmel	Other	1.09, 1.10, 1.17, 1.74, 1.76, 2.03	ELC
June-04-20	Grace Pitman		1.58, 1.59, 1.91	ELC, Disturbance Assessment, Detailed Botany
June-05-20	Grace Pitman		1.54, 1.55, 1.56	ELC, Disturbance Assessment, Detailed Botany
June-08-20	Christina Myrdal	Summer Graham	1.34, 1.37, 1.39, 1.81	ELC, Disturbance Assessment
June-11-20	Christina Myrdal	Summer Graham	1.35, 1.36, 1.40, 1.41, 1.42	ELC, Disturbance Assessment
June-11-20	Sarah Mainguy		1.71, 1.070	ELC, Disturbance Assessment, Detailed Botany
June-12-20	Grace Pitman		1.63	ELC, Disturbance Assessment
June-12-20	Heather Schibli	Other	1.11, 1.12, 1.13, 1.18	ELC, Disturbance Assessment
June-12-20	Grace Pitman		1.47, 1.63, 1.64, 1.83, 1.84	ELC, Disturbance Assessment, Detailed Botany
June-12-20	Heather Schibli	Other	1.98	ELC, Disturbance Assessment
June-12-20	Sarah Mainguy		1.070, 1.45, 1.71	ELC, Disturbance Assessment, Detailed Botany
June-18-20	Mary Anne Young	Other	1.22, 1.96, 1.97, 1.14, 1.23	ELC, Disturbance Assessment
June-19-20	Grace Pitman		1.48, 1.49, 1.87, 1.88, 1.89, 1.90	ELC, Disturbance Assessment, Detailed Botany
June-19-20	Mary Anne Young	Other	1.14	ELC, Disturbance Assessment
June-25-20	Christina Myrdal	Summer Graham	1.15	ELC, Disturbance Assessment
June-25-20	Grace Pitman		1.85, 1.86, 1.93, 1.94, 1.95	ELC, Disturbance Assessment
June-26-20	Sarah Mainguy		1.62	ELC, Disturbance Assessment, Detailed Botany

Survey Date	Surveyor 1	Surveyor 2	Polygon ID	Survey Type
July-02-20	Izabela Van Amelsvoort		1.21, 1.50, 1.53, 1.72	ELC, Disturbance Assessment
July-17-20	Sarah Mainguy		1.70	ELC, Disturbance Assessment, Detailed Botany
July-24-20	Izabela Van Amelsvoort		1.43, 1.44, 1.46	ELC, Disturbance Assessment
July-24-20	Sarah Mainguy		1.70, 1.71, 2.71	ELC, Disturbance Assessment, Detailed Botany
July-30-20	Carl-Adam Wegenschimmel	Summer Graham	1.24, 1.25, 1.26, 1.27, 1.79	ELC, Disturbance Assessment
July-30-20	Izabela Van Amelsvoort		1.21, 1.50, 1.53, 1.72	ELC, Disturbance Assessment
July-31-20	Grace Pitman		1.20, 1.66, 1.68	ELC, Disturbance Assessment
August-03-20	Sarah Mainguy		1.070, 1.45	ELC, Disturbance Assessment, Detailed Botany
August-05-20	Grace Pitman		1.51, 1.57, 1.60, 1.61	ELC, Disturbance Assessment
August-05-20	Izabela Van Amelsvoort		1.106, 1.52	ELC, Disturbance Assessment, Detailed Botany
August-06-20	Summer Graham	Christina Myrdal	1.28, 1.77	ELC, Disturbance Assessment
August-12-20	Grace Pitman		1.68, 1.82	ELC, Disturbance Assessment
August-20-20	Izabela Van Amelsvoort		1.69, 2.27	ELC, Disturbance Assessment, Detailed Botany
September-04-20	Sarah Mainguy		1.070, 1.75	ELC, Disturbance Assessment, Detailed Botany
September-20-20	Sarah Mainguy		1.65, 1.73, 1.02	ELC, Disturbance Assessment, Detailed Botany

Table A1-2. Breeding Bird Survey information.

Survey Date	Surveyor	Survey Type	Station ID or Area Search Number	Visit Number	Air Temperature (°C)	Wind Direction	Beaufort Wind Scale	Precipitation	Cloud Cover Percentage	Noise Index	Start Time	Finish Time
May-25-20	Carl-Adam Wegenschimmel	BBS Point Cour	216	1	22		0	NoneDry	1	0	07:10	07:20
May-25-20	Carl-Adam Wegenschimmel	BBS Point Count	224	1	22		1	NoneDry	1	1	07:52	08:02
May-25-20	Carl-Adam Wegenschimmel	BBS Point Count	222	1	22		0	NoneDry	2	1	08:26	
May-25-20	Carl-Adam Wegenschimmel	BBS Point Count	223	1	23		0	NoneDry	1	1	09:00	

Survey Date	Surveyor	Survey Type	Station ID or Area Search Number	Visit Number	Air Temperature (°C)	Wind Direction	Beaufort Wind Scale	Precipitation	Cloud Cover Percentage	Noise Index	Start Time	Finish Time
May-25-20	Carl-Adam Wegenschimmel	BBS Point Count	221	1	24		0	NoneDry	1	4	09:34	
May-25-20	Carl-Adam Wegenschimmel	BBS Point Count	219	1	18		0	NoneDry	2	1	06:38	06:48
May-26-20	Carl-Adam Wegenschimmel	BBS Point Count	215	1	19		0	NoneDry	1	2	05:32	05:42
May-26-20	Carl-Adam Wegenschimmel	BBS Area Search	212	1	21		0	NoneDry	2	1	06:11	07:10
May-26-20	Carl-Adam Wegenschimmel	BBS Area Search	203	1	24		0	NoneDry	1	1	07:31	08:08
May-26-20	Carl-Adam Wegenschimmel	BBS Area Search	204	1	25		0	NoneDry	1	1	08:50	09:50
May-27-20	Sarah Mainguy	BBS Area Search	220	1	25	N	3	NoneDry	10	1	12:43	13:35
May-27-20	Sarah Mainguy	BBS Area Search	214	1	22	N	3	NoneDry	0	1	09:21	11:47
May-27-20	Sarah Mainguy	BBS Point Count	214	1	22	N	2	NoneDry	0	1	09:08	09:19
May-27-20	Sarah Mainguy	BBS Area Search	220	1	22		0	NoneDry	3	1	05:56	08:07
May-29-20	Grace Pitman	BBS Point Count	225	1	23	SW	2	NoneDry	7	2	09:38	09:48
May-29-20	Grace Pitman	BBS Area Search	225	1	23	SW	2	NoneDry	7	2	09:30	10:20
May-31-20	Sarah Mainguy	BBS Area Search	206	1	11		2	NoneDry	0	1	08:20	11:25
May-31-20	Sarah Mainguy	BBS Point Count	206	1	11	E	3	NoneDry	0	1	08:53	
May-31-20	Sarah Mainguy	BBS Area Search	206	1	8		2	NoneDry	1	1	06:26	
May-31-20	Sarah Mainguy	BBS Point Count	206	1	8		1	NoneDry	5	1	06:13	
June-01-20	Sarah Mainguy	BBS Area Search	201	1	13	NW	1	NoneDry	5	2	08:54	09:05
June-01-20	Sarah Mainguy	BBS Point Count	207	1	13		2	NoneDry	3	0	09:19	
June-01-20	Sarah Mainguy	BBS Area Search	208	1	15	NE	1	NoneDry	1	1	10:04	11:11
June-01-20	Sarah Mainguy	BBS Area Search	211	1	12		0	NoneDry	0	2	07:51	08:43
June-01-20	Sarah Mainguy	BBS Area Search	213	1	11		0	NoneDry	0	2	06:18	
June-01-20	Sarah Mainguy	BBS Point Count	213	1	11		0	NoneDry	0	1	05:47	06:01

Survey Date	Surveyor	Survey Type	Station ID or Area Search Number	Visit Number	Air Temperature (°C)	Wind Direction	Beaufort Wind Scale	Precipitation	Cloud Cover Percentage	Noise Index	Start Time	Finish Time
June-05-20	Sarah Mainguy	BBS Area Search	209	1	22		0	NoneDry	1	1	07:30	
June-05-20	Sarah Mainguy	BBS Area Search	227	1	20		0	NoneDry	1	1	06:45	07:15
June-05-20	Sarah Mainguy	BBS Area Search	218	1	19		0	NoneDry	1	0	08:58	
June-05-20	Sarah Mainguy	BBS Area Search	210	1	22		0	NoneDry	1	1	10:02	12:55
June-05-20	Sarah Mainguy	BBS Point Count	210	1	20		0	NoneDry	1	1	09:51	10:02
June-05-20	Sarah Mainguy	BBS Point Count	218	1	19		0	NoneDry	1	0	08:44	08:54
June-05-20	Sarah Mainguy	BBS Point Count	227	1	20		0	NoneDry	1	1	06:45	
June-05-20	Sarah Mainguy	BBS Point Count	228	1	18	NE	1	NoneDry	1	3	05:42	06:19
June-12-20	Sarah Mainguy	BBS Area Search	220	2	15	NE	3	NoneDry	0	1	09:53	
June-12-20	Sarah Mainguy	BBS Area Search	202	1	14	W	3	NoneDry	0	1	06:06	07:36
June-18-20	Carl-Adam Wegenschimmel	BBS Point Count	221	2	26		0	NoneDry	0	1	08:29	
June-18-20	Carl-Adam Wegenschimmel	BBS Point Count	219	2	22	N	0	NoneDry	0	1	07:51	
June-18-20	Carl-Adam Wegenschimmel	BBS Point Count	216	2	20	N	0	NoneDry	1	1	07:19	
June-18-20	Carl-Adam Wegenschimmel	BBS Point Count	226	2	20		0	NoneDry	0	1	06:52	07:02
June-18-20	Carl-Adam Wegenschimmel	BBS Area Search	212	2	18		0	NoneDry	0	1	05:21	
June-26-20	Carl-Adam Wegenschimmel	BBS Point Count	223	2	20		0	NoneDry	2	1	07:35	07:45
June-26-20	Carl-Adam Wegenschimmel	BBS Point Count	222	2	20		0	NoneDry	1	1	07:00	07:10
June-26-20	Carl-Adam Wegenschimmel	BBS Area Search	204	2	18		0	NoneDry	10	1	05:27	
June-26-20	Sarah Mainguy	BBS Area Search	202	2	23	NW	3	NoneDry	1	2	09:37	14:43
June-26-20	Sarah Mainguy	BBS Area Search	205	2	16		0	NoneDry	1	2	07:32	09:12
June-26-20	Sarah Mainguy	BBS Point Count	205	2	20		0	NoneDry	1	1	08:13	08:23
June-26-20	Sarah Mainguy	BBS Area Search	220	2	22	NE	1	NoneDry	2	1	06:07	07:09

Table A1-3. Reptile and Incidentals Survey information.

Survey Date	Surveyor	Start Time	Finish Time	Station ID	Visit Number	Air Temperature (°C)	Beaufort Wind Scale	Wind Direction	Precipitation	Cloud Cover (10ths)	Noise Index	Species Present?
May-25-20	Carl-Adam Wegenschimmel	10:20	10:41	101	1	24	0			0	1	Yes
May-25-20	Carl-Adam Wegenschimmel	11:16	11:47	103	1	25	0		None/Dry	0	1	Yes
May-29-20	Sarah Mainguy	14:30	14:45	1.65	1	---	---		---	---	---	Yes
May-29-20	Sarah Mainguy	10:50	11:00	1.73	1	0	0		None/Dry	0	0	Yes
May-29-20	Grace Pitman	10:45	11:05	102	1	23	3	SW	None/Dry	9	2	No
June-01-20	Sarah Mainguy	12:50	13:00	1.58	1	---	---		---	---	---	Yes
June-01-20	Grace Pitman	12:55	13:30	1.64	1	---	---		---	---	---	Yes
June-04-20	Sarah Mainguy	08:22	08:45	1.58	1	---	---		---	---	---	Yes
June-04-20	Grace Pitman	08:50	09:00	1.59	1	---	---		---	---	---	Yes
June-04-20	Grace Pitman	08:56	09:00	1.91	1	---	---		---	---	---	Yes
June-04-20	Grace Pitman	14:32	14:54	101	1	29	3	W	None/Dry	6	2	No
June-04-20	Grace Pitman	13:10	13:55	102	2	29	2	SW	None/Dry	5	2	Yes
June-04-20	Grace Pitman	15:18	15:35	103	1	29	3	NW		8	2	No
June-05-20	Sarah Mainguy	14:44	15:15	1.070	1	---	---		---	0	0	Yes
June-05-20	Grace Pitman	08:38	08:45	1.54	1	---	---		---	---	---	Yes
June-05-20	Grace Pitman	14:03	14:15	1.55	1	---	---		---	---	---	Yes
June-11-20	Sarah Mainguy	14:10	14:30	1.45	1	---	---		---	---	---	Yes
June-11-20	Sarah Mainguy	10:30	10:45	1.71	1	---	---		---	---	---	Yes
June-12-20	Grace Pitman	13:31	14:15	1.47	1	---	---		---	---	---	Yes
June-12-20	Grace Pitman	09:37	09:45	1.63	1	---	---		---	---	---	Yes
June-12-20	Grace Pitman	09:24	09:30	1.83	1	---	---		---	---	---	Yes
June-12-20	Grace Pitman	09:09	09:15	1.84	1	---	---		---	---	---	Yes
June-18-20	Carl-Adam Wegenschimmel	09:01	09:30	101	2	27	0		None/Dry	0	1	Yes
June-18-20	Carl-Adam Wegenschimmel	09:40	10:00	103	2	27	0		None/Dry	0	1	Yes
June-19-20	Grace Pitman	13:18	13:30	1.49	1	---	---		---	---	---	Yes
June-26-20	Carl-Adam Wegenschimmel	07:59	08:33	101	3	25	0		None/Dry	0	1	Yes
June-26-20	Carl-Adam Wegenschimmel	08:46	08:56	103	3	25	0		None/Dry	0	1	Yes
July-17-20	Sarah Mainguy	09:49	10:30	1.70	1	---	---		---	---	---	Yes
August-12-20	Grace Pitman	08:43	09:00	1.82	1	---	---		---	---	---	Yes
August-26-20	Izabela van Amelsvoort	11:07	11:15	2.27	1	---	---		---	---	---	Yes
September-04-20	Sarah Mainguy	11:00	11:15	1.75	1	---	---		---	---	---	Yes
September-20-20	Sarah Mainguy	11:39	12:00	1.02	2	---	---		---	---	---	Yes

Table A1-4. Nocturnal Animals Survey information.

Survey Date	Surveyor 1	Surveyor 2	Station ID	Visit Number	Air Temperature (°C)	Beaufort Wind Scale	Kestrel Wind Speed	Wind Direction	Precipitation	Cloud Cover (10ths)	Noise Index	Start Time	Finish Time	Species Present
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	35	1	12	1		NE	None/Dry	1	2	20:45	20:51	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	36	1	12	1		NE	None/Dry	4	3	21:00	21:06	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	34	1	12	0			None/Dry	4	1	21:24	21:30	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	11	1	13	1		NE	None/Dry	4	2	21:47	21:53	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	29	1	13	1		NE	None/Dry	0	2	22:04	22:10	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	6	1	13	1		NE	None/Dry	0	1	22:22	22:28	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	13	1	12	1		NE	None/Dry	0	2	22:39	22:45	YES
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	14	1	12	0			None/Dry	2	2	23:00	23:06	NO
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	27	1	12	1		NE	None/Dry	4	1	23:19	23:25	YES
April-27-20	Christina Myrdal	Carl-Adam Wegenschimmel	28	1	12	0			None/Dry	1	1	23:37	23:43	YES
April-27-20	Grace Pitman	Kristen Pott	21	1	11	2	3	NE	None/Dry	0	1	20:59	21:03	NO
April-27-20	Grace Pitman	Kristen Pott	12	1	11	2	3	NE	None/Dry	0	1	21:10	21:15	YES
April-27-20	Grace Pitman	Kristen Pott	17	1	11	2	3	NE	None/Dry	0	2	21:33	21:39	NO
April-27-20	Grace Pitman	Kristen Pott	24	1	9	2	3	NE	None/Dry	1	2	21:43	21:48	NO
April-27-20	Grace Pitman	Kristen Pott	25	1	9	1	3	NE	None/Dry	1	2	22:04	22:05	NO
April-27-20	Grace Pitman	Kristen Pott	23	1	9	1	3	NE	None/Dry	1	3	22:13	22:18	NO
April-27-20	Grace Pitman	Kristen Pott	16	1	6	0	3		None/Dry	0	1	22:39	22:45	NO
April-27-20	Grace Pitman	Kristen Pott	20	1	8	1	3	NE	None/Dry	3	2	22:59	23:05	NO
April-27-20	Grace Pitman	Kristen Pott	22	1	8	0	3		None/Dry	8	2	23:15	23:20	NO
April-27-20	Grace Pitman	Kristen Pott	19	1	7	0	0		None/Dry	4	1	23:35	23:41	YES
April-28-20	Christina Myrdal	Summer Graham	15	1	10	2		NE	None/Dry	8	1	20:48	20:54	NO
April-28-20	Christina Myrdal	Summer Graham	3	1	10	1		NE	None/Dry	4	1	21:04	21:10	NO
April-28-20	Christina Myrdal	Summer Graham	1	1	10	0			None/Dry	6	1	21:25	21:31	NO

Survey Date	Surveyor 1	Surveyor 2	Station ID	Visit Number	Air Temperature (°C)	Beaufort Wind Scale	Kestrel Wind Speed	Wind Direction	Precipitation	Cloud Cover (10ths)	Noise Index	Start Time	Finish Time	Species Present
April-28-20	Christina Myrdal	Summer Graham	2	1	10	1		NE	None/Dry	4	2	21:36	21:41	NO
April-28-20	Christina Myrdal	Summer Graham	5	1	10	0			None/Dry	4	1	21:54	22:01	NO
April-28-20	Christina Myrdal	Summer Graham	4	1	9	1		NE	None/Dry	8	1	22:06	22:12	NO
April-28-20	Christina Myrdal	Summer Graham	9	1	10	0			None/Dry	6	1	22:28	22:34	NO
April-28-20	Christina Myrdal	Summer Graham	10	1	9	1		NE	None/Dry	6	3	22:45	22:51	NO
April-30-20	Grace Pitman	Kristen Pott	26	1	11	0	0		None/Dry	0	1	20:55	21:01	YES
April-30-20	Grace Pitman	Kristen Pott	37	1	11	1	3	NE	None/Dry	10	1	21:27	21:35	YES
April-30-20	Grace Pitman	Kristen Pott	33	1	10	1	5	NW	None/Dry	10	1	22:10	22:13	NO
April-30-20	Grace Pitman	Kristen Pott	32	1	10	1	5	NW	None/Dry	10	2	22:25	22:28	NO
April-30-20	Grace Pitman	Kristen Pott	18	1	10	1	2	W	None/Dry	10	0	22:43	22:51	NO
April-30-20	Grace Pitman	Kristen Pott	30	1	10	1	3	W	None/Dry	10	1	23:07	23:14	NO
April-30-20	Grace Pitman	Kristen Pott	31	1	10	2	5	W	None/Dry	10	1	23:17	23:22	NO
May-01-20	Grace Pitman	Kristen Pott	8	1	10	1	3	W	None/Dry	10	0	00:04	00:08	NO
May-21-20	Kristen Pott	Devin Bettencourt	26	2	20	1	7	E	None/Dry	0	2	20:51	20:57	YES
May-21-20	Kristen Pott	Devin Bettencourt	37	2	17	1	7	E	None/Dry	0	2	21:17	21:21	YES
May-21-20	Kristen Pott	Devin Bettencourt	33	2	16	1	7	E	None/Dry	0	3	21:41	21:43	YES
May-21-20	Kristen Pott	Devin Bettencourt	32	2	15	1	7	E	None/Dry	0	2	21:57	22:00	NO
May-21-20	Kristen Pott	Devin Bettencourt	18	2	14	1	7	S	None/Dry	0	1	22:18	22:23	YES
May-21-20	Kristen Pott	Devin Bettencourt	19	2	12	1	7	S	None/Dry	0	1	22:41	22:44	YES
May-21-20	Kristen Pott	Devin Bettencourt	22	2	12	1	3	SE	None/Dry	0	1	22:53	22:56	NO
May-21-20	Kristen Pott	Devin Bettencourt	20	2	14	1	2	SE	None/Dry	0	2	23:05	23:11	NO
May-21-20	Kristen Pott	Devin Bettencourt	31	2	13	1	2	E	None/Dry	0	2	23:19	23:23	YES
May-21-20	Summer Graham	Christina Myrdal	15	2	14	0			None/Dry	0	1	21:14	21:20	NO
May-21-20	Summer Graham	Christina Myrdal	3	2	12	0			None/Dry	0	2	21:32	21:38	NO
May-21-20	Summer Graham	Christina Myrdal	1	2	13	0			None/Dry	0	1	21:54	22:00	NO
May-21-20	Summer Graham	Christina Myrdal	2	2	14	0			None/Dry	0	2	22:06	22:12	YES

Survey Date	Surveyor 1	Surveyor 2	Station ID	Visit Number	Air Temperature (°C)	Beaufort Wind Scale	Kestrel Wind Speed	Wind Direction	Precipitation	Cloud Cover (10ths)	Noise Index	Start Time	Finish Time	Species Present
May-21-20	Summer Graham	Christina Myrdal	5	2	14	0			None/Dry	0	1	22:26	22:32	NO
May-21-20	Summer Graham	Christina Myrdal	4	2	12	0			None/Dry	0	1	22:36	22:42	NO
May-21-20	Summer Graham	Christina Myrdal	9	2	13	0			None/Dry	0	1	22:56	23:02	NO
May-21-20	Christina Myrdal	Summer Graham	10	2	12	0			None/Dry	0	2	23:12	23:18	NO
May-21-20	Christina Myrdal	Summer Graham	6	2	14	0			None/Dry	0	1	23:40	23:46	YES
May-21-20	Summer Graham	Christina Myrdal	11	2	14	0			None/Dry	0	1	23:59	23:59	NO
May-27-20	Kristen Pott	Devin Bettencourt	7	1	24	0	6		None/Dry	0	0	21:09	21:14	YES
May-27-20	Kristen Pott	Devin Bettencourt	21	2	23	1	6	E	None/Dry	0	3	21:38	21:42	YES
May-27-20	Kristen Pott	Devin Bettencourt	12	2	23	1	6	E	None/Dry	0	1	21:47	21:51	YES
May-27-20	Kristen Pott	Devin Bettencourt	17	2	23	1	6	E	None/Dry	0	0	21:58	22:01	YES
May-27-20	Kristen Pott	Devin Bettencourt	24	2	22	0	6		None/Dry	0	1	22:09	22:12	NO
May-27-20	Kristen Pott	Devin Bettencourt	25	2	22	1	6	SE	None/Dry	0	1	22:21	22:25	NO
May-27-20	Kristen Pott	Devin Bettencourt	23	2	22	1	5	SE	None/Dry	0	1	22:34	22:37	YES
May-27-20	Kristen Pott	Devin Bettencourt	16	2	22	1	5	SE	None/Dry	0	1	22:50	22:53	NO
June-18-20	Christina Myrdal	Summer Graham	15	3	24	0			None/Dry	1	2	21:35	21:41	NO
June-18-20	Christina Myrdal	Summer Graham	1	3	23	0			None/Dry	3	2	21:52	21:58	YES
June-18-20	Christina Myrdal	Summer Graham	22	3	23	0			None/Dry	1	2	22:04	22:10	YES
June-18-20	Christina Myrdal	Summer Graham	27	3	21	0			None/Dry	7	1	22:28	22:34	YES
June-18-20	Christina Myrdal	Summer Graham	28	3	21	0			None/Dry	0	1	22:42	22:48	YES
June-18-20	Christina Myrdal	Summer Graham	14	3	21	0			None/Dry	1	2	23:08	23:14	YES
June-18-20	Christina Myrdal	Summer Graham	6	3	23	0			None/Dry	0	1	23:26	23:32	YES
June-18-20	Christina Myrdal	Summer Graham	13	3	20	0			None/Dry	0	1	23:41	23:47	YES

Survey Date	Surveyor 1	Surveyor 2	Station ID	Visit Number	Air Temperature (°C)	Beaufort Wind Scale	Kestrel Wind Speed	Wind Direction	Precipitation	Cloud Cover (10ths)	Noise Index	Start Time	Finish Time	Species Present
June-19-20	Christina Myrdal	Summer Graham	35	3	22	0			None/Dry	0	0	00:10	00:16	NO
June-19-20	Christina Myrdal	Summer Graham	36	3	21	0			None/Dry	0	1	00:27	00:33	NO
June-19-20	Grace Pitman	Kristen Pott	26	3	26	1	6	E	None/Dry	0	0	22:52	22:56	YES
June-19-20	Grace Pitman	Kristen Pott	17	3	22	0			None/Dry	0	1	22:59	23:05	YES
June-19-20	Grace Pitman	Kristen Pott	20	3	22	0			None/Dry	0	1	23:22	23:28	YES
June-20-20	Grace Pitman	Kristen Pott	25	3	28	0			None/Dry	0	1	22:50	22:56	YES
June-20-20	Grace Pitman	Kristen Pott	19	3	24	1	5	SE	None/Dry	0	1	23:03	23:07	YES
June-20-20	Grace Pitman	Kristen Pott	23	3	26	1		N	None/Dry	0	2	23:12	23:18	YES
June-20-20	Grace Pitman	Kristen Pott	31	3	24	1	5	SE	None/Dry	0	3	23:27	23:30	NO

APPENDIX 2 | Vegetation Communities

Appendix page

Table A2-1. Ecosite Summaries of ELC and Detailed Botanical Surveys from the 2020 vegetation surveys.

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
BLO1 – Open Bluff	1	0.3	Manitoba Maple (*Acer negundo*) Eastern White Pine (*Pinus strobus*) ---	Eastern White Cedar (*Thuja occidentalis*)	---	Yellow Sweet-Clover (*Melilotus officinalis*) Wild Carrot (*Daucus carota*) Canada Goldenrod (*Solidago canadensis*)	
BBO – Open Beach	1	0.01	Arrowhead and Coltsfoot				
CUM – Cultural Meadow	40	25.4	Manitoba Maple (*Acer negundo*) Crack Willow (*Salix* x *fragilis)* Sugar Maple (*Acer saccharum*)	Common Buckthorn (*Rhamnus cathartica*) Freeman's Maple (*Acer* x *freemanii*) Manitoba Maple (*Acer negundo*)	Staghorn Sumac (*Rhus typhina*) Red-oiser Dogwood (*Cornus sericea*) Eastern White Cedar (*Thuja occidentalis*)	Kentucky Bluegrass (*Poa pratensis*) Reed Canary Grass (*Phalaris arundinacea*) Tall Goldenrod (*Solidago altissima)*	
CUM1 – Mineral Cultural Meadow	38	63.7	Manitoba Maple (*Acer negundo*) Black Walnut (*Juglans nigra*) Sugar Maple (*Acer saccharum*).	Manitoba Maple (*Acer negundo*) Black Locust (*Robinia pseudoacacia*) Freeman's Maple (*Acer* x *freemanii*).	Red Elderberry (*Sambucus racemose ssp. pubens*) Common Buckthorn (*Rhamnus cathartica*) Red-oiser Dogwood (*Cornus sericea*)	Smooth Brome (*Bromus inermis*) Reed Canary Grass (*Phalaris arundinacea*) Creeping Bentgrass (*Agrostis stolonifera*)	
CUP – Plantations	6	1.9	Scots Pine (*Pinus sylvestris*), Norway Spruce, White Pine and Eastern White Cedar (*Thuja occidentalis*)	Manitoba Maple (*Acer negundo*)	Common Buckthorn (*Rhamnus cathartica*)	Garlic Mustard (*Alliaria petiolata*) Herb-Robert (*Geranium robertianum*), European Lily-of-the-valley (*Convallaria majalis*).	
CUP1 – Deciduous Plantations	4	0.6	Crack Willow (*Salix* x *fragilis*) Manitoba Maple (*Acer negundo*)	Crack Willow (*Salix* x *fragilis*) Manitoba Maple (*Acer negundo*)	Japanese Honeysuckle (*Lonicera japonica*) Choke Cherry (*Prunus virginiana*)	Zigzag Goldenrod (*Solidago flexicaulis*) Garlic Mustard (*Alliaria petiolata*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			---	Common Buckthorn (*Rhamnus cathartica*).	---	---	
CUP2 – Mixed Plantations	3	0.4	Manitoba Maple (*Acer negundo*)	---	Nannyberry (*Viburnum lentago)*	Goldenrod sp. (*Solidago*)	Heavy recreational use
			White Spruce (*Picea glauca*)		Red-oiser Dogwood (*Cornus sericea*)	Reed Canary Grass (*Phalaris arundinacea*)	
			---		Tartarian Honeysuckle (*Lonicera tatarica*)	Canada Thistle (*Cirsium arvense*)	
CUP3 – Coniferous Plantations	13	8.6	White Spruce (*Picea glauca*)	White Ash (*Fraxinus americana*)	Common Buckthorn (*Rhamnus cathartica*).	European Swallow-wort (*Vincetoxicum rossicum*)	Dominant and widespread alien species
			Eastern White Pine (*Pinus strobus*)	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Common Dandelion (*Taraxacum officinale*)	
			Eastern White Cedar (*Thuja occidentalis*)	European Swallow-wort (*Vincetoxicum rossicum*)	Smooth Brome (*Bromus inermis*)	Garlic Mustard (*Alliaria petiolata*)	
CUS – Cultural Savannah	8	18.3	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Eastern White Pine (*Pinus strobus*)	Smooth Brome (*Bromus inermis*)	Abundant and widespread alien species
			Crack Willow *(Salix* x *fragilis)*	Eastern White Pine (*Pinus strobus*)	Common Buckthorn (*Rhamnus cathartica*)	Tall Goldenrod (*Solidago altissima*)	
			Trembling Aspen (*Populus tremuloides*)	Scots Pine (*Pinus sylvestris*)	Red-oiser Dogwood (*Cornus sericea*)	Reed Canary Grass (*Phalaris arundinacea*)	
CUS1 – Mineral Cultural Savannah	7	9.8	White Ash (*Fraxinus americana*)	White Ash (*Fraxinus americana*)	Staghorn Sumac (*Rhus typhina*)	Smooth Brome (*Bromus inermis*)	Abundant and extensive alien species
			Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Tartarian Honeysuckle (*Lonicera tatarica*)	Garlic Mustard (*Alliaria petiolata*)	
			Eastern White Pine (*Pinus strobus*)	Hawthorn sp. (*Crataegus*)	Nannyberry (*Viburnum lentago)*	Goldenrod sp. (*Solidago*)	
CUT – Cultural Thicket	9	3.3	White Spruce (*Picea glauca*)	Willow sp. (*Salix*)	Tartarian Honeysuckle (*Lonicera tatarica*)	Tall Goldenrod (*Solidago altissima*)	Occasional and widespread alien species

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Eastern White Cedar (*Thuja occidentalis*)	Staghorn Sumac (*Rhus typhina*)	Red-oiser Dogwood (*Cornus sericea*)	Spotted Joe Pye Weed (*Eutrochium maculatum*)	
			Manitoba Maple (*Acer negundo*)	Black Walnut (*Juglans nigra*)	Common Buckthorn (*Rhamnus cathartica*)	Garlic Mustard (*Alliaria petiolata*)	
CUT1 – Mineral Cultural Thicket	10	7.2	Black Walnut (*Juglans nigra*)	Manitoba Maple (*Acer negundo*)	Smooth Brome (*Bromus inermis*)	Garlic Mustard (*Alliaria petiolata*)	Abundant and widespread alien species
			Staghorn Sumac (*Rhus typhina*)	Black Walnut (*Juglans nigra*)	Honeysuckle sp. (*Lonicera*)	Dame's Rocket (*Hesperis matronalis*)	
			Eastern Cottonwood (*Populus deltoides*)	Staghorn Sumac (*Rhus typhina*)	Gray Dogwood (*Cornus racemosa*)	European Swallow-wort (*Vincetoxicum rossicum*)	
CUW – Cultural Woodland	36	32.0	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Common Buckthorn (*Rhamnus cathartica*)	Smooth Brome (*Bromus inermis*)	Abundant and widespread alien species
			Black Walnut (*Juglans nigra*)	Common Buckthorn (*Rhamnus cathartica*)	Riverbank Grape (*Vitis riparia*)	Garlic Mustard (*Alliaria petiolata*)	
			Crack Willow *(Salix x fragilis)*	Trembling Aspen (*Populus tremuloides*)	Manitoba Maple (*Acer negundo*)	Giant Goldenrod (*Solidago gigantea*)	
CUW1 – Mineral Cultural Woodland	23	25.2	Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Smooth Brome (*Bromus inermis*)	Intermediate and widespread gaps in forest canopy
			Crack Willow *(Salix x fragilis)*	Manitoba Maple (*Acer negundo*)	European Euonymus (*Euonymus europaeus*)	Kentucky Bluegrass (*Poa pratensis*)	
			Manitoba Maple (*Acer negundo*)	American Basswood (*Tilia americana*)	Common Buckthorn (*Rhamnus cathartica*)	Canada Goldenrod (*Solidago canadensis*)	
FOC - Coniferous Forest	2	0.2	Eastern White Cedar (*Thuja occidentalis*) Eastern Hemlock (*Tsuga canadensis*)	Eastern White Cedar (*Thuja occidentalis*)	Common Buckthorn (*Rhamnus cathartica*)	Bulblet Bladder-fern (*Cystopteris bulbifera*)	Understory often very sparse
FOC1 - Dry – Fresh Pine Coniferous Forest	2	0.3	Eastern White Pine (*Pinus strobus*)	Eastern White Pine (*Pinus strobus*)	Black Holly (*Ilex verticillata*)	European Swallow-wort (*Vincetoxicum rossicum*)	Abundant and widespread alien species
			American Basswood (*Tilia americana*)	Black Cherry (*Prunus serotina*)	Riverbank Grape (*Vitis riparia*)	Virginia Creeper (*Parthenocissus quinquefolia*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			---	American Basswood (*Tilia americana*)	Common Red Raspberry (*Rubus idaeus*)	Wild Strawberry (*Fragaria virginiana*)	
FOC2 - Dry – Fresh Cedar Coniferous Forest	1	0.5	Eastern White Cedar (*Thuja occidentalis*)	Sugar Maple (*Acer saccharum*)	Green Ash (*Fraxinus pennsylvanica*)	European Swallow-wort (*Vincetoxicum rossicum*)	Occasional and widespread alien species
FOC3 - Fresh – Moist Hemlock Coniferous Forest	2	0.6	Eastern Hemlock (*Tsuga canadensis*)	Eastern Hemlock (*Tsuga canadensis*)	Choke Cherry (*Prunus virginiana*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	Low understory and ground layer cover
			Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)		Garlic Mustard (*Alliaria petiolata*)	
			American Basswood (*Tilia americana*)	American Basswood (*Tilia americana*)		Running Strawberry Bush (*Euonymus obovatus*)	
FOC4 - Fresh – Moist White Cedar Coniferous Forest	10	7.9	Eastern White Cedar (*Thuja occidentalis*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	European Swallow-wort (*Vincetoxicum rossicum*)	Abundant and widespread alien species
			Eastern White Pine (*Pinus strobus*)	Eastern White Cedar (*Thuja occidentalis*)	Green Ash (*Fraxinus pennsylvanica*)	Common Buckthorn (*Rhamnus cathartica*)	
			Black Walnut (*Juglans nigra*)	Common Apple (*Malus pumila*)	Eastern White Cedar (*Thuja occidentalis*)	Giant Goldenrod (*Solidago gigantea*)	
FOD – Deciduous Forest	9	8.2	Trembling Aspen (*Populus tremuloides*)	Sugar Maple (*Acer saccharum*)	Common Buckthorn (*Rhamnus cathartica*)	Smooth Brome (*Bromus inermis*)	Occasional and widespread alien species
			Silver Maple (*Acer saccharinum*)	White Ash (*Fraxinus americana*)	Choke Cherry (*Prunus virginiana*)	Virginia Waterleaf (*Hydrophyllum virginianum*)	
			Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Staghorn Sumac (*Rhus typhina*)	Garlic Mustard (*Alliaria petiolata*)	
FOD3 - Dry – Fresh Poplar – White Birch Deciduous Forest	6	2.3	Trembling Aspen (*Populus tremuloides*)	Trembling Aspen (*Populus tremuloides*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	Abundant and widespread alien species
			Large-tooth Aspen (*Populus grandidentata*)	Large-tooth Aspen (*Populus grandidentata*)	Riverbank Grape (*Vitis riparia*)	European Swallow-wort (*Vincetoxicum rossicum*)	
			Eastern Cottonwood (*Populus deltoides*)	Manitoba Maple (*Acer negundo*)	Staghorn Sumac (*Rhus typhina*)	Choke Cherry (*Prunus virginiana*)	
FOD4 – Dry – Fresh Deciduous Forest	11	6.8	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	Abundant and widespread alien species

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Black Locust (*Robinia pseudoacacia*)	White Ash (*Fraxinus americana*)	Manitoba Maple (*Acer negundo*)	Garlic Mustard (*Alliaria petiolata*)	
			White Ash (*Fraxinus americana*)	American Beech (*Fagus grandifolia*)	White Ash (*Fraxinus americana*)	European Swallow-wort (*Vincetoxicum rossicum*)	
FOD5 – Dry – Fresh Sugar Maple Deciduous Forest	33	84.3	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Choke Cherry (*Prunus virginiana*)	Sugar Maple (*Acer saccharum*)	Occasional and widespread alien species
			Black Locust (*Robinia pseudoacacia*)	Eastern Hop-hornbeam (*Ostrya virginiana*)	Sugar Maple (*Acer saccharum*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	
			American Beech (*Fagus grandifolia*)	American Beech (*Fagus grandifolia*)	White Ash (*Fraxinus americana*)	Yellow Trout-lily (*Erythronium Americanum*)	
FOD6 – Fresh – Moist Sugar Maple Deciduous Forest	13	11.5	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Abundant and widespread alien species
			Black Walnut (*Juglans nigra*)	Eastern Hop-hornbeam (*Ostrya virginiana*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	
			American Basswood (*Tilia americana*)	Black Cherry (*Prunus serotina*)	Japanese Honeysuckle (*Lonicera japonica*)	Ostrich Fern (*Matteuccia struthiopteris*)	
FOD7 – Fresh – Moist Lowland Deciduous Forest	82	99.5	Black Walnut (*Juglans nigra*)	Manitoba Maple (*Acer negundo*)	Common Buckthorn (*Rhamnus cathartica*)	Garlic Mustard (*Alliaria petiolata*)	Abundant and widespread alien species
			Manitoba Maple (*Acer negundo*)	Sugar Maple (*Acer saccharum*)	Green Ash (*Fraxinus pennsylvanica*)	Dame's Rocket (*Hesperis matronalis*)	
			Crack Willow *(Salix x fragilis)*	Crack Willow *(Salix x fragilis)*	Manitoba Maple (*Acer negundo*)	Giant Goldenrod (*Solidago gigantea*)	
FOD8 – Fresh – Moist Poplar – Sassafras Deciduous Forest	1	0.5	White Poplar (*Populus alba*)	White Poplar (*Populus alba*)	Common Buckthorn (*Rhamnus cathartica*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	Abundant and widespread alien species
			Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Manitoba Maple (*Acer negundo*)	Riverbank Grape (*Vitis riparia*)	
			White Willow (*Salix alba*)	Common Buckthorn (*Rhamnus cathartica*)	Serviceberry sp. (*Amelanchier*)	Red Baneberry (Actaea rubra)	
FOD9 – Fresh Moist Oak – Maple – Hickory Deciduous Forest	1	0.6	Bur Oak (*Quercus macrocarpa*)	Sugar Maple (*Acer saccharum*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	Occasional and widespread alien species
			Sugar Maple (*Acer saccharum*)	Eastern Hop-hornbeam (*Ostrya virginiana*)	Manitoba Maple (*Acer negundo*)	White Ash (*Fraxinus americana*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Scots Pine (*Pinus sylvestris*)	Blue-beech (*Carpinus caroliniana*)	Blue-beech (*Carpinus caroliniana*)	Red Baneberry (Actaea rubra)	
FOM – Mixed Forest	8	8.3	Black Walnut (*Juglans nigra*)	Black Walnut (*Juglans nigra*)	Common Buckthorn (*Rhamnus cathartica*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	Abundant and widespread alien species
			Freeman's Maple (*Acer* x *freemanii*)	Manitoba Maple (*Acer negundo*)	Black Walnut (*Juglans nigra*)	Common Buckthorn (*Rhamnus cathartica*)	
			Eastern White Cedar (*Thuja occidentalis*)	Green Ash (*Fraxinus pennsylvanica*)	Red-oiser Dogwood (*Cornus sericea*)	Virginia Creeper (*Parthenocissus quinquefolia*)	
FOM3 - Dry – Fresh Hardwood – Hemlock Mixed Forest	4	3.6	Sugar Maple (*Acer saccharum*)	Eastern White Cedar (*Thuja occidentalis*)	Green Ash (*Fraxinus pennsylvanica*)	Long-stalked Sedge (*Carex pedunculata*)	Occasional and local alien species
FOM4 - Dry – Fresh White Cedar Mixed Forest	1	6.7	Eastern White Cedar (*Thuja occidentalis*)	American Basswood (*Tilia americana*)	Manitoba Maple (*Acer negundo*)	Ostrich Fern (*Matteuccia struthiopteris*)	Dominant and widespread alien species
			Manitoba Maple (*Acer negundo*)	Eastern White Cedar (*Thuja occidentalis*)		Garlic Mustard (*Alliaria petiolata*)	
FOM5 - Dry – Fresh White Birch – Poplar – Conifer Mixed Forest	1	1.4	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Occasional and widespread alien species
			Black Cherry (*Prunus serotina*)	American Basswood (*Tilia americana*)	Choke Cherry (*Prunus virginiana*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	
			American Beech (*Fagus grandifolia*)	---	Common Buckthorn (*Rhamnus cathartica*)	Garlic Mustard (*Alliaria petiolata*)	
FOM6 – Fresh – Moist Hemlock Mixed Forest Ecosite	12	20.5	Eastern Hemlock (*Tsuga canadensis*)	Eastern Hemlock (*Tsuga canadensis*)	Black Cherry (Prunus serotina)	Sugar Maple (*Acer saccharum*)	Occasional and widespread alien species
			Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Choke Cherry (*Prunus virginiana*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	
			American Elm (*Ulmus americana*)	American Elm (*Ulmus americana*)	Sugar Maple (*Acer saccharum*)	Zigzag Goldenrod (*Solidago flexicaulis*)	
FOM7 – Fresh – Moist White Cedar – Hardwood Mixed Forest	8	12.1	Eastern White Cedar (*Thuja occidentalis*)	Eastern White Cedar (*Thuja occidentalis*)	White Ash (*Fraxinus americana*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	Occasional and widespread alien species
			Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Choke Cherry (*Prunus virginiana*)	Garlic Mustard (*Alliaria petiolata*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			White Spruce (*Picea glauca*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	European Swallow-wort (*Vincetoxicum rossicum*)	
FOM8 – Fresh – Moist Poplar – White Birch Mixed Forest	1	0.3	White Poplar (*Populus alba*)	White Poplar (*Populus alba*)	Black Walnut (*Juglans nigra*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	Abundant and widespread alien species
			White Spruce (*Picea glauca*)	Black Walnut (*Juglans nigra*)	Common Buckthorn (*Rhamnus cathartica*)	Giant Goldenrod (*Solidago gigantea*)	
			Black Walnut (*Juglans nigra*)	Eastern White Cedar (*Thuja occidentalis*)	Serviceberry sp. (*Amelanchier*)	Common Buckthorn (*Rhamnus cathartica*)	
MAM – Meadow Marsh	11	8.5	White Willow (*Salix alba*)	Manitoba Maple (*Acer negundo*)	Crack Willow (*Salix* x *fragilis*)	Common Reed (*Phragmites australis*)	Abundant and widespread alien species
			Trembling Aspen (*Populus tremuloides*)	Common Buckthorn (*Rhamnus cathartica*)	Common Reed (*Phragmites australis*)	Cattail sp. (*Typha*)	
			Eastern Cottonwood (*Populus deltoides*)	Common Reed (*Phragmites australis*)	Red-oiser Dogwood (*Cornus sericea*)	Reed Canary Grass (*Phalaris arundinacea*)	
MAM2 – Mineral Meadow Marsh	24	8.4	Black Walnut (*Juglans nigra*)	Manitoba Maple (*Acer negundo*)	Spotted Joe Pye Weed (*Eutrochium maculatum)*	Spotted Jewelweed (*Impatiens capensis*)	Light dumping, abundant and widespread alien species
			Manitoba Maple (*Acer negundo*)	Common Buckthorn (*Rhamnus cathartica*)	Reed Canary Grass (*Phalaris arundinacea*)	Dark-green Bulrush (*Scirpus atrovirens*)	
			Crack Willow (*Salix* x *fragilis)*	Crack Willow (*Salix* x *fragilis)*	Red-osier Dogwood (*Cornus sericea*)	Spotted Joe Pye Weed (*Eutrochium maculatum)*	
MAM3 – Organic Meadow Marsh	1	0.3	Not recorded	Not recorded	Not recorded	Reed Canary-grass (Phalaris arundinacea) Forbs (*not described*) Jewelweed (*Impatiens capensis*)	
MAS – Shallow Marsh	3	1.5	White Willow (*Salix alba*)	Crack Willow (*Salix euxina*)	Reed Canary Grass (*Phalaris arundinacea*)	Reed Canary Grass (*Phalaris arundinacea*)	Dominant and extensive alien species
			Green Ash (*Fraxinus pennsylvanica*)	Bebb's Willow (*Salix bebbiana*)	Red-osier Dogwood (*Cornus sericea*)	Reed Canary Grass (*Phalaris arundinacea*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Eastern Cottonwood (*Populus deltoides*)	Eastern Cottonwood (*Populus deltoides*)	Narrow-leaved Cattail (*Typha angustifolia*)	Narrow-leaved Cattail (*Typha angustifolia*)	
MAS2 – Mineral Shallow Marsh	18	6.6	Manitoba Maple (*Acer negundo*)	Crack Willow *(Salix x fragilis)*	Broad-leaved Cattail (*Typha latifolia*)	Spotted Jewelweed (*Impatiens capensis*)	Occasional and local alien species
			Narrow-leaved Cattail (*Typha angustifolia*)	Reed Canary Grass (*Phalaris arundinacea*)	Spotted Joe Pye Weed (*Eutrochium maculatum)*	Broad-leaved Cattail (*Typha latifolia*)	
			White Willow (*Salix alba*)	American Elm (*Ulmus americana*)	Reed Canary Grass (*Phalaris arundinacea*)	Reed Canary Grass (*Phalaris arundinacea*)	
MAS3 – Organic Shallow Marsh	2	2.0	Eastern Cottonwood (*Populus deltoides*)	Manitoba Maple (*Acer negundo*)	Red-osier Dogwood (*Cornus sericea*)	Narrow-leaved Cattail (*Typha angustifolia*)	Light dumping, occasional and widespread alien species
			Slippery Elm (*Ulmus rubra*)	Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	Reed Canary Grass (*Phalaris arundinacea*)	
			Sugar Maple (*Acer saccharum*)	White Willow (*Salix alba*)	Gray Dogwood (*Cornus racemosa*)	Common Reed (*Phragmites australis*)	
OAO – Open Aquatic	26	21.0	Fragrant Water-lily (*Nymphaea odorata*)	Pondweed sp. (*Potamogeton*)	Red-osier Dogwood (*Cornus sericea*)	Goldenrod sp. (*Solidago*)	Well marked and widespread tracks/trails
			Willow sp. (*Salix*)	Willow sp. (*Salix*)	Willow sp. (*Salix*)	Riverbank Grape (*Vitis riparia*)	
			Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Honeysuckle sp. (*Lonicera*)	Common Burdock (*Arctium minus*)	
SWC1 – White Cedar Mineral Coniferous Swamp	3	0.9	Sugar Maple (*Acer saccharum*)	Sugar Maple (*Acer saccharum*)	Choke Cherry (*Prunus virginiana*)	Zigzag Goldenrod (*Solidago flexicaulis*)	Occasional and widespread alien species
			Eastern White Cedar (*Thuja occidentalis*)	Norway Maple (*Acer platanoides*)	Green Ash (*Fraxinus pennsylvanica*)	Spotted Jewelweed (*Impatiens capensis*)	
			Black Cherry (Prunus serotina)	---	Norway Maple (*Acer platanoides*)	Broad-leaved Enchanter's Nightshade (*Circaea canadensis*)	
SWC3 – White Cedar Organic Coniferous Swamp	2	2.8	Eastern White Cedar (*Thuja occidentalis*)	Eastern White Cedar (*Thuja occidentalis*)	Eastern White Cedar (*Thuja occidentalis*)	White Snakeroot (*Ageratina altissima*)	Occasional and widespread alien species
			Balsam Fir (*Abies balsamea*)	Yellow Birch (*Betula alleghaniensis*)	Speckled Alder (*Alnus incana*)	Creeping Jennie (*Lysimachia nummularia*)	

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Yellow Birch (*Betula alleghaniensis*)	Speckled Alder (*Alnus incana*)	Common Buckthorn (*Rhamnus cathartica*)	Colt's Foot (*Tussilago farfara*)	
SWD2 – Ash Mineral Deciduous Swamp	1	2.7	Manitoba Maple (*Acer negundo*)	Green Ash (*Fraxinus pennsylvanica*)	Trembling Aspen (*Populus tremuloides*)	White Snakeroot (*Ageratina altissima*)	Intermediate and widespread gaps in forest canopy
			Yellow Birch (*Betula alleghaniensis*)	Black Ash (*Fraxinus nigra*)		Stinging Nettle (*Urtica dioica*)	
			American Basswood (*Tilia americana*)	---		---	
SWD3 – Maple Mineral Deciduous Swamp	13	11.2	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Wood Nettle (*Laportea canadensis*)	Abundant and widespread alien species
			Green Ash (*Fraxinus pennsylvanica*)	Red Maple (*Acer rubrum*)	Alternate-leaved Dogwood (*Cornus alternifolia*)	Stinging Nettle (*Urtica dioica*)	
			Red Maple (*Acer rubrum*)	Dotted Hawthorn (*Crataegus punctata*)	Common Reed (*Phragmites australis*)	Ostrich Fern (*Matteuccia struthiopteris*)	
SWD4 – Mineral Deciduous Swamp	13	7.7	Crack Willow *(Salix x fragilis)*	Manitoba Maple (*Acer negundo*)	Eastern White Cedar (*Thuja occidentalis*)	Spotted Jewelweed (*Impatiens capensis*)	Abundant and widespread alien species
			White Willow (*Salix alba*)	Crack Willow *(Salix x fragilis)*	Crack Willow *(Salix x fragilis)*	Reed Canary Grass (*Phalaris arundinacea*)	
			Manitoba Maple (*Acer negundo*)	White Willow (*Salix alba*)	Common Red Raspberry (*Rubus idaeus*)	European Swallow-wort (*Vincetoxicum rossicum*)	
SWM – Mixed Swamp	1	0.6	Crack Willow *(Salix x fragilis)*	Sugar Maple (*Acer saccharum*)	Common Buckthorn (*Rhamnus cathartica*)	Ostrich Fern (*Matteuccia struthiopteris*)	Not recorded
			Eastern White Cedar (*Thuja occidentalis*)	Green Ash (*Fraxinus pennsylvanica*)	Alternate-leaved Dogwood (*Cornus alternifolia*)	Zigzag Goldenrod (*Solidago flexicaulis*)	
			White Ash (*Fraxinus americana*)	American Elm (Ulmus americana)	Green Ash (*Fraxinus pennsylvanica*)	Spotted Jewelweed (*Impatiens capensis*)	
SWM1 – White Cedar Mineral Mixed Swamp	7	6.2	Eastern White Cedar (*Thuja occidentalis*)	Eastern White Cedar (*Thuja occidentalis*)	Manitoba Maple (*Acer negundo*)	Bulblet Fern (*Cystopteris bulbifera*)	Occasional and widespread alien species

Ecosite	Number of Polygons	Total Area (ha)	Canopy - Dominant Species	Subcanopy - Dominant Species	Understory – Dominant Species	Ground Layer – Dominant Species	Disturbance
			Black Walnut (*Juglans nigra*)	Sugar Maple (*Acer saccharum*)	Common Buckthorn (*Rhamnus cathartica*)	Sensitive Fern (*Onoclea sensibilis*)	
			Manitoba Maple (*Acer negundo*)	Manitoba Maple (*Acer negundo*)	Norway Maple (*Acer platanoides*)	Rice Cutgrass (*Leersia oryzoides*)	
SWT – Thicket Swamp	1	0.3	Manitoba Maple (*Acer negundo*)	American Basswood (*Tilia americana*)	Red-osier Dogwood (*Cornus sericea*)	Spotted Jewelweed (*Impatiens capensis*)	Occasional and widespread alien species
			American Elm (*Ulmus americana*)	American Elm (*Ulmus americana*)	Riverbank Grape (*Vitis riparia*)	Reed Canary Grass (*Phalaris arundinacea*)	
			---	Common Buckthorn (*Rhamnus cathartica*)	Tartarian Honeysuckle (*Lonicera tatarica*)	Aster sp. (*Symphyotrichum*)	
SWT2 – Mineral Thicket Swamp	4	1.0	Crack Willow *(Salix x fragilis)*	Manitoba Maple (*Acer negundo*)	Cattail sp. (*Typha*)	Reed Canary Grass (*Phalaris arundinacea*)	Occasional and widespread alien species
				Eastern Cottonwood (*Populus deltoides*)	Japanese Honeysuckle (*Lonicera japonica*)	Broad-leaved Cattail (*Typha latifolia*)	
				Common Buckthorn (*Rhamnus cathartica*)	Common Buckthorn (*Rhamnus cathartica*)	Goldenrod sp. (*Solidago*)	

APPENDIX 3 | Flora List

Appendix page

Table A3-1. Flora species list

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Abies balsamea	Balsam Fir		G5	N5		S5			L4	N	5	-3
Acalypha rhomboidea	Common Three-seeded Mercury		G5	N5		S5			L5	N	0	3
Acer tataricum ssp. ginnala	Amur Maple		GNR	NNA		SNA				I		5
Acer negundo	Manitoba Maple		G5	N5		S5			L+?	N	0	-2
Anemone quinquefolia	Wood Anemone		G5	N5		S5	U	R3	L4	N	7	0
Acer nigrum	Black Maple		G5	NNR		S4?		R4	L4	N	7	3
Acer pensylvanicum	Striped Maple		G5	N5		S4				N	7	3
Acer platanoides	Norway Maple		GNR	NNA		SNA			L+	I	0	5
Acer rubrum	Red Maple		G5	N5		S5			L4	N	4	0
Carex leptalea	Bristle-stalked Sedge		G5	N5		S5	U	U	L3	N	8	-5
Acer saccarum	Sugar Maple		G5	N5		S5			L5	N	4	3
Acer saccharum	Sugar Maple		G5	N5		S5			L5	N	4	3
Caulophyllum thalictroides	Blue Cohosh		G5	N5		S5	R	R	L3	N	6	5
Juglans cinerea	Butternut	END	G4	N3N4	END	S2?			L3	N	6	2
Juglans nigra	Black Walnut		G5	N4		S4?		R	L5	N	5	3
Parthenocissus quinquefolia	Virginia Creeper		G5	N4N5		S4?	R	R1	L5	N	6	1
Acer saccharinum	Silver Maple		G5	N5		S5			L4	N	5	-3
Acer x freemanii	(Acer rubrum X Acer saccharinum)		GNA	NNA		SNA			L4	I		
Achillea millefolium	Common Yarrow		G5	N5		SNA			L+	I		3
Actaea pachypoda	White Baneberry		G5	NNR		S5			L4	N	6	5
Actaea sp	Baneberry Species											
Actaea rubra	Red Baneberry		G5	N5		S5			L5	N	5	5
Aegopodium podagraria	Goutweed		GNR	NNA		SNA			L+	I	0	0
Aesculus hippocastanum	Horse Chestnut		GNR	NNA		SNA			L+	I	0	5
Ageratina altissima	White Snakeroot		G5	N5		S5			L5	N	5	3
Acer spicatum	Mountain Maple		G5	N5		S5			L4	N	6	3
Agrimonia gryposepala	Hooked Agrimony		G5	N5		S5			L5	N	2	2
Agrostis capillaris	Colonial Bentgrass		GNR	NNA		SNA				I	0	5
Agrostis gigantea	Redtop		G4G5	NNA		SNA			L+	I	0	0
Agrostis perennans	Upland Bentgrass		G5	N5		S4?	R	R3	L3	N	5	1
Agrostis stolonifera	Creeping Bentgrass		G5	N5		SNA			L+?	I	0	-3
Ajuga reptans	Creeping Bugleweed		GNR	NNA		SNA			L+	I	0	5
Alisma subcordatum	Southern Water-plantain		G5	N5		S4?			L3	N	1	5
Alisma triviale	Northern Water-plantain		G5	N5		S5			L5	N	1	5
Alliaria petiolata	Garlic Mustard		GNR	NNA		SNA			L+	I	0	0
Allium tricoccum	Wild Leek		G5	N5		S4				N	7	2
Alnus incana	Speckled Alder		G5	N5		S5			L3	N	6	-5
Alnus incana ssp. rugosa	Speckled Alder		G5T5	N5		S5				N	6	-5
Ambrosia artemisiifolia	Annual Ragweed		G5	N5		S5			L5	N	0	3

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Amelanchier sp	Serviceberry Species											
Amphicarpaea bracteata	American Hog-peanut		G5	N5		S5			L5	N	4	0
Andropogon gerardii	Big Bluestem*		G5	N5		S4	R	R3	L3	N	7	1
Anemone americana	Round-lobed Hepatica		G5	NNR		S5	R	R5	L2	N	6	5
Anemone canadensis	Canada Anemone		G5	N5		S5			L5	N	3	-3
Anemone virginiana	Tall Anemone		G5	NNR		S5				N	4	5
Angelica atropurpurea	Great Angelica		G5	N5		S5	R	R9	L3	N	6	-5
Antennaria neglecta	Field Pussytoes		G5	N5		S5		U	LU	N	3	5
Anthriscus sylvestris	Wild Chervil		GNR	NNA		SNA			L+	I	0	5
Apocynum cannabinum	Hemp Dogbane		G5	N5		S5		U	L5	N	3	0
Aralia nudicaulis	Wild Sarsaparilla		G5	N5		S5			L5	N	4	3
Aralia racemosa	American Spikenard		G4G5	N5		S5	U	U	L3	N	7	5
Arctium sp	Burdock Species											
Arctium minus	Common Burdock		GNR	NNA		SNA			L+	I	0	5
Arisaema triphyllum	Jack-in-the-pulpit		G5	N5		S5			L5	N	5	-2
Asarum canadense	Canada Wild-ginger		G5	N5		S5			L4	N	6	5
Asclepias incarnata ssp. incarnata	Swamp Milkweed		G5T5	N5		S5				N	6	-5
Asclepias incarnata	Swamp Milkweed		G5	N5		S5			L4	N	6	-5
Asclepias syriaca	Common Milkweed		G5	N5		S5			L5	N	0	5
Aster sp	Aster Species											
Athyrium filix-femina	Common Lady Fern		G5	N5		S5				N	4	0
Barbarea vulgaris	Bitter Wintercress		GNR	NNA		SNA			L+	I	0	0
Berberis thunbergii	Japanese Barberry		GNR	NNA		SNA			L+	I	0	4
Betula alleghaniensis	Yellow Birch		G5	N5		S5			L4	N	6	0
Betula papyrifera	Paper Birch		G5	N5		S5			L4	N	2	2
Bidens cernua	Nodding Beggarticks		G5	N5		S5			L5	N	2	-5
Bidens connata	Purple-stemmed Beggarticks		G5	NNR		S4?				N	5	-3
Bidens frondosa	Devil's Beggarticks		G5	N5		S5			L5	N	3	-3
Bidens tripartita	Three-parted Beggarticks		GNR	NNR		S5	U		L5	N	4	-3
Boehmeria cylindrica	False Nettle		G5	N5		S5			L4	N	4	-5
Berberis vulgaris	European Barberry		GNR	NNA		SNA			L+	I	0	3
Bolboschoenus fluviatilis	River Bulrush		G5	N5		S4S5	R	R3	L3	N	7	-5
Bromus inermis	Smooth Brome		G5TNR	NNA		SNA			L+	I	0	5
Bromus latiglumis	Broad-glumed Brome		G5	N5		S4	U	R5	L4	N	7	-2
Calamagrostis stricta	Slim-stemmed Reedgrass*		G5	N5		S5				N	8	-4
Caltha palustris	Yellow Marsh Marigold		G5	N5		S5			L4	N	5	-5
Calystegia sepium	Hedge False Bindweed		G5	N5		S5			L5	N	2	0
Campanula rapunculoides	Creeping Bellflower		GNR	NNA		SNA			L+	I	0	5
Cannabis sativa	Marijuana		GNR	NNA		SNA			L+	I	0	0

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Caragana arborescens	Siberian Peashrub		GNR	NNA		SNA			L+	I	0	5
Cardamine concatenata	Cut-leaved Toothwort		G5	N5		S5			L3	N	6	3
Cardamine diphylla	Two-leaved Toothwort		G5	N5		S5			L4	N	7	5
Cardamine maxima	Large Toothwort		G5	NNR		S3			L4	N		
Cardamine pensylvanica	Pennsylvania Bittercress		G5	N5		S5	U	U	L4	N	6	-4
Cardamine pratensis	Meadow Bittercress		G5TU	NNR		SNA				I	7	-5
Carex sp	Sedge Species											
Carex albursina	White Bear Sedge		G5	N5		S5	U	U	L3	N	7	5
Carex arctata	Drooping Woodland Sedge		G5	N5		S5			L5	N	5	5
Carex blanda	Woodland Sedge		G5	N5		S5			L5	N	3	0
Carex cephaloidea	Thin-leaved Sedge		G5	N5		S4	U	R9	L4	N	6	2
Carex cristatella	Crested Sedge		G5	N5		S5			L5	N	3	-4
Carex deweyana	Dewey's Sedge		G5	N5		S5			L4	N	6	4
Carex flava	Yellow Sedge		G5	N5		S5	U	U	L3	N	5	-5
Carex grisea	Gray Sedge		G5?	N4N5		S4			L4	N	8	1
Carex gracillima	Graceful Sedge		G5	N5		S5			L5	N	4	3
Carex granularis	Limestone Meadow Sedge		G5	N5		S5			L5	N	3	-4
Carex grayi	Gray's Sedge		G4	NNR		S4	R	R2	L3	N	8	-4
Carex hitchcockiana	Hitchcock's Sedge		G5	N5		S4S5	U	U	L4	N	6	5
Carex hirtifolia	Pubescent Sedge		G5	N5		S4S5	U	U	L4	N	5	5
Carex hystericina	Porcupine Sedge		G5	N5		S5			L4	N	5	-5
Carex interior	Inland Sedge		G5	N5		S5			L3	N	6	-5
Carex intumescens	Bladder Sedge		G5	N5		S5			L4	N	6	-4
Carex laxiflora	Loose-flowered Sedge		G5	N5		S5	U	U	L4	N	5	0
Carex lacustris	Lake Sedge		G5	N5		S5			L4	N	5	-5
Carex laevivaginata	Smooth-cone Sedge		G5	N4		S4	R	R9	L3	N	8	-5
Carex laxiculmis	Spreading Sedge		G5	N4		S4	R	R4		N	7	5
Carex lurida	Sallow Sedge		G5	N5		S4S5	R1	R2	L3	N	6	-5
Carex lupulina	Hop Sedge		G5	N5		S5			L4	N	6	-5
Carex peckii	Peck's Sedge		G5	N5		S5			L4	N	6	5
Carex pedunculata	Long-stalked Sedge		G5	N5		S5			L5	N	5	5
Carex pensylvanica	Pennsylvania Sedge		G5	N5		S5			L4	N	5	5
Carex plantaginea	Plantain-leaved Sedge		G5	N5		S5		U	L3	N	7	5
Carex projecta	Necklace Sedge		G5	N5		S5			L4	N	5	-4
Carex pseudocyperus	Cyperus-like Sedge		G5	N5		S5			L4	N	6	-5
Carex radiata	Eastern Star Sedge		G5	N5		S5			L5	N	4	5
Carex retrorsa	Retrorse Sedge		G5	N5		S5			L4	N	5	-5
Carex rosea	Rosy Sedge		G5	N5		S5			L5	N	5	5
Carex scabrata	Eastern Rough Sedge		G5	N5		S5	U	U	L4	N	8	-5

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Carex stipata	Awl-fruited Sedge		G5	N5		S5			L5	N	3	-5
Carex vulpinoidea	Fox Sedge		G5	N5		S5			L5	N	3	-5
Carpinus caroliniana	Blue-beech		G5	N5		S5			L4	N	6	0
Carya cordiformis	Bitternut Hickory		G5	N5		S5			L4	N	6	0
Catalpa speciosa	Northern Catalpa		G4?	NNA		SNA			L+	I	0	3
Caulophyllum giganteum	Giant Blue Cohosh		G4G5	N4		S4S5	R	R	L4	N	5	5
Caulophyllum thalictroides	Blue Cohosh		G5	N5		S5			L3	N	5	5
Celtis occidentalis	Common Hackberry*		G5	N4		S4	R		L+	N	8	1
Cercis canadensis	Eastern Redbud*		G5	NX		SX				N	8	3
Chelone glabra	White Turtlehead		G5	N5		S5	U	U	L3	N	7	-5
Chelidonium majus	Greater Celadine		GNR	NNA		SNA			L+	I	0	5
Chenopodium album	White Goosefoot		G5	NNA		SNA			L+	I	0	1
Chrysosplenium americanum	American Golden-saxifrage		G5	N5		S4	R	R6	L3	N	8	-5
Cichorium intybus	Chicory		GNR	NNA		SNA			L+	I	0	5
Cicuta maculata	Spotted Water-hemlock		G5	N5		S5				N	6	-5
Circaea canadensis	Broad-leaved Enchanter's Nightshade		G5T5	N5		S5			L5	N	3	3
Circaea canadensis ssp. canadensis	Canada Enchanter's Nightshade		GNR	NNR		S5				N	3	3
Cirsium arvense	Canada Thistle		GNR	NNA		SNA			L+	I	0	3
Cirsium vulgare	Bull Thistle		GNR	NNA		SNA			L+	I	0	4
Clematis virginiana	Virginia Virgin's-bower		G5	NNR		S5			L5	N	3	0
Clinopodium vulgare	Field Basil		G5	N5		S5			L5	N	4	5
Convolvulus arvensis	Field Bindweed		GNR	NNA		SNA			L+	I	0	5
Convallaria majalis	European Lily-of-the-valley		G5	NNA		SNA			L+	I	0	5
Cornus alternifolia	Alternate-leaved Dogwood		G5	N5		S5			L5	N	6	5
Cornus racemosa	Gray Dogwood		G5?	N5		S5		U	L5	N	2	-2
Cornus rugosa	Round-leaved Dogwood		G5	NNR		S5			L4	N	6	5
Cornus sericea	Red-osier Dogwood		G5	N5		S5			L5	N	2	-3
Corylus cornuta	Beaked Hazelnut		G5	N5		S5			L4	N	5	5
Crataegus sp	Hawthorn Species											
Crataegus monogyna	English Hawthorn		G5	NNA		SNA			L+	I	0	5
Crataegus punctata	Dotted Hawthorn		G5	N5		S5			L5	N	4	5
Cryptotaenia canadensis	Canada Honewort		G5	N5		S5			L5	N	5	0
Cuscuta gronovii	Swamp Dodder		G5	N5		S5				N	4	-3
Cynoglossum officinale	Common Hound's-tongue		GNR	NNA		SNA			L+	I	0	5
Cyperus fuscus	Brown Flatsedge		GNR	NNA		SNA			L+	I	0	-5
Cystopteris bulbifera	Bulblet Fern		G5	N5		S5			L4	N	5	-2
Dactylis glomerata	Orchard Grass		GNR	NNA		SNA			L+	I	0	3
Daucus carota	Wild Carrot		GNR	NNA		SNA			L+	I	0	5
Desmodium sp	Tick-trefoil Species											

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Diervilla lonicera	Northern Bush-honeysuckle		G5	N5		S5			L5	N	5	5
Dichanthelium implicatum	Slender-stemmed Panicgrass		G5	N5		S5	R	R3	L4	N	3	0
Dipsacus fullonum	Common Teasel		GNR	NNA		SNA			L+	I	0	5
Dryopteris sp	Wood Fern Species											
Dryopteris carthusiana	Spinulose Wood Fern		G5	N5		S5			L5	N	5	-2
Dryopteris cristata	Crested Wood Fern		G5	N5		S5			L4	N	7	-5
Dryopteris intermedia	Evergreen Wood Fern		G5	N5		S5			L4	N	5	0
Dryopteris marginalis	Marginal Wood Fern		G5	N5		S5			L4	N	5	3
Echinochloa crus-galli	Large Barnyard Grass		GNR	NNA		SNA			L+	I	0	-3
Echinocystis lobata	Wild Mock-cucumber		G5	N5		S5			L5	N	3	-2
Echinochloa muricata	Rough Barnyard Grass		G5	N5		S5				N	4	-5
Echinops sphaerocephalus	Great Globe-thistle		GNR	NNA		SNA			L+	I	0	5
Echium vulgare	Common Viper's-bugloss		GNR	NNA		SNA			L+	I	0	5
Elaeagnus angustifolia	Russian Olive		GNR	NNA		SNA			L+	I	0	4
Eleocharis sp	Spikerush Species											
Eleocharis erythropoda	Red-stemmed Spikerush		G5	N5		S5			L5	N	4	-5
Elodea canadensis	Broad Waterweed		G5	N5		S5	U	U	L4	N	4	-5
Elymus repens	Creeping Wildrye		GNR	NNA		SNA			L+	I	0	3
Elymus riparius	Eastern Riverbank Wildrye		G5	N4		S4	R	R5	L4	N	7	-3
Elymus villosus	Hairy Wildrye		G5	N4		S4	R	R3	L2	N	7	3
Elymus virginicus	Virginia Wildrye		G5	N5		S5				N	5	-2
Epilobium ciliatum	Northern Willowherb		G5	N5		S5			L5	N	3	3
Epilobium coloratum	Purple-veined Willowherb		G5	N5		S5	R	R6	L5	N	3	-5
Epilobium hirsutum	Hairy Willowherb		GNR	NNA		SNA			L+	I	0	-4
Epilobium parviflorum	Small-flowered Willowherb		GNR	NNA		SNA			L+	I	0	3
Epipactis helleborine	Eastern Helleborine		GNR	NNA		SNA			L+	I	0	5
Equisetum sp	Horsetail Species											
Equisetum arvense	Field Horsetail		G5	N5		S5			L5	N	0	0
Equisetum fluviatile	Water Horsetail		G5	N5		S5			L3	N	7	-5
Equisetum pratense	Meadow Horsetail		G5	N5		S5	R	R8	L3	N	8	-3
Equisetum variegatum	Variegated Horsetail		G5	N5		S5			L4	N	5	-3
Erigeron annuus	Annual Fleabane		G5	N5		S5			L5	N	0	1
Erigeron canadensis	Canada Horseweed		G5	N5		S5			L5	N	0	1
Erigeron philadelphicus	Philadelphia Fleabane		G5	N5		S5			L5	N	1	-3
Erigeron strigosus	Rough Fleabane		G5	N5		S5			L5	N	0	1
Erysimum cheiranthoides	Wormseed Wallflower		G5	NNR		SNA			L+	I	0	3
Erythronium sp	Trout-lily Species											
Erythronium americanum	Yellow Trout-lily		G5	N5		S5			L5	N	5	5
Euonymus alatus	Winged Euonymus		GNR	NNA		SNA			L+	I	0	5

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Euonymus europaeus	European Euonymus		GNR	NNA		SNA			L+	I	0	5
Euonymus obovatus	Running Strawberry Bush		G5	N5		S4			L3	N	6	5
Eupatorium perfoliatum	Common Boneset		G5	N5		S5			L4	N	2	-4
Euphorbia maculata	Spotted Spurge		G5?	NNR		SNA			L+?	I	0	4
Eurybia macrophylla	Large-leaved Aster		G5	N5		S5			L5	N	5	5
Euthamia graminifolia	Grass-leaved Goldenrod		G5	N5		S5			L5	N	2	-2
Eutrochium maculatum	Spotted Joe Pye Weed		G5	N5		S5				N	3	-5
Fagus grandifolia	American Beech		G5	N5		S4			L4	N	6	3
Fallopia convolvulus	Black Bindweed		GNR	NNA		SNA			L+	I	0	1
Floerkea proserpinacoides	False Mermaid	NAR	G5	N4	NAR	S4	R	R1	L2	N	9	-1
Fragaria vesca	Woodland Strawberry		G5	N5		S5			L5	N	4	4
Fragaria virginiana	Wild Strawberry		G5	N5		S5			L5	N	2	1
Frangula alnus	Glossy Buckthorn		GNR	NNA		SNA			L+	I	0	-1
Fraxinus sp	Ash Species											
Fraxinus pennsylvanica	Green Ash		G5	N5		S4			L5	N	3	-3
Fraxinus americana	White Ash		G5	N5		S4			L5	N	4	3
Fraxinus excelsior	European Ash		GNR	NNA		SNA			L+	I		
Fraxinus nigra	Black Ash	THR	G5	N5		S4			L4	N	7	-4
Galeopsis tetrahit	Common Hemp-nettle		GNR	NNA		SNA			L+	I	0	5
Galium sp	Bedstraw Species											
Galium aparine	Cleavers		G5	N5		S5	U	U	L5	N	4	3
Galium asprellum	Rough Bedstraw		G5	NNR		S5	U	U	L5	N	6	-5
Galium palustre	Marsh Bedstraw		G5	NNR		S5			L5	N	5	-5
Geranium maculatum	Spotted Geranium		G5	N5		S5	U	R2	L4	N	6	3
Geranium robertianum	Herb-Robert		G5	N4		S5			L+?	N	0	5
Geum sp	Avens Species											
Geum aleppicum	Yellow Avens		G5	N5		S5			L5	N	2	-1
Geum canadense	White Avens		G5	N5		S5			L5	N	3	0
Geum x catlingii	(Geum canadense X Geum urbanum)		GNA	NNA		SNA				I		
Geum urbanum	Wood Avens		G5	NNA		SNA			L+	I	0	5
Glechoma hederacea	Ground Ivy		GNR	NNA		SNA			L+	I	0	3
Glyceria grandis	Tall Mannagrass		G5	N5		S5			L5	N	5	-5
Glyceria septentrionalis	Eastern Mannagrass		G5	NNR		S4	R	U	L3	N	8	-5
Glyceria striata	Fowl Mannagrass		G5	N5		S5			L5	N	3	-5
Hackelia virginiana	Virginia Stickseed		G5	N5		S5	U	R8	L5	N	5	1
Helianthus sp	Sunflower Species											
Heliopsis helianthoides	False Sunflower*		G5	N5		S4S5	R	R1	L2	N	3	5
Helianthus tuberosus	Jerusalem Artichoke		G5	N5		SU			L5	N	0	0
Hemerocallis fulva	Orange Daylily		GNA	NNA		SNA			L+	I	0	5

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Heracleum mantegazzianum	Giant Hogweed		GNR	NNA		SNA			L+	I		
Heracleum maximum	Cow-parsnip		G5	N5		S5	R	R9	L5	N	3	-3
Hesperis matronalis	Dame's Rocket		G4G5	NNA		SNA			L+	I	0	5
Geum fragarioides	Barren Strawberry		G5	NNR		S5			L4	N	5	5
Hieracium sp	Hawkweed Species											
Hydrocotyle americana	American Water-pennywort		G5	N5		S4S5	U	U	L4	N	7	-5
Hydrophyllum canadense	Bluntleaf Waterleaf		G5	N4		S4	R	R5	L3	N	8	-2
Hydrophyllum virginianum	Virginia Waterleaf		G5	N5		S5			L5	N	6	-2
Hypericum perforatum	Common St. John's-wort		GNR	NNA		SNA			L+	I	0	5
Ilex verticillata	Black Holly		G5	N5		S5			L3	N	5	-4
Impatiens capensis	Spotted Jewelweed		G5	N5		S5			L5	N	4	-3
Impatiens glandulifera	Purple Jewelweed		GNR	NNA		SNA			L+	I	0	-3
Inula helenium	Elecampane		GNR	NNA		SNA			L+	I	0	5
Iris sp	Iris Species											
Iris pseudacorus	Yellow Iris		GNR	NNA		SNA			L+	I	0	-5
Iris versicolor	Harlequin Blue Flag		G5	N5		S5			L3	N	5	-5
Juncus effusus	Soft Rush		G5	N5		S5			L4	N	4	-5
Juniperus sp	Juniper Species											
Juniperus virginiana	Eastern Red Cedar		G5	N5		S5	U	U	L4	N	4	3
Lactuca biennis	Tall Blue Lettuce		G5	N5		S5	U	U	L4	N	6	0
Lactuca serriola	Prickly Lettuce		GNR	NNA		SNA			L+	I	0	0
Lamiastrum galeobdolon	Yellow Archangel		GNR	NNA		SNA			L+	I		
Laportea canadensis	Wood Nettle		G5	N5		S5			L5	N	6	-3
Lapsana communis	Common Nipplewort		GNR	NNA		SNA			L+	I	0	5
Larix decidua	European Larch		G5	NNA		SNA			L+	I	0	5
Larix laricina	American Larch*		G5	N5		S5			L3	N	7	-3
Leersia oryzoides	Rice Cutgrass		G5	N5		S5			L5	N	3	-5
Leersia virginica	Virginia Cutgrass		G5	N4N5		S4	R	R4	L4	N	6	-3
Lemna minor	Lesser Duckweed		G5	N5		S5			L5	N	2	-5
Leonurus cardiaca	Common Motherwort		GNR	NNA		SNA			L+	I	0	5
Leucanthemum vulgare	Oxeye Daisy		GNR	NNA		SNA			L+	I	0	5
Ligustrum vulgare	European Privet		GNR	NNA		SNA			L+	I	0	1
Lilium michiganense	Michigan Lily		G5	N5		S4	U	U	L4	N	7	-1
Lithospermum officinale	European Gromwell		GNR	NNA		SNA			L+	I	0	5
Lobelia siphilitica	Great Blue Lobelia		G5	NNR		S5	U	U	L3	N	6	-4
Lolium arundinaceum	Tall Fescue		GNR	NNA		SNA			L+	I	0	2
Lolium pratense	Meadow Fescue		G5	NNA		SNA			L+	I	0	4
Lonicera sp	Honeysuckle Species											
Lonicera x bella	(Lonicera morrowii X Lonicera tatarica)		GNA	NNA		SNA			L+	I	0	5

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Lonicera canadensis	Canada Fly Honeysuckle		G5	N5		S5			L3	N	6	3
Lonicera japonica	Japanese Honeysuckle		GNR	NNA		SNA			L+	I	0	3
Lonicera tatarica	Tartarian Honeysuckle		GNR	NNA		SNA			L+	I	0	3
Lonicera villosa	Mountain Fly Honeysuckle		G5	N5		S5	R	R1		N	10	-3
Lotus corniculatus	Garden Bird's-foot Trefoil		GNR	NNA		SNA			L+	I	0	1
Lycopus americanus	American Water-horehound		G5	N5		S5			L4	N	4	-5
Lycopus europaeus	European Water-horehound		GNR	NNA		SNA			L+	I	0	-5
Lycopus uniflorus	Northern Water-horehound		G5	N5		S5			L5	N	5	-5
Lycopus sp	Bugleweed Species											
Lysimachia ciliata	Fringed Loosestrife		G5	N5		S5			L5	N	4	-3
Lysimachia nummularia	Creeping Jennie		GNR	NNA		SNA			L+	I	0	-4
Lythrum salicaria	Purple Loosestrife		G5	NNA		SNA			L+	I	0	-5
Maianthemum sp	Solomon's Seal Species											
Maianthemum canadense	Wild Lily-of-the-valley		G5	N5		S5			L4	N	5	0
Maianthemum racemosum	False Solomon's-seal		G5	N5		S5			L5	N	4	3
Maianthemum stellatum	Star-flowered False Solomon's-seal		G5	N5		S5			L5	N	6	1
Malus sp	Apple Species											
Malus pumila	Common Apple		G5	NNA		SNA			L+	I	0	5
Matteuccia struthiopteris	Ostrich Fern		G5	N5		S5			L5	N	5	-3
Medicago lupulina	Black Medic		GNR	NNA		SNA			L+	I	0	1
Medicago sativa	Alfalfa		GNR	NNA		SNA				I	0	5
Medicago sativa ssp. sativa	Alfalfa		GNRTNR	NNA		SNA			L+	I		
Melilotus albus	White Sweet-clover		G5	NNA		SNA			L+	I	0	3
Melilotus officinalis	Yellow Sweet-clover		GNR	NNA		SNA			L+	I	0	3
Menispermum canadense	Canada Moonseed		G5	N4N5		S4	U	R5	L3	N	7	0
Mentha sp	Mint Species											
Mentha canadensis	Canada Mint		G5T5	N5		S5				N	3	-3
Mentha spicata	Spearmint		GNR	NNA		SNA			L+	I	0	-4
Miscanthus sacchariflorus	Japanese Silver Grass		GNR	NNA		SNA			L+	I	0	5
Monarda fistulosa	Wild Bergamot		G5	N5		S5				N	6	3
Morus alba	White Mulberry		GNR	NNA		SNA			L+	I	0	0
Muhlenbergia frondosa	Wirestem Muhly		G5	NNR		S4	R	R2	L4	N	5	-3
Myosotis sp	Forget-me-not Species											
Myosotis arvensis	Rough Forget-me-not		GNR	NNA		SNA			L+	I	0	0
Myosotis laxa	Small Forget-me-not		G5	N5		S5			L4	N	6	-5
Myosotis scorpioides	True Forget-me-not		G5	NNA		SNA			L+	I	0	-5
Myosotis sylvatica	Woodland Forget-me-not		G5	NNA		SNA			L+	I	0	5
Nabalus altissimus	Tall Rattlesnakeroot		G5	N5		S5			L5	N	5	3
Nasturtium officinale	Watercress		GNR	NNA		SNA			L+?	I	0	-5

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Nuphar variegata	Variegated Pond-lily		G5T5	N5		S5	U	U	L3	N	4	-5
Nymphaea odorata	Fragrant Water-lily		G5	N5		S5				N	5	-5
Oenothera sp	Evening-primrose Species											
Oenothera biennis	Common Evening Primrose		G5	N5		S5	U	U	L5	N	0	3
Onoclea sensibilis	Sensitive Fern		G5	N5		S5			L5	N	4	-3
Mycelis muralis	Wall Lettuce		GNR	NNA		SNA			L+	I	0	5
Onopordum acanthium	Scotch Cotton-thistle		GNR	NNA		SNA			L+	I		
Oryzopsis asperifolia	White-grained Mountain-ricegrass		G5	N5		S5			L4	N	6	5
Ostrya virginiana	Eastern Hop-hornbeam		G5	N5		S5			L5	N	4	4
Oxalis sp	Wood Sorrel Species											
Oxalis stricta	Upright Yellow Wood-sorrel		G5	N5		S5			L5	N	0	3
Parthenocissus vitacea	Thicket Creeper		G5	N5		S5			L5	N	3	3
Pastinaca sativa	Wild Parsnip		GNR	NNA		SNA			L+	I	0	5
Persicaria amphibia	Water Smartweed		G5	N5		S5				N	5	-5
Persicaria hydropiper	Marshpepper Smartweed		GNR	NNR		SNA			L+?	I	4	-5
Persicaria lapathifolia	Pale Smartweed		G5	N5		S5			L5	N	2	-4
Persicaria maculosa	Spotted Lady's-thumb		G3G5	NNA		SNA			L+	I	0	-3
Persicaria pensylvanica	Pennsylvania Smartweed		G5	N5		S5	R	R3	L4	N	3	-4
Phalaris arundinacea var. arundinacea	Reed Canary Grass		GNR	NNR		S5				I	0	-4
Phalaris arundinacea	Reed Canary Grass		G5	N5		S5			L+?	I	0	-4
Phleum pratense ssp. pratense	Common Timothy		GNRTNR	NNA		SNA				I	0	3
Phleum pratense	Common Timothy		GNR	NNA		SNA			L+	I	0	3
Phragmites australis ssp. australis	European Common Reed		G5	N5		SU				I	0	-4
Phryma leptostachya	Lopseed		G5	N5		S4S5			L5	N	6	5
Physalis heterophylla	Clammy Ground-cherry		G5	N4		S4	R	R7	L5	N	3	5
Physalis virginiana	Virginia Ground-cherry		G5	NNR		SU	R		LU	N	8	5
Phytolacca americana	Common Pokeweed		G5	N4		S4	R	R1		N	3	1
Picea sp	Spruce Species											
Picea abies	Norway Spruce		G5	NNA		SNA			L+	I	0	5
Picea glauca	White Spruce*		G5	N5		S5			L3	N	6	3
Picea pungens	Blue Spruce		G5	NNA		SNA			L+	I		
Pilea fontana	Springs Clearweed		G5	N4		S4	R	U	L4	N	5	-3
Pilea pumila	Canada Clearweed		G5	N5		S5			L5	N	5	-3
Pilosella caespitosa	Meadow Hawkweed		GNR	NNA		SNA			L+	I	0	5
Pinus nigra	Black Pine		GNR	NNA		SNA			L+	I	0	-5
Pinus strobus	Eastern White Pine		G5	N5		S5			L4	N	4	3
Pinus sylvestris	Scots Pine		GNR	NNA		SNA			L+	I	0	5
Plantago lanceolata	English Plantain		G5	NNA		SNA			L+	I	0	0
Plantago major	Common Plantain		G5	NNA		SNA			L+	I	0	-1

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Plantago rugelii	Rugel's Plantain		G5	N5		S5			L5	N	1	0
Poa sp	Bluegrass Species											
Poa compressa	Canada Bluegrass		GNR	NNA		SNA			L+	I	0	2
Poa nemoralis	Woods Bluegrass		G5	N5		SNA			L+	I	0	0
Poa palustris	Fowl Bluegrass		G5	N5		S5			L5	N	5	-4
Poa pratensis	Kentucky Bluegrass		G5	N5		S5				N	0	1
Podophyllum peltatum	May-apple		G5	N5		S5			L5	N	5	3
Polystichum acrostichoides	Christmas Fern		G5	N5		S5			L4	N	5	5
Polygonatum multiflorum	Eurasian Solomon's Seal		GNR	NNA		SNA			L+	I	8	3
Polygonatum pubescens	Hairy Solomon's Seal		G5	N5		S5			L4	N	5	5
Pontederia cordata	Pickerel Weed		G5	N5		S5	R	R3	L2	N	7	-5
Populus alba	White Poplar		G5	NNA		SNA			L+	I	0	5
Populus balsamifera	Balsam Poplar		G5	N5		S5			L5	N	4	-3
Populus deltoides	Eastern Cottonwood		G5	N5		S5				N	4	-1
Populus tremuloides	Trembling Aspen		G5	N5		S5			L5	N	2	0
Potamogeton sp	Pondweed Species											
Potamogeton crispus	Curly-leaved Pondweed		G5	NNA		SNA			L+	I	0	-5
Potamogeton foliosus	Leafy Pondweed		G5	N5		S5	R	U	L4	N	4	-5
Potamogeton natans	Floating Pondweed		G5	N5		S5	U	U	L3	N	5	-5
Potentilla sp	Cinquefoil Species											
Potentilla anserina	Silverweed		G5	N5		S5				N	5	-4
Potentilla recta	Sulphur Cinquefoil		GNR	NNA		SNA			L+	I	0	5
Prenanthes sp	Rattlesnake-root Species											
Prunus sp	Cherry Species											
Prunus pensylvanica	Pin Cherry		G5	NNR		S5			L4	N	3	4
Prunus serotina	Black Cherry		G5	N5		S5			L5	N	3	3
Prunus virginiana	Choke Cherry		G5	NNR		S5			L5	N	2	1
Prunella vulgaris	Self-heal		G5	N5		S5				N		
Pulmonaria officinalis	Blue Lungwort		GNR	NNA		SNA			L+	I		
Pyrola elliptica	Shinleaf		G5	N5		S5			L4	N	5	5
Pyrus communis	Common Pear		G5	NNA		SNA			L+	I	0	5
Quercus alba	White Oak		G5	N5		S5		R6	L3	N	6	3
Quercus macrocarpa	Bur Oak		G5	N5		S5			L4	N	5	1
Quercus rubra	Northern Red Oak		G5	N5		S5			L4	N	6	3
Ranunculus sp	Buttercup Species											
Ranunculus abortivus	Kidney-leaved Buttercup		G5	NNR		S5			L5	N	2	-2
Ranunculus acris	Tall Buttercup		G5	NNA		SNA			L+	I	0	-2
Ranunculus hispidus var. caricetorum	Northern Swamp Buttercup		G5T5	NNR		S5			L4	N	5	-5
Ranunculus recurvatus	Hooked Buttercup		G5	NNR		S5			L5	N	4	-3

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Ranunculus sceleratus	Cursed Buttercup		G5	N5		S5				N	2	-5
Rhamnus cathartica	Common Buckthorn		GNR	NNA		SNA			L+	I	0	3
Rhus aromatica	Fragrant Sumac*		G5	N5		S4	R	R1	L+	N	8	5
Rhus typhina	Staghorn Sumac		G5	N5		S5			L5	N	1	5
Ribes sp	Currant Species											
Ribes americanum	Wild Black Currant		G5	N5		S5			L5	N	4	-3
Ribes cynosbati	Prickly Gooseberry		G5	N5		S5			L5	N	4	5
Ribes rubrum	Northern Red Currant		G4G5	NNA		SNA			L+	I	0	5
Ribes triste	Swamp Red Currant		G5	N5		S5	U	U	L3	N	6	-5
Robinia pseudoacacia	Black Locust		G5	NNA		SNA			L+	I	0	4
Rorippa palustris	Marsh Yellowcress		G5	N5		S5				N	3	-5
Rosa sp	Rose Species											
Rosa multiflora	Multiflora Rose		GNR	NNA		SNA			L+	I	0	3
Rosa rugosa	Rugosa Rose		GNR	NNA		SNA			L+	I	0	3
Rubus sp	Rubus Species											
Rubus idaeus	Common Red Raspberry		G5	N5		S5				N		
Rubus idaeus ssp. idaeus	Common Red Raspberry		G5T5	NNR		SNA			L+	I	0	-2
Rubus laciniatus	Cut-leaved Blackberry		GUQ	NNA		SNA				I		
Rubus occidentalis	Black Raspberry		G5	N5		S5			L5	N	2	5
Rubus odoratus	Purple-flowering Raspberry		G5	N5		S5			L5	N	3	5
Rubus pubescens	Dewberry		G5	NNR		S5			L4	N	4	-4
Rudbeckia hirta var. pulcherrima	Black-eyed Susan		G5T5	N5		S5			L4	N	0	3
Rudbeckia laciniata	Cut-leaved Coneflower		G5	N5		S5	U	R4	L4	N	7	-4
Rudbeckia triloba	Brown-eyed Susan		G5	NNA		SNA			L+	I	0	1
Rumex britannica	Water Dock		G5	N5		S5	U		L3	N	6	-5
Rumex crispus	Curly Dock		GNR	NNA		SNA			L+	I	0	-1
Sagittaria latifolia	Broad-leaved Arrowhead		G5	N5		S5			L4	N	4	-5
Salix sp	Willow Species											
Salix alba	White Willow		G5	NNA		SNA			L+	I	0	-3
Salix bebbiana	Bebb's Willow		G5	N5		S5			L4	N	4	-4
Salix caprea	Goat Willow		GNR	NNA		SNA			L+	I		
Salix discolor	Pussy Willow		G5	N5		S5			L4	N	3	-3
Salix eriocephala	Heart-leaved Willow		G5	N5		S5			L5	N	4	-3
Salix euxina	Crack Willow		GNR	NNA		SNA			L+	I	0	-1
Salix interior	Sandbar Willow		GNR	NNR		S5		U	L5	N	3	-5
Salix matsudana	Corkscrew Willow		GNR	NNA		SNA			L+	I		
Salix purpurea	Purple Willow		G5	NNA		SNA			L+	I	0	-3
Salix x fragilis	(Salix alba X Salix euxina)		GNA	NNA		SNA			L+	I	0	-4
Salix x sepulcralis	(Salix alba X Salix babylonica)		GNA	NNA		SNA			L+	I		

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Sambucus canadensis	Common Elderberry		G5T5	NNR		S5			L5	N	5	-2
Sambucus racemosa	Red Elderberry		G5	N5		S5			L5	N	5	2
Sanguinaria canadensis	Bloodroot		G5	N5		S5			L5	N	5	4
Saponaria officinalis	Bouncing-bet		GNR	NNA		SNA			L+	I	0	3
Schizachne purpurascens	Purple False Melic		G5	N5		S5			L4	N	6	2
Schoenoplectus tabernaemontani	Soft-stemmed Bulrush		G5	N5		S5			L4	N	5	-5
Scirpus atrovirens	Dark-green Bulrush		G5?	N5		S5				N	3	-5
Scirpus microcarpus	Red-tinged Bulrush		G5	N5		S5	U	U	L5	N	4	-5
Scutellaria galericulata	Hooded Skullcap		G5	N5		S5			L5	N	6	-5
Securigera varia	Common Crown-vetch		GNR	NNA		SNA			L+	I	0	5
Silene latifolia	White Campion		GNR	NNA		SNA			L+	I		
Sium suave	Hemlock Water-parsnip		G5	N5		S5			L4	N	4	-5
Solanum dulcamara	Climbing Nightshade		GNR	NNA		SNA			L+	I	0	0
Solanum sp	Nightshade Species											
Solidago sp	Goldenrod Species											
Solidago altissima	Tall Goldenrod		G5	N5		S5				N		
Solidago caesia	Blue-stemmed Goldenrod		G5	N5		S5			L5	N	5	3
Solidago canadensis	Canada Goldenrod		G5	N5		S5				N	1	3
Solidago caesia var. caesia	Blue-stemmed Goldenrod		G5	N5		S5				N		
Solidago flexicaulis	Zigzag Goldenrod		G5	N5		S5			L5	N	6	3
Solidago gigantea	Giant Goldenrod		G5	N5		S5			L5	N	4	-3
Solidago juncea	Early Goldenrod		G5	N5		S5	U	R6	L4	N	3	5
Solidago patula	Round-leaved Goldenrod		G5	N5		S4	R	R5	L3	N	8	-5
Sonchus arvensis	Field Sow-thistle		GNR	NNA		SNA				I		1
Sorbus aucuparia	European Mountain-ash		G5	NNA		SNA			L+	I	0	5
Sparganium eurycarpum	Broad-fruited Burreed		G5	N5		S5	U	U	L3	N	3	-5
Spiraea alba	White Meadowsweet		G5	N5		S5			L4	N	3	-4
Spirodela polyrhiza	Great Duckweed		G5	N5		S5			L4	N	4	-5
Stachys palustris	Marsh Hedge-nettle		G5	N5		SNA	R	R4	L+	I	0	-5
Stellaria sp	Chickweed Species											
Stuckenia pectinata	Sago Pondweed		G5	N5		S5			L4	N	4	-5
Symphyotrichum cordifolium	Heart-leaved Aster		G5	N5		S5			L5	N	5	5
Symphyotrichum ericoides	White Heath Aster		G5	N5		S5				N	4	4
Symphyotrichum lanceolatum	Panicled Aster		G5	N5		S5				N	3	-3
Symphyotrichum lateriflorum	Calico Aster		G5	N5		S5			L5	N	3	-2
Symphyotrichum novae-angliae	New England Aster		G5	N5		S5			L5	N	2	-3
Symphytum officinale	Common Comfrey		GNR	NNA		SNA			L+	I	0	5
Symphyotrichum pilosum var. pilosum	Old Field Aster		G5T5	N5		S5	R	R3	L2	N	4	2
Symphyotrichum puniceum	Swamp Aster		G5	N5		S5			L5	N	6	-5

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Syringa vulgaris	Common Lilac		GNR	NNA		SNA			L+	I	0	5
Taraxacum officinale	Common Dandelion		G5	N5		SNA			L+	I	0	3
Taxus canadensis	Canadian Yew		G5	N5		S4			L3	N	7	3
Thalictrum dioicum	Early Meadow-rue		G5	NNR		S5			L5	N	5	2
Thalictrum pubescens	Tall Meadow-rue		G5	NNR		S5			L5	N	5	-2
Thelypteris palustris	Marsh Fern		G5	N5		S5			L4	N	5	-4
Thuja occidentalis	Eastern White Cedar		G5	N5		S5			L4	N	4	-3
Tiarella cordifolia	Heart-leaved Foam-flower		G5	N5		S5			L4	N	6	1
Tilia americana	American Basswood		G5	N5		S5			L5	N	4	3
Tilia cordata	Little-leaf Linden		GNR	NNA		SNA			L+	I		
Toxicodendron radicans	Poison Ivy		G5	N5		S5			L5	N	5	-1
Toxicodendron radicans var. rydbergii	Western Poison Ivy		G5	N5		S5		R6	L5	N	0	0
Trifolium hybridum	Alsike Clover		GNR	NNA		SNA			L+	I	0	1
Trifolium pratense	Red Clover		GNR	NNA		SNA			L+	I	0	2
Trifolium repens	White Clover		GNR	NNA		SNA			L+	I	0	2
Trillium erectum	Red Trillium		G5	N5		S5			L4	N	6	1
Trillium grandiflorum	White Trillium		G5	N5		S5			L4	N	5	5
Triosteum aurantiacum	Orange-fruited Horse-gentian		G5	N5		S4S5	R	R9	L3	N	7	5
Tripleurospermum inodorum	Scentless Chamomile		GNR	NNA		SNA			L+	I	0	5
Tsuga canadensis	Eastern Hemlock		G5	N5		S5			L4	N	7	3
Tussilago farfara	Colt's-foot		GNR	NNA		SNA			L+	I	0	3
Typha angustifolia	Narrow-leaved Cattail		G5	N5		SNA			L+	I	3	-5
Typha latifolia	Broad-leaved Cattail		G5	N5		S5			L4	N	3	-5
Ulmus sp	Elm Species											
Ulmus americana	American Elm		G5	N5		S5			L5	N	3	-2
Ulmus pumila	Siberian Elm		GNR	NNA		SNA			L+	I	0	5
Ulmus rubra	Slippery Elm		G5	N5		S5		U	L3	N	6	0
Urtica dioica	Stinging Nettle		G5	N5		S5				N		
Verbena hastata	Blue Vervain		G5	NNR		S5			L5	N	4	-4
Verbascum thapsus	Common Mullein		GNR	NNA		SNA			L+	I	0	5
Verbena urticifolia	White Vervain		G5	N5		S5			L5	N	4	-1
Vernonia gigantea	Giant Ironweed*		G5	N1N2		S1?			L+	N	7	0
Veronica anagallis-aquatica	Water Speedwell		G5	N4		SNA			L4	I	0	-5
Veronica officinalis	Common Speedwell		G5	NNR		SNA			L+	I	0	5
Veronicastrum virginicum	Culver's Root*		G4	N2		S2			L+	N	10	0
Viburnum sp	Viburnum Species											
Viburnum acerifolium	Maple-leaved Viburnum		G5	N5		S5			L3	N	6	5
Viburnum lantana	Wayfaring-tree		GNR	NNA		SNA			L+	I	0	5
Viburnum lentago	Nannyberry		G5	N5		S5			L5	N	4	-1

Scientific Name	Common Name	COSEWIC	G Rank	N Rank	SARO	S Rank	GTA	RM York	TRCA	Native Status	CC	CW
Viburnum opulus ssp. opulus	Cranberry Viburnum		GNR	NNR		SNA			L+	I	0	0
Viburnum opulus	Cranberry Viburnum		G5	N5		S5				N		0
Viburnum opulus ssp. trilobum	Highbush Cranberry		GNR	NNR		S5			L3	N	5	-3
Vicia cracca	Tufted Vetch		GNR	NNA		SNA			L+	I	0	5
Vinca minor	Periwinkle		GNR	NNA		SNA			L+	I	0	5
Vincetoxicum rossicum	European Swallow-wort		GNR	NNA		SNA			L+	I	0	5
Viola sp	Violet Species											
Viola canadensis	Canada Violet		G5	N5		S5				N	6	5
Viola cucullata	Marsh Blue Violet		G4G5	N5		S5			L4	N	5	-5
Viola pubescens	Yellow Violet		G5	N5		S5				N	5	4
Viola sororia	Woolly Blue Violet		G5	N5		S5			L5	N	4	1
Vitis riparia	Riverbank Grape		G5	N5		S5			L5	N	0	-2
Xanthium strumarium	Rough Cocklebur		G5	N5		S5			L5	N	2	0
Zizia aurea	Golden Alexanders		G5	N5		S5	R	R1	L3	N	7	-1

*Species planted, species ranking do not apply

APPENDIX 4 | Wildlife List

Appendix page

Table A4-1. Wildlife list including breeding birds, amphibians, reptiles, and mammals.

Group	Common Name	Scientific Name	Breeding (2020)	G RANK	S Rank	SARA Status	COSEWIC	ESA Status	Area Sensitivity	TRCA	Observed in 1991?	Observed in 2020?	Habitat Guild (from Gore and Storrie 1992 except where otherwise noted)
Amphibian	American Toad	*Anaxyrus americanus*	Y	G5	S5					L4	Y	Y	Wetlands**
Amphibian	Gray Treefrog	*Hyla versicolor*		G5	S5					L2	Y	Y	Woodland and wetlands**
Amphibian	American Bullfrog	*Lithobates catesbeianus*	Y	G5	S4				AS	L2	Y	Y	Wetlands**
Amphibian	Green Frog	*Lithobates clamitans*	Y	G5	S5					L4	Y	Y	Wetlands**
Amphibian	Northern Leopard Frog	*Lithobates pipiens*	Y	G5	S5		NAR	NAR		L3	Y	Y	Wetlands**
Amphibian	Wood Frog	*Lithobates sylvaticus*	Y	G5	S5					L2	Y	Y	Woodland**
Amphibian	Eastern Red-backed Salamander	*Plethodon cinereus*		G5	S5					L3	N	Y	Woodland***
Amphibian	Spring Peeper	*Pseudacris crucifer*	Y	G5	S5					L2	N	Y	Woodland**
Bird	Cooper's Hawk	*Accipiter cooperi*	PO	G5	S4		NAR	NAR	AS	L4	Y	Y	Forest interior
Bird	Sharp-shinned Hawk	*Accipiter striatus*		G5	S5		NAR	NAR	AS	L3	Y	N	Forest edge or interior
Bird	Spotted Sandpiper	*Actitis macularius*	PR	G5	S5					L4	Y	Y	Forest edge or interior near wetland
Bird	Red-winged Blackbird	*Agelaius phoeniceus*	C	G5	S4					L5	Y	Y	Open marsh
Bird	Wood Duck	*Aix sponsa*		G5	S5					L4	Y	N	Forest edge or interior near wetland
Bird	Green-winged Teal	*Anas crecca*		G5	S4					L2	Y	N	Forest edge or interior near wetland
Bird	Mallard	*Anas platyrhynchos*	PR	G5	S5					L5	Y	Y	Open areas near wetland
Bird	Ruby-throated Hummingbird	*Archilochus colubris*	PO	G5	S5B					L4	N	Y	Forest edge or interior*
Bird	Great Blue Heron	*Ardea herodias*	O	G5	S4					L3	Y	Y	Forest edge or interior near wetland
Bird	Cedar Waxwing	*Bombycilla cedrorum*	PO	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Ruffed Grouse	*Bonasa umbellus*		G5	S4					L3	Y	N	Forest edge or interior
Bird	Canada Goose	*Branta canadensis*	PR	G5	S5						Y	Y	Open areas near wetland
Bird	Great Horned Owl	*Bubo virginianus*		G5	S4					L4	Y	N	Forest edge or interior
Bird	Red-tailed Hawk	*Buteo jamaicensis*	PO	G5	S5		NAR	NAS		L5	Y	Y	Forest Edge or Interior
Bird	Green Heron	*Butorides virescens*	PO	G5	S4B					L4	Y	Y	Forest edge or interior near wetland
Bird	Canada Warbler	*Cardellina canadensis*	PO	G5	S4B	THR	THR	SC	AS	L2	N	Y	Forest interior*
Bird	Northern Cardinal	*Cardinalis cardinalis*	C	G5	S5					L5	Y	Y	Forest Edge or Interior

Group	Common Name	Scientific Name	Breeding (2020)	G RANK	S Rank	SARA Status	COSEWIC	ESA Status	Area Sensitivity	TRCA	Observed in 1991?	Observed in 2020?	Habitat Guild (from Gore and Storrie 1992 except where otherwise noted)
Bird	Veery	*Catharus fuscescens*		G5	S4B				AS		Y	N	Forest Edge or Interior
Bird	Chimney Swift	*Chaetura pelagica*		G4G5	S4B,S4N	THR	THR			L4	Y	N	Anthropogenic Areas
Bird	Killdeer	*Charadrius vociferus*	PO	G5	S5B, S5N					L4	Y	Y	Open Areas
Bird	Common Nighthawk	*Chordeiles minor*		G5	S4B	THR	SC			L3	N	Y	Woodlands, shrublands, grasslands***
Bird	Northern Harrier	*Circus cyaneus*		G5	S4B		NAR	NAR	AS	L2	Y	N	Open areas near wetland
Bird	Yellow-billed Cuckoo	*Coccyzus americanus*	PO	G5	S4B					L3	N	Y	Forest edge or interior
Bird	Black-billed Cuckoo	*Coccyzus erythropthalmus*	PO	G5	S5B					L3	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Northern Flicker	*Colaptes auratus*	PR	G5	S4B					L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Rock Dove	*Columba livia*		G5	SNA					L+	Y	N	Anthropogenic areas
Bird	Eastern Wood-Pewee	*Contopus virens*	PR	G5	S4B	SC	SC	SC		L4	Y	Y	Forest edge or Interior
Bird	American Crow	*Corvus brachyrhynchos*	C	G5	S5B					L5	Y	Y	Forest edge or interior
Bird	Common Raven	*Corvus corax*	C	G5	S5					L4	N	Y	Forest interior*
Bird	Blue Jay	*Cyanocitta cristata*	C	G5	S5					L5	Y	Y	Forest Edge or Interior
Bird	Bobolink	*Dolichonyx oryzivorus*		G5	S4B	THR	THR	THR	AS	L2	Y	N	Open areas
Bird	Pileated Woodpecker	*Drycopus pileatus*	PO	G5	S5				AS	L3	N	Y	Forest interior*
Bird	Downy Woodpecker	*Dryobates pubescens*	PR	G5	S5					L5	Y	Y	Forest Edge or Interior
Bird	Hairy Woodpecker	*Dryobates villosus*	C	G5	S5				AS	L4	N	Y	Forest interior*
Bird	Gray Catbird	*Dumetella carolinensis*	PR	G5	S4B					L4	Y	Y	Forest Edge or Interior
Bird	Alder Flycatcher	*Empidonax alnorum*	PO	G5						L3	Y	Y	Forest edge or interior near wetland
Bird	Least Flycatcher	*Empidonax minimus*	PR	G5	S4B				AS	L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Willow Flycatcher	*Empidonax traillii*	PR	G5	S5B					L4	Y	Y	Forest edge or interior near wetland
Bird	American Kestrel	*Falco sparverius*		G5	S4					L4	Y	N	Forest edge and wooded anthropogenic or successional area
Bird	Mourning Warbler	*Geothlypis philadelphia*	PR	G5	S4B					L3	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Common Yellowthroat	*Geothlypis trichas*	PR	G5	S5B					L4	Y	Y	Open marsh
Bird	House Finch	*Haemorhous mexicanus*		G5	SNA					L+	Y	N	Forest edge and wooded anthropogenic or successional area

Group	Common Name	Scientific Name	Breeding (2020)	G RANK	S Rank	SARA Status	COSEWIC	ESA Status	Area Sensitivity	TRCA	Observed in 1991?	Observed in 2020?	Habitat Guild (from Gore and Storrie 1992 except where otherwise noted)
Bird	Barn Swallow	*Hirundo rustica*	PO	G5	S4B	THR	THR	THR		L4	Y	Y	Anthropogenic Areas
Bird	Wood Thrush	*Hylocichla mustelina*	PR	G5	S4B	THR	THR	SC		L3	Y	Y	Forest edge or Interior
Bird	Baltimore Oriole	*Icterus galbula*	PR	G5	S4B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Orchard oriole	*Icterus spurius*	PO	G5	S4B					L5	N	Y	Forest edge and wooded anthropogenic or successional areas*
Bird	Belted Kingfisher	*Megaceryle alcyon*	C	G5	S4B					L4	Y	Y	Sandy banks near water
Bird	Eastern Screech-owl	*Megascops asio*	PO	G5	S4		NAR	NAR		L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Red-bellied Woodpecker	*Melanerpes carolinus*	PR	G5	S4					L4	N	Y	Forest edge or interior*
Bird	Wild Turkey	*Meleagris gallopavo*	PR	G5	S5					L3	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	Swamp Sparrow	*Melospiza georgiana*	PO	G5	S5B					L4	Y	Y	Open marsh
Bird	Song Sparrow	*Melospiza melodia*	PR	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Brown-headed Cowbird	*Molothrus ater*	C	G5	S4B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Great Crested Flycatcher	*Myiarchus crinitus*	PR	G5	S4B					L4	N	Y	Forest edge or Interior
Bird	Osprey	*Pandion haliaetus*		G5	S5B					L3	Y	N	Forest edge or interior near wetland
Bird	Northern Waterthrush	*Parkesia noveboracensis*		G5	S5B					L3	Y	N	Forest edge or interior near wetland
Bird	House Sparrow	*Passer domesticus*	PO	G5	SNA					L+	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Savannah Sparrow	*Passerculus sandwichensis*	C	G5	S4B				AS	L4	Y	Y	Open areas
Bird	Indigo Bunting	*Passerina cyanea*	PR	G5	S4B					L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Ring-necked Pheasant	*Phasianus colchicus*		G5	SNA					L+	Y	N	Forest edge and wooded anthropogenic or successional area
Bird	Rose-breasted Grosbeak	*Pheucticus ludovicianus*	PR	G5	S4B					L4	Y	Y	Forest edge or Interior
Bird	Eastern Towhee	*Pipilo erythrophthalmus*		G5	S4B					L3	Y	N	Forest edge or Interior
Bird	Scarlet Tanager	*Piranga olivacea*	PR	G5	S4B				AS	L3	N	Y	Forest interior*
Bird	Black-capped Chickadee	*Poecile atricapillus*	C	G5	S5					L5	Y	Y	Forest Edge or Interior
Bird	Blue-gray Gnatcatcher	*Polioptila caerulea*	PO	G5	S4B				AS	L4	N	Y	Forest edge or interior

Group	Common Name	Scientific Name	Breeding (2020)	G RANK	S Rank	SARA Status	COSEWIC	ESA Status	Area Sensitivity	TRCA	Observed in 1991?	Observed in 2020?	Habitat Guild (from Gore and Storrie 1992 except where otherwise noted)
Bird	Vesper Sparrow	*Pooecetes gramineus*		G5	S4B					L3	Y	N	Open areas
Bird	Purple Martin	*Progne subis*		G5	S4B					L4	Y	N	Anthropogenic areas
Bird	Common Grackle	*Quiscalus quiscula*	C	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Virginia Rail	*Rallus limicola*	PO	G5	S5B					L3	Y	Y	Open marsh
Bird	Bank Swallow	*Riparia riparia*		G5	S4B	THR	THR	THR		L3	Y	N	Sandy banks near water
Bird	Eastern Phoebe	*Sayornis phoebe*	PO	G5	S5B					L5	Y	Y	Cliff Ledges or bridges near water
Bird	American Woodcock	*Scolopax minor*		G5	S4B					L3	Y	N	Forest edge or interior
Bird	Magnolia Warbler	*Setophaga magnolia*	PO	G5	S5B				AS	L3	N	Y	Forest interior*
Bird	Chestnut-sided Warbler	*Setophaga pensylvanica*	PO	G5	S5B					L3	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	Yellow Warbler	*Setophaga petechia*	PR	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Pine Warbler	*Setophaga pinus*	PO	G5	S5B				AS	L4	N	Y	Forest interior*
Bird	American Redstart	*Setophaga ruticilla*	C	G5	S5B				AS	L4	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	Eastern Bluebird	*Sialis sialis*	PO	G5	S5B		NAR	NAR		L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Red-breasted Nuthatch	*Sitta canadensis*	PR	G5	S5				AS	L4	Y	Y	Forest interior
Bird	White-breasted Nuthatch	*Sitta carolinensis*	PR	G5	S5				AS	L4	Y	Y	Forest Edge or Interior
Bird	American Goldfinch	*Spinus tristis*	PR	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Clay-coloured Sparrow	*Spizella pallida*	PO	G5	S4B					L3	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	Chipping Sparrow	*Spizella passerina*	PO	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Field Sparrow	*Spizella pusilla*	PO	G5	S4B					L4	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	PR	G5	S4B					L4	Y	Y	Sandy banks near water
Bird	Eastern Meadowlark	*Sturnella magna*	PR	G5	S4B	THR	THR	THR	AS	L3	Y	Y	Open Areas
Bird	European Starling	*Sturnus vulgaris*	C	G5	SNA					L+	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Tree Swallow	*Tachycineta bicolor*	PR	G5	S4B					L4	Y	Y	Forest edge and wooded anthropogenic or successional area

Group	Common Name	Scientific Name	Breeding (2020)	G RANK	S Rank	SARA Status	COSEWIC	ESA Status	Area Sensitivity	TRCA	Observed in 1991?	Observed in 2020?	Habitat Guild (from Gore and Storrie 1992 except where otherwise noted)
Bird	Carolina Wren	*Thryothorus ludovicianus*		G5	S4					L4	Y	N	Forest edge or interior near wetland
Bird	Brown Thrasher	*Toxostoma rufum*	PO	G5	S4B					L3	N	Y	Forest edge and wooded anthropogenic or successional area
Bird	House Wren	*Troglodytes aedon*	PR	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	American Robin	*Turdus migratorius*	PR	G5	S5B					L5	Y	Y	Forest edge or interior
Bird	Eastern Kingbird	*Tyrannus tyrannus*	PR	G5	S4B					L4	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Warbling Vireo	*Vireo gilvus*	PR	G5	S5B					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Bird	Red-eyed Vireo	*Vireo olivaceus*	PR	G5	S5B					L4	Y	Y	Forest Edge or Interior
Bird	Mourning Dove	*Zenaida macroura*	PO	G5	S5					L5	Y	Y	Forest edge and wooded anthropogenic or successional area
Mammal	Beaver	*Castor canadensis*		G5	S5					L4	Y	Y	Creek, river***
Mammal	Woodchuck	*Marmota monax*		G5	S5					L5	Y	N	Forest edge and wooded anthropogenic or successional area***
Mammal	Striped Skunk	*Mephitis mephitis*		G5	S5					L5	Y	Y	Forest edge and wooded anthropogenic or successional area***
Mammal	American Mink	*Mustela vison*		G5	S4					L4		Y	Woodlands and wetlands***
Mammal	White-tailed Deer	*Odocoileus virginianus*		G5	S5					L4	Y	Y	Woodlands, forest edge and wooded anthropogenic, or successional area***
Mammal	Muskrat	*Ondatra zibethicus*		G5	S5					L4	Y	Y	Wetlands***
Mammal	Hairy-tailed Mole	*Parascalops breweri*		G5	S4					L3		Y	Wetlands***
Mammal	Raccoon	*Procyon lotor*		G5	S5					L5	Y	Y	Woodlands***
Mammal	Gray Squirrel	*Sciurus carolinensis*		G5	S5					L5	Y	Y	Woodlands***
Mammal	Eastern Cottontail	*Sylvilagus floridanus*		G5	S5					L4	Y	Y	Woodlands***
Mammal	Eastern Chipmunk	*Tamias striatus*		G5	S5					L4	Y	Y	Woodlands***
Mammal	Red Squirrel	*Tamiasciurus hudsonicus*		G5	S5					L4	Y	Y	Woodlands***
Mammal	Red Fox	*Vulpes vulpes*		G5	S5					L4	Y	Y	Woodlands***
Reptile	Snapping Turtle	*Chelydra serpentina*		G5	S3	SC	SC	SC		L3	N	Y	Wetlands***
Reptile	Midland Painted Turtle	*Chrysemy picta marginata*		G5T5	S4		SC			L3	N	Y	Wetlands***
Reptile	Eastern Gartersnake	*Thamnophis sirtalis sirtalis*		G5T5	S5					L4	Y	Y	Wetlands***
Reptile	Pond Slider	*Trachemys scripta*		G5	SNA					L+	N	Y	Wetlands***

*****Determined by experience of the authors and the Wildlife Habitat Technical Guide (MNR 2000)

******Ecoregion 6E and 7E Ecoregion Schedules for the Significant Wildlife Habitat Guide (2015)

*******NatureServe Explorer (https://explorer.natureserve.org/)

APPENDIX 5 | MNRF Wetland Mapping

Appendix page

MNRF WETLANDS WHITCHURCH-STOUFFVILLE

KING

VAUGHAN

RICHMOND HILL

WHITCHURCH-STOUFFVILLE

UXBRIDGE

MARKHAM

PICKERING

VAUGHAN

TORONTO

Ontario

Scale 1:3,500 (approx.)

KM 0 0.75 1.5 3 4.5 6

2021-06-ST

Legend

MNR Evaluated Wetland

MNRF Identified Wetlands

MNRF Identified Wetlands (Northern Markham)

CommunityC

Fen

Marsh

Open Water

Shallow Water

Swamp

PUBLICATION

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Universal Transverse Mercator (6 degree) projection, Zone 17. North American Datum 1983

SOURCE OF INFORMATION

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Ministry of Natural Resources & Forestry - Aurora District 50 Bloomington Road West, Aurora, ON L4G 0L8

Base information derived from the Ontario Base Map, 1983 at a scale of 1:10,000 and the Natural Resources Values Information System (NRVIS).

NOTE

The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should be viewed as illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

For detailed information on natural features such as their location, size or status, the individual files held by the Aurora district office of the Ministry of Natural Resources & Forestry should be consulted.