Toronto and Region Conservation Authority

Humber Arboretum Study Area - Terrestrial Biological Inventory

Prepared by Terrestrial Inventories & Monitoring

April, 2021

Table of Contents

1.0 INTRODUCTION **1**
1.1 The TRCA Terrestrial Natural Heritage Program 1
2.0 STUDY AREA DESCRIPTION AND HISTORY **2**
3.0 INVENTORY METHODOLOGY **2**
3.1 Landscape Analysis 3
3.2 Vegetation Community, Flora and Fauna Species Scoring and Ranking 4
3.3 Vegetation Communities, Flora and Fauna Species Data Collection 6
4.0 RESULTS AND DISCUSSION **8**
4.1 Landscape Analysis Regional Context 8
4.2 Habitat Patch Findings for Humber Arboretum Study Area 8
4.2.1 Quantity of Natural Cover 8
4.2.2 Quality of Natural Cover 9
4.3 Vegetation Community Findings for Humber Arboretum 9
4.3.1 Vegetation Community Representation 10
4.3.2 Vegetation Communities of Concern 14
4.3.3 Vegetation Community Disturbances and Changes 2000 - 2020 15
4.4 Flora Findings for Humber Arboretum 17
4.4.1 Flora Species Representation 17
4.4.2 Flora Species of Concern 18
4.4.3 Planted Flora Species 21
4.4.4 Invasive Species 22
4.5 Fauna Species Findings for Humber Arboretum 23
4.5.1 Fauna Species Representation 23
4.5.2 Fauna Species of Concern 24
5.0 SUMMARY **30**
5.1 Site Summary 30
6.0 REFERENCES **32**

List of Tables

Table 1: Habitat patch quality, rank and species response. 4

Table 2: L-ranks and total score ranges for vegetation communities. 5

Table 3: L-ranks and total score ranges for flora. 5

Table 4: L-ranks and total score ranges for fauna. 6

Table 5: Source of terrestrial natural heritage information for the Humber Arboretum. 7

Table 6: Summary of vegetation communities at Humber Arboretum, 2020. 10

Table 7: Current flora species, Humber Arboretum, 2006-2020. Regional species of conservation concern (L1-L3), historically extirpated (LX), urban species of conservation concern (L4), secure species (L5), exotic/probable exotic species (L+/L+?). 18

Table 8: Fauna species and Species of Regional and Urban Concern (ranked L1 to L4) counts for Humber Arboretum study area for the period 2011-2020. 24

List of Figures

Figure 1. Successional communities form the largest share of vegetation types at Humber Arboretum (photo: TRCA 2020). 12

Figure 2. Proportions of different vegetation community classes within area surveyed in both 2000 and 2020 at Humber Arboretum. Values differ slightly from Appendices 1a and 1b which cover total areas surveyed in 2000 and 2020 rather than the overlap. 16

Figure 3. Regionally rare white trout-lily was found at the Humber Arboretum in 2008 and 2021 (photo: TRCA 2021). 18

Figure 4. Hawthorns are abundant in parts of Humber Arboretum, including this one that has not yet been identified (photo: TRCA, 2020). 20

Figure 5. Sweet toadshade trillium, native to southern US and planted in the ESA woodlot. 22

Figure 6. American Redstarts established as many as 11 territories at Humber Arboretum in 2020, up from zero in 2000 (photo: TRCA 2016) 27

List of Maps

Map 1. Humber Arboretum in the Context of Regional Natural Cover 36
Map 2. Humber Arboretum Study Area 37
Map 3. Regional Natural System Habitat Patch Quality 38
Map 4. Distribution of Fauna Regional Species of Concern 39
Map 5. Habitat Patch Size Scores with Fauna Area Sensitivity 40
Map 6. Scores for Matrix Influence and Flora Sensitivity to Development 41
Map 7. Scores for Matrix Influence and Fauna Sensitivity to Development 42
Map 8. Habitat Patch Quality Scores 43
Map 9. Vegetation Communities and Associated Local Ranks 44
Map 10. Flora Species of Concern (L1 to L4) 45
Map 11. Flora Species Habitat Dependence Scores 46
Map 12. Planted Flora (L1 to L4) 47
Map 13. Invasive Flora 48
Map 14. Fauna Species of Concern (L1 to L4) 49

List of Appendices

Appendix 1a. Vegetation Communities at Humber Arboretum (2020) 50
Appendix 1b. Historical Vegetation Communities (2000) 53
Appendix 2. Flora Species at Humber Arboretum (2000-2020) 55
Appendix 3. Fauna Species at Humber Arboretum 66

1.0 INTRODUCTION

In 2020, the Terrestrial Inventories and Monitoring group of Toronto and Region Conservation Authority (TRCA) was commissioned to conduct a terrestrial biological inventory of the baseline conditions of the Humber Arboretum in the City of Toronto. This report summarizes the baseline conditions using the updated biological data while drawing on existing terrestrial fauna and flora data collected over the past two decades. The information is of value both for site management plans and to assess biodiversity at a broader regional level.

This report summarizes the biological inventory findings to:

- Characterize the terrestrial natural heritage features of Humber Arboretum.
- Describe how the natural heritage features of the Humber Arboretum contribute to the regional Terrestrial Natural Heritage System (TNHS) and support regional biodiversity.

The primary concerns that the inventory addresses are:

- To aid the City of Toronto in management decisions concerning the Humber Arboretum
- And, on the broader scale, to examine how the Humber Arboretum fits within the regional natural heritage system, and how its contribution to this system may be protected and maximized?

An important underlying message is that the integrity and health of the natural system are measured at the regional scale; individual sites must be considered in this larger system context.

1.1 The TRCA Terrestrial Natural Heritage Program

Rapid urban expansion in the TRCA jurisdiction has led to continuous and incremental loss of natural cover and species. In a landscape that probably supported 95% forest cover prior to European settlement, the most recent TRCA desktop landscape analysis (2017) shows that only 17.8% forest (including successional) and wetland cover remains. It is important to stress that these are cumulative declines that result from innumerable site-specific decisions. Agricultural and natural lands are increasingly being urbanized while species continue to disappear from a landscape that is less able to support them. This represents a substantial loss of ecological health and ecosystem function that will be exacerbated in the future according to current urbanization trends. With the loss of natural cover, diminishing proportions of various natural vegetation communities and reduced populations of native species remain. As additional stresses are exerted on the natural system many species become even rarer until they are lost, or at imminent risk of being lost. Reductions in the natural heritage system reduce biodiversity and the ecosystem services that sustain human society.

In the late 1990s the TRCA initiated the Terrestrial Natural Heritage Program to address the loss of terrestrial biodiversity within the jurisdiction's nine watersheds. This work culminated in the Terrestrial Natural Heritage System Strategy (TNHSS) (TRCA 2007a), which was approved in 2008, and has been under implementation since that time. The aim is to protect elements of the natural system (vegetation communities, flora, and fauna species) *before* they become rare, and to promote greater ecological function of the system as a whole. This

proactive approach is needed; by the time a community or species has become rare, irreversible damage has already occurred. A healthy natural system capable of supporting regional biodiversity in the long term is the goal. Targets, both short and long-term (100 years), provide direction for planning at all scales (TRCA 2007a, TRCA 2007b).

The systems approach applied in TNHSS development incorporated data from a range of scales. Assessments of the components of biodiversity similarly consider multiple scales, ranging from the region as a whole, through the watersheds and smaller landscape habitat elements, to site level communities and species.

2.0 STUDY AREA DESCRIPTION AND HISTORY

The study area consists of 104 ha of public land and is located along West Humber River as it flows from Finch Avenue, in the north, downstream as far as Highway 27. The area is bound to the west by the dense residential area along Humberwood Boulevard; to the north-east by the residential area along Humberline Drive and Humber College; and to the south-east by the residential and commercial developments along Queens Plate Drive and Rexdale Boulevard (Maps 1 and 2). Overall, the site is located in a highly urbanized landscape with the only significant natural linkage being along the West Humber River as it continues east towards the Main Humber River. The area is one of the last to be developed within the City of Toronto, with urbanization occurring between roughly 1970 and 2000. Prior to that period, it was open agricultural land, with only the older woodlots being visible in aerial photography from the late 1960s.

Geological information regarding the study area reveals that the base material is mostly Halton Till, overlain by glaciolacustrine deposits on the tableland and flatter areas (Peel Clay Plain). More recent alluvial deposits in the floodplain of the West Humber River have a blend of clay, silt, and gravel. There are small areas of Ordovician shale bedrock along the riverbank, but these are much more prominent downstream of the study area. Soils are predominantly Peel Clay (Hoffman and Richards 1955), and this is borne out by most of the soil samples taken during 2020 vegetation community surveys. Six of the eight soil samples were clay or clay loam, with one loam sample near the river. There was, however one anomalous very fine sand record on a terrace south of the river which is not captured in soil mapping. This sand lens showed differences in vegetation as noted below.

The study area is situated within the Carolinian Floristic Region, a zone of forest within southern Ontario that is largely characterized by broad-leaved deciduous trees. A few northern species from the Great Lakes – St. Lawrence mixed forest zone are associated with cooler micro-habitats and seepage areas. Humber Arboretum is known as a locally important natural area. The central woodlot is designated as an Environmentally Significant Area (ESA) by the City of Toronto (Map 2; North-South Environmental 2012).

3.0 INVENTORY METHODOLOGY

Terrestrial biological data for the Humber Arboretum study area is available from inventory work conducted in 2000 and 2020. The largest dataset by far is from the latter 2020 inventory. This same year saw the temporary installation of 2 bat-recorders, allowing TRCA staff to assess the presence of various bat species at the site. Where available, terrestrial inventory data has been supplemented by recent incidental records taken from the

online citizen science platform, iNaturalist (all such non-TRCA records having been confirmed with photographic evidence). A few records from the central woodlot surveyed in 2008 for the City of Toronto Environmentally Significant Areas study were also incorporated (North-South Environmental 2012).

Biological inventories were conducted at the levels of habitat patch (landscape analysis), vegetation community, and species (flora and fauna) according to the TRCA methodologies for landscape evaluation (TRCA 2007c) and field data collection (TRCA 2007d). The scoring and ranking of vegetation communities, flora and fauna to generate local conservation concern L-ranks (L1 to L5) is a key underlying process that supports this field work (Section 3.2; TRCA 2017).

3.1 Landscape Analysis

TRCA natural system characterization applies a regional landscape analysis approach that scales from the level of the individual habitat patch to the natural system region wide (TRCA 2007c). Key to this is our understanding that a healthy natural system for the region requires more than a minimum quantity of area: it requires natural connections across the larger landscape; it requires multiple habitat types; it requires quality of habitat; it also requires protection from those external influences (matrix influences) that would degrade the habitat.

Base Mapping

The most recent available landscape analysis used 2017 ortho-rectified aerial photography (Table 5). Regional habitat patches were digitally mapped and characterized into the broadly defined patch categories of forest, successional, wetland, meadow and dynamic (beach, dune, and bluff) using ArcMap GIS software. These broad classes should not be confused with vegetation communities. The latter incorporate a much finer level of data, collected in the field during botanical surveys (Sections 3.3, 4.3).

Quality of Natural Cover

The quality metric used for each habitat patch essentially assesses the potential for the scored habitat patch to support components of biodiversity. Three criteria are used: *size* (ha), *shape* (edge-to-area ratio), and *matrix influence* (measure of the positive and negative impacts from surrounding land use) (TRCA 2007c). A weighted average of the scores for the criteria provides a total score, and total score ranges are used to assign local ranks of conservation concern, or L-ranks, as outlined in Table 1. Ranks are from L1 (highest quality) through L5 (poorest quality).

Both avian species richness (Kilgour 2003) and biodiversity quality (McKenzie *et al*. 2018) have been demonstrated to correlate with patch total score. Specifically, TRCA regional Species of Conservation Concern are more likely to be present in habitat patches of higher patch score/rank, as summarized in Table 1.

Table 1: Habitat patch quality, rank and species response.

Size, Shape and Matrix Influence	Patch Rank	Fauna Species of Conservation Concern
Excellent	L1	Generally found
Good	L2	Generally found
Fair	L3	Generally found
Poor	L4	Generally not found
Very Poor	L5	Generally not found

Forest Interior

The forest interior metric evaluates the potential for a forest patch to support those species requiring isolation from human activity/influences. Sufficiently large patches of a sufficiently optimal shape provide interior forest. Measurements of the distance from any point in the habitat to the closest edge are used to categorize interior elements, where they exist. The lowest distance from edge category is 100–200 m interior forest; increasingly deeper interior components are measured in additional 100m increments.

Quantity and Distribution

Periodic landscape analysis (every 4-6 years) assesses progress towards the regional quantity target of 30% natural cover (TRCA 2007a). This target results from modelling the minimum area that could support species of conservation concern over the long term.

3.2 Vegetation Community, Flora and Fauna Species Scoring and Ranking

Vegetation communities, native vascular plants (flora) and native vertebrate animals (fauna) are scored on a set of ecological sensitivity, habitat requirement and abundance criteria by TRCA biologists in order to assign conservation concern status ranks or L-ranks (local ranks of conservation concern). The process of scoring and ranking is described in detail in TRCA (2017). Applied since 2001, the method also provides for updates of scores and ranks as additional, or more current, data becomes available for a given community or species.

Vegetation community scores and ranks are based on two criteria: *local occurrence* and the number of *geophysical requirements* or factors on which they depend (Table 2). Flora species are scored using four criteria: *local occurrence*, *population trend*, *habitat dependence*, and *sensitivity to* impacts associated with *development* (Table 3). Fauna species are scored on seven criteria: *local occurrence*, *local population trend*, *continent-wide population trend*, *habitat dependence*, *sensitivity to development*, *area-sensitivity*, and *patch isolation sensitivity* (Table 4). Species ranked from L1 through L3 are region-wide Species of Conservation Concern. Those ranked L4 are also of concern in the urban and urbanizing parts of the region. Species with an L-rank of L5 are currently not considered of concern as they are able to persist alongside urbanization. Some derive benefit from living in close proximity to human society; as a result, they are likely to be more common in urban than in rural areas.

Table 2: L-ranks and total score ranges for vegetation communities.

L-rank	Total Score Range	Conservation Concern Status
L1	8.5 - 10	Of high level of concern in TRCA jurisdiction due to rarity, stringent site needs, and/or threat to habitat
L2	6.5 - 8	Of regional concern, typically occurs in less-disturbed natural areas and under highly specific site conditions; at risk of decline/disappearance from the region
L3	5 - 6	Of regional concern, restricted in occurrence and/or requires specific site conditions; generally, occurs in natural rather than cultural areas
L4	3 – 4.5	Generally secure in rural matrix; of conservation concern in the urban matrix
L5	1 – 2.5	Generally secure; not of conservation concern unless it contains sensitive species or other features such as old growth; contributes to natural cover
L+	n/a	Community defined by alien species (e.g., Scots pine plantation, buckthorn thicket). Contributes to natural cover

Table 3: L-ranks and total score ranges for flora.

L-rank	Total Score Range	Conservation Concern Status
L1	19 - 20	Unable to withstand disturbance; many criteria are limiting factors: generally occur in high-quality natural areas in natural matrix; almost certainly rare in the TRCA jurisdiction; of concern regionally
L2	17 - 18	Unable to withstand disturbance; some criteria are very limiting factors: generally occur in high-quality natural areas, in natural matrix; probably rare in the TRCA jurisdiction; of concern regionally
L3	14 - 16	Able to withstand minor disturbance; generally secure in natural matrix; of concern regionally
L4	11 - 13	Able to withstand some disturbance; generally secure in rural matrix; of concern in urban matrix
L5	2 - 10	Able to withstand high levels of disturbance; generally secure throughout the jurisdiction, including the urban matrix; may be of very localized concern in highly degraded areas
LX	n/a	Extirpated from our region with remote chance of rediscovery (i.e., natural populations). May be present in plantings. Presumably highly sensitive.
LH	n/a	Hybrid between two native species; not scored; a hybrid that is highly stable and behaves like a species (e.g., *Equisetum x nelsonii*) is not given this designation, but is scored and ranked
L+	n/a	Exotic; not native to the TRCA jurisdiction; includes hybrids between a native species and an exotic
L+?	n/a	Origin uncertain or disputed, i.e. may or may not be native

Table 4: L-ranks and total score ranges for fauna.

L-rank	Total Score Range	Conservation Concern Status
L1	25+	Of high level of concern in TRCA jurisdiction due to rarity, stringent habitat needs, and/or threat to habitat; greatly at risk of decline/disappearance from the region
L2	20 - 24	Of regional concern, typically occurs in less-disturbed natural areas and specific habitat(s); at risk of decline/disappearance from the region
L3	15 - 19	Of regional concern, restricted in occurrence and/or requires specific habitat(s); generally occurs in natural rather than cultural areas
L4	10 - 14	Able to withstand some disturbance; generally secure in rural matrix; of concern in urban matrix
L5	2 - 9	Able to withstand disturbance; currently considered secure, including in the urban matrix
LX	n/a	Extirpated from the region
L+	n/a	Exotic; not native to the TRCA jurisdiction; exotic species are not scored

3.3 Vegetation Communities, Flora and Fauna Species Data Collection

Vegetation community, flora species and fauna species data were collected through field surveys. Surveys were carried out at the appropriate times of year to assess breeding status in the case of amphibians and birds, and during the optimal growing period of the various plant species and communities (TRCA 2007d). Vegetation communities and flora species were surveyed concurrently. It should be noted that all flora and fauna records are subject to a threshold period (15 years for flora, 10 years for fauna) beyond which records are no longer considered current.

Botanical fieldwork undertaken in 2020 was conducted between the months of May through September (Table 5). In 2000, TRCA had also undertaken a quick survey for the City of Toronto Natural Heritage Study which used an earlier version of vegetation mapping along with a few significant flora records (TRCA 2001). Botanical work begins with identifying ephemeral flora in the spring before the full closure of forest canopy occurs. This is followed by the bulk of the vegetation community work in the summer and fall months when characteristics of community and non-ephemeral flora species are most readily observed. Vegetation community designations were based on the Ecological Land Classification (ELC) and determined to the level of vegetation type (Lee *et al.* 1998). Community boundaries were outlined on printouts of digital ortho-rectified photographs (ortho-photos) at a scale of 1:2000 and then digitized in ArcView.

Flora Species of Regional Concern (ranked L1 to L3) and Urban Concern (L4) were mapped as point data, and the approximate population size recorded for each point. For this study area, populations of selected invasive plants were also mapped. A list of all flora species observed was documented for the site. Plant species records available from 2000 historical records collected within the study area were also included in the species list.

Table 5: Source of terrestrial natural heritage information for the Humber Arboretum.

Survey Item	Source	Dates	Survey Effort
Patch / Landscape	GIS	2002, 2007/08, 2013, 2017: ortho-photos	-
Vegetation Communities and Flora Species	TRCA Toronto Natural Heritage Study	2000: Aug 17, 18; Sept. 5	21 hours
	TRCA Humber Arboretum Inventory	2020: May 6, 9, 27, 28; July 20, 28, 29, 30; August 5, 6, 17, 28; Sept. 2, 3, 4	108 hours
	North-South (Toronto ESA Study)	2008: April 25, July 2	-
	Incidental Records (iNaturalist)	2019: June 3, July 2	-
Nocturnal Fauna Species	Humber Arboretum Inventory	2020: April 21, May 28, July 7	7.5 hours
Bats	Passive bat-recorders	2020: June 3 - 17	14 nights
Diurnal Fauna Species	Humber Arboretum Inventory Humber Arboretum Inventory	2020: June 3, 4, 24, 25. 2000: June 30.	16 hours unknown
Fauna Species	Incidental records iNaturalist	1987 to 2020	-

The 2020 fauna inventory was conducted from April to July (Table 5). The April, May and July evening visits surveyed for breeding frog species of Regional and Urban Concern; this visit also incidentally surveyed for nocturnal bird species, including owls and American Woodcock (*Scolopax minor*). Surveys in June point-mapped breeding bird territories (L1-L4 ranked species). Other breeding birds (L5 and exotic) were listed, but not mapped.

Breeding bird surveys were conducted at least twice during the breeding season to assess the breeding status of each mapped individual. Categorization of possible, probable, or confirmed breeding status for birds followed the method used for Ontario Breeding Bird Atlas data collection (Cadman *et al*. 2007). All initial visits were completed by the end of the third week of June. Bird observations recorded prior to June 16 were validated through a second visit later in the season. A quality assurance process filtered out individuals likely to be migrants in transit, rather than on-site breeders.

For a period of 14 days in June 2020 passive bat-recording devices were installed at 2 separate locations within the study area to assess the presence or absence of bat species. The 2 bat-recording devices (Anabat Swift passive models) were installed at locations on the west and the east side of the site, 1.2 km apart, and were programmed to record from sunset to sunrise for 14 nights from 3rd to 17th June. These devices record acoustic data which are subsequently analysed using Sonobat software which automatically identifies every individual recording to species where recording quality allows. A sample of the results of the automatic identification process is then manually quality controlled (“vetted”) to ensure that the software has correctly applied the various identification criteria.

In addition to the 2020 data, a few incidental records from 2011 to 2020 have been included, and data from TRCA's partial biological inventory in 2000 have been referenced. Ten years is the threshold for inclusion of fauna data as current under the protocol (TRCA 2007d), but any significant records from external sources for dates prior to 2011 (e.g., an Ontario Herp Survey record from 1994) are also referenced in this report. Any records included from the iNaturalist citizen science platform (indicated in Appendix 3) have been confirmed through photographic evidence and checked for veracity.

4.0 RESULTS AND DISCUSSION

The results of the 2017 landscape analysis and available biological inventory are the focus of this section, discussed to characterize the natural features of the site and to provide an integrated perspective of the site in the regional system context. Natural features throughout the study area are noted where relevant to the discussion. Note that species are referred to by common name; the scientific name is noted the first time a species is mentioned, and Appendices 1 through 3 list the species found by both common and scientific name.

4.1 Landscape Analysis Regional Context

The 2017 ortho-photography shows that 25% of the land area in the TRCA jurisdiction hosts natural cover, including 6.2% meadow. Historically, the region would have consisted of up to 95% forest cover with interspersed wetlands and very little meadow coverage; currently just 17.8% forest, successional habitat and wetland remains.

The regional analysis of habitat patches shows an average patch quality across the TRCA jurisdiction of "fair" (L3) with an unbalanced distribution; forest and wetland cover are contained largely in the northern half of the TRCA jurisdiction, especially on the Oak Ridges Moraine (Map 3). The existing natural system stands below the 30% quantity target set for the region (TRCA 2007a). Fauna species of conservation concern are also largely restricted to the northern part of the jurisdiction and generally absent from the urban matrix (Map 4).

4.2 Habitat Patch Findings for Humber Arboretum Study Area

The landscape-scale analysis of the Humber Arboretum's habitat patches considers it at a coarse level of detail but includes the context of the watershed and the region (Section 3.1).

4.2.1 Quantity of Natural Cover

Natural cover occupies the vast majority of the study area. Ground-truthed ELC data shows 101.4 ha of existing natural cover. This includes 27.9 ha of forest, 42.0 ha of successional, 9.7 ha of meadow and 3.7 ha of dynamic (largely riparian bar), 8.0 ha of wetland and 0.2 ha of vegetated aquatic. The remaining lands include heavily managed manicured areas, roads, parking lots, and buildings; as well as unvegetated open aquatic (e.g., the West Humber River). However, for the purposes of landscape analysis "forest" habitat includes any areas that seem to have high tree cover, not restricted necessarily to areas that are designated as forest vegetation types in ELC; it may include treed swamp and more dense successional areas.

4.2.2 Quality of Natural Cover

Habitat Patch Size and Shape

The size of habitat patches within the study area ranges from "very poor" to "fair" with examples of both forest and meadow habitats managing to attain the latter "fair" - or L3 - status. The study area as a whole is bisected by the West Humber River which, although obviously natural habitat itself, acts as a break in what would otherwise be measured as larger continuous patches of forest; if this is taken into consideration then the forest patch sizes are behaving as slightly larger patches than the analysis indicates (Map 5). Patch shape tends to score higher as many of the habitat patches have compact shapes that minimize edge-to-area ratio and reduces edge effects. The bulk of the patches score as "poor" and "fair" for the shape criterion, but there are also several smaller patches that are scored as "good" and even "excellent". One aspect of combining the size and shape of forest patches is an indication of forest interior, a measure of the extent of this very specific forest habitat type. Interior forest habitat (measured in increments of 100 m from the forest edge) is important in the accommodation of a suite of more sensitive forest fauna species. Despite the occurrence of a couple of reasonably large forest patches at Humber Arboretum, the longitudinal riparian nature of these larger patches (resulting in "poor" shape as the patch edge abuts the river) precludes the presence of any forest interior on site.

Habitat Patch Matrix Influence

Humber Arboretum is located within an intensely urban matrix, which results in high levels of stress to the ecosystem (e.g., urban land use impacts such as heavy recreational use, soil disturbance, and intrusions of invasive plants - see Sections 4.3.3, 4.4.2, and 4.4.4). The matrix score for all the natural patches within the study area is "very poor" (Maps 6 and 7).

Habitat Patch Total Score

The combination of size, shape and matrix influence yields a total score that provides an objective assessment of patch ecological potential: in particular, the potential to support species of regional conservation concern. At Humber Arboretum such "habitat patch total scores" are fairly evenly split between "poor" and "very poor"; in large part this is due to the extreme negative influence of the urban matrix (Map 8). The slightly higher than otherwise anticipated "poor" (L4) total scores of some of the more centrally situated habitat patches is primarily due to the "fair" patch area scores achieved by the larger patches (and the higher shape scores of a couple of the more compact patches).

4.3 Vegetation Community Findings for Humber Arboretum

Examination of habitat at the finer level of detail provided by vegetation communities gives greater insight into current habitat patch value. High scoring habitat patches that are made up of native vegetation communities and vegetation communities of concern have the highest potential to support regional biodiversity and species of conservation concern.

4.3.1 Vegetation Community Representation

The surveys in 2020 included 101.4 ha of natural cover at Humber Arboretum. There were 68 different vegetation communities spanning 5 broad vegetation classes (i.e., forest, successional, wetland, aquatic and dynamic). Eight of the communities are found solely as an inclusion or complex within a larger community (Table 6; Appendix 1a).

Table 6: Summary of vegetation communities at Humber Arboretum, 2020.

Class	Number of Types	Total Area (hectares)	% of Natural Cover
Forest	15	27.9	27
Plantation	11	4.5	4
Dynamic	9	3.7	4
Successional	12	42.0	41
Meadow	3	9.7	10
Wetland	13	8.0	8
Aquatic	5	5.7	6
Total	*68*	*101.4**	*100*

***N.B. Due to rounding errors, the total area may not exactly equal the sum of the column.**

Forests

Forests occupy 27.9 ha (27%) of the vegetation communities. All the forests are deciduous with some southern species present, consistent with the study area's location in the Carolinian zone. There were 15 types documented that can be fit into 3 broad groupings. Mature sugar maple forest occurs in several patches on the north tableland by Humber College and on some of the valley slopes both north and south of the West Humber River. Vegetation types include Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1), Dry-Fresh Sugar Maple – Oak Deciduous Forest (FOD5-3), Dry-Fresh Sugar Maple – Hickory Deciduous Forest (FOD5-5), Dry-Fresh Sugar Maple Basswood Deciduous Forest (FOD5-6), and Dry-Fresh Sugar Maple – Ash Deciduous Forest (FOD5-8). There is also Fresh-Moist Sugar Maple – Black Maple Deciduous Forest (FOD6-2) on a lower terrace. The largest patch of mature forest forms the centre of the Humber Arboretum ESA (Map 2). It includes communities with shagbark hickory (*Carya ovata*) and old-growth black maple (*Acer nigrum*). Other associated trees include bitternut hickory (*Carya cordiformis*), red oak (*Quercus rubra*), basswood (*Tilia americana*), ironwood (*Ostrya virginiana*) and white ash (*Fraxinus americana*). The understorey includes younger sugar maple, choke cherry (*Prunus virginiana*), and some buckthorn (*Rhamnus cathartica*). Ground vegetation varies; it is richest in the ESA woodlot where cut-leaved toothwort (*Cardamine concatenata*) and yellow trout-lily (*Erythronium americanum*) are abundant. In other areas, the ground layer is very thin and consists of garlic mustard (*Alliaria petiolata*), avens (*Geum canadense* and *G. urbanum*), enchanter's nightshade (*Circaea canadensis*), and seedlings of sugar maple and buckthorn.

Other mature forests are dominated by oak and/or hickory. These include Dry-Fresh Oak – Hardwood Deciduous Forest (FOD2-4), Fresh-Moist Bur Oak Deciduous Forest (FOD9-3), and Fresh-Moist Bitternut Hickory Deciduous Forest (FOD9-5). The predominant trees include red and bur oak (*Quercus rubra* and *Q. macrocarpa*), shagbark and bitternut hickory, and basswood. The understorey and ground layers are similar to

those of the sugar maple forests. Oak-hickory forests are Carolinian vegetation types, occupying 1.6 ha of the study area.

Younger and more disturbed forest types are characteristic of the floodplains as well as second-growth areas on the valley slopes and areas that have experienced tree mortality from pests and diseases such as Dutch elm disease (*Ophiostoma* spp) and emerald ash borer (*Agrilus planipennis*). These cover 14.3 ha and include Dry-Fresh Exotic Deciduous Forest (FOD4-e), Dry-Fresh Hawthorn – Apple Deciduous Forest (FOD4-H), Fresh-Moist Hawthorn – Apple Deciduous Forest (FOD7-E), Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3), Fresh-Moist Black Walnut Lowland Deciduous Forest (FOD7-4), and Fresh-Moist Manitoba Maple Lowland Deciduous Forest (FOD7-a). The canopy is dominated by shade-intolerant exotic and native species including Manitoba maple (*Acer negundo*), crack willow (*Salix* x *fragilis*), hawthorns (*Crataegus* spp), apple (*Malus pumila*), black walnut (*Juglans nigra*), and occasionally basswood and poplar (*Populus* spp). A dense understorey of riverbank grape (*Vitis riparia*) and thicket creeper (*Parthenocissus vitacea*) is often present. The ground layer is diverse but often very weedy with such species as garlic mustard, white and urban avens, enchanter's nightshade, hedge parsley (*Torilis japonica*), calico aster (*Symphyotrichum lateriflorum*) and common blue violet (*Viola sororia*). In areas with more light penetration, there may be late goldenrod (*Solidago gigantea*) and dog-strangling vine (*Vincetoxicum rossicum*). Exotic species are abundant to dominant, with aggressive native species co-dominant.

Plantation

Although there is a lot of planted material at the Humber Arboretum, contiguous areas of plantation community are small and scattered, occupying 4.5 ha (4% of the surveyed communities). They are mostly young and divided into 11 types, functionally included within forest communities (Appendix 1a). Restoration Mixed Plantation (CUP2-A) and Restoration Deciduous Plantation are the most prominent, featuring such trees as white pine (*Pinus strobus*), white spruce (*Picea glauca*), silver maple (*Acer saccharinum*), bur oak and basswood. Closer to Humber College in more formal arboretum plantings, there are some unusual ornamental species such as European beech (*Fagus sylvatica*), Ohio buckeye (*Aesculus glabra*) and hybrid oaks such as *Quercus* x *bimundorum* (*Quercus alba* x *robur*). Shrubs include grey and red-osier dogwoods (*Cornus racemosa* and *C. sericea*), staghorn sumach (*Rhus typhina*) and nannyberry (*Viburnum lentago*). Since most of these communities still have a fairly open canopy, meadow species such as European cool-season grasses and goldenrods (*Solidago* spp) are prominent in the ground layer. Locust Deciduous Plantation (CUP1-c) forms a distinctive invasive-dominated type found near the east end of the study area on the south-facing slopes near Highway 27. This consists of black locust (*Robinia pseudoacacia*) with an understorey of Tatarian honeysuckle (*Lonicera tatarica*) and buckthorn. Herbaceous species include garlic mustard and dog-strangling vine.

Successional

Twelve successional types have been classified within the study area, covering 42.0 ha (41% of the surveyed communities and the largest single category) (Appendix 1a) (Figure 1). They are characterized by a thin to discontinuous cover of shrubs and/or young trees and have a history of recent (<70 years) disturbance. They may result from either the traditional process of fast-growing shade intolerant trees and shrubs moving into a meadow; or from extensive dieback of forest trees that opens the canopy. Successional communities often

have a high proportion of exotic species as well as dense coverage of woody vines including natives such as riverbank grahpe (*Vitis riparia*). Vegetation types are poorly defined due to overlapping species composition and indistinct polygon boundaries. In particular, they may differ from young forest communities only by the amount of woody canopy cover being under 60%. The most common types are Native Deciduous Successional Woodland (CUW1-A3) and Native Deciduous Successional Savannah (CUS1-A1) with 11.1 and 18.3 ha, respectively. Some of the other types include Exotic Deciduous Woodland (CUW1-b), Buckthorn Deciduous Thicket (CUT1-b) and Exotic Deciduous Thicket (CUT1-c). Areas of Hawthorn Successional Savannah (CUS1-1) or Woodland (CUW1-D) reflect historical cow pasture use and together cover 2.3 ha (3.8 ha if one includes more closed canopy hawthorn young forests) (Marks 2001). Prominent tree species are like those of the younger forests and include Manitoba maple, poplars, crack willow, black walnut, bur oak, white elm (*Ulmus americana*) and hawthorns (*Crataegus* spp). Shrubs include buckthorn and honeysuckles (*Lonicera* spp) and sometimes raspberries (*Rubus* spp), staghorn sumach, dogwoods, and willows. Herbaceous species include a blend of old-field plants such as tall goldenrod (*Solidago altissima*) and European cool-season grasses with those of younger disturbed forests such as enchanter's nightshade, Virginia stickseed (*Hackelia virginiana*), avens and garlic mustard.

Figure 1. Successional communities form the largest share of vegetation types at Humber Arboretum (photo: TRCA 2020).

Meadow

Meadows with little woody vegetation cover 9.7 ha, the majority of which is Native Forb Meadow (6.9 ha). (Forb is a term for broad-leaved herbaceous plants). There are also 1.9 ha of Exotic Cool-season Grass Graminoid Meadow (CUM1-b) and 0.9 ha of Exotic Forb Meadow (CUM1-c). Tall goldenrod, New England, panicled and heath asters (*Symphyotrichum novae-angliae*, *S. lanceolatum* and *S. ericoides*), and common milkweed (*Asclepias syriaca*) are the main native forbs. Frequently encountered exotic forbs include dog-strangling vine, creeping thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), and cow vetch (*Vicia cracca*). Grasses are mostly the common ones introduced during European settlement for livestock forage purposes, hay, and erosion ground cover: for example, smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), quack grass (*Elymus repens*), and meadow fescue (*Lolium pratense*).

Wetlands and Aquatic Communities

Wetlands contribute 8.0 ha of natural cover to Humber Arboretum and are represented by 13 vegetation types falling under the categories of either swamp or marsh (Appendix 1a). Aquatic communities cover 5.6 ha but most of this is unvegetated watercourse. There are 2 vegetated aquatic communities covering 0.2 ha. Wetlands occur scattered throughout the study area, with the biggest ones associated with tributary watercourses and seepage in a wide part of the valley west of Humber College that includes old oxbows and complex topography. Others are associated with ponds and restoration projects, including one within the otherwise formal arboretum area. The largest share is Hybrid Cattail Mineral Shallow Marsh (MAS2-1b), which occupies 3.2 ha largely in the southwestern part of the study area. Hybrid cattail (*Typha* x *glauca*) forms almost monotypic stands. Forb Mineral Meadow Marsh (MAM2-10) occupies 1.8 ha. This is largely dominated by panicled aster (*Symphyotrichum lanceolatum*), Joe Pye weed (*Eutrochium maculatum*), and goldenrods (*Solidago* spp). Ancillary species include purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*) and creeping bent grass (*Agrostis stolonifera*). Humber Arboretum also has small areas of Common Reed Mineral Meadow and Shallow Marsh (MAM2-a and MAS2-a), Reed Canary Grass Mineral Meadow Marsh (MAM2-2), Bulrush Mineral Shallow Marsh (MAS2-2), and Forb Mineral Shallow Marsh (MAS2-9).

Swamps occupy a smaller area than marshes. Willow Mineral Deciduous Swamp (SWD4-1) comprises the majority, with 1.7 ha largely associated with active high-water channels of the West Humber River as well as more removed oxbows that are generally offline. Two oxbow features, one on each side of the river, include vernal pools. The main tree species are crack willow and peach-leaved willow (*Salix amygdaloides*). Manitoba maple and riverbank grape are often abundant as well. Herbaceous species include reed canary grass, orange touch-me-not (*Impatiens capensis*), purple loosestrife, false nettle (*Boehmeria cylindrica*), and creeping bent grass. There are also very small areas of Poplar Mineral Deciduous Swamp (SWD4-3), Willow Mineral Thicket Swamp (SWT2-2) and Red-osier Mineral Thicket Swamp (SWT2-5).

Vegetated aquatic communities occur in small pockets in the midst of cattail marshes and in a naturalized water garden in the formal part of the arboretum. They include Pondweed Submerged Shallow Aquatic (SAS1-1), Coontail Submerged Shallow Aquatic (SAS1-A), and Duckweed Floating-leaved Shallow Aquatic (SAF1-3). Associated species include leafy pondweed (*Potamogeton foliosus*), sago pondweed (*Stuckenia pectinata*),

coontail (*Ceratophyllum demersum*), and turion, common and greater duckweeds (*Lemna turionifera*, *L. minor* and *Spirodela polyrhiza*).

The wetland features within the Study Area have not been evaluated by the MNRF to assess whether they are locally or provincially significant (MNRF 2013). However, the City of Toronto ESA includes one of the oxbow channels with willow swamp and vernal pools.

Dynamic

Dynamic communities are maintained in an open or semi-open state by erosion or other repeated processes such as fire. At Humber Arboretum they include numerous riparian bars, a few small bluffs, areas of clay barren, and one variant of oak savannah.

Riparian bars and bluffs occur along the West Humber River and are affected by frequent floods and sometimes ice scour. These include Reed Canary Grass Riparian Bar (BBO1-3), Willow Shrub Riparian Bar (BBS1-2B), Mineral Treed Riparian Bar (BBT1-B), Mineral Open Bluff (BLO1) and Deciduous Treed Bluff (BLT1-B). Common tree species include crack and white willow (*Salix alba*), cottonwood (*Populus deltoides*), and Manitoba maple. Shrubs include narrow heart-leaved willow (*Salix eriocephala*), sandbar willow (*S. interior*) and buckthorn. Characteristic herbaceous species include reed canary grass, goldenrods, and Canada anemone (*Anemonastrum canadense*).

Two dynamic vegetation types fit within the savannah – prairie spectrum: Bur Oak Non-tallgrass Savannah (CUS1-3B) and Fresh-Moist Tallgrass Prairie Planting (TPO2-A). The former community is an open floodplain stand on the south bank of the West Humber River and has an open canopy of bur oak, basswood, and black walnut. Herbaceous species are more characteristic of the floodplain successional areas than of High Park oak savannahs: they include goldenrods, asters, dog-strangling vine, European cool-season grasses, and Canada anemone. The tallgrass planting is part of a restoration project in the western part of the study area (west of Humberwood Blvd; it is a complex within a more regular meadow. Species include grey-headed coneflower (*Ratibida pinnata*), switch grass (*Panicum virgatum*), and Indian grass (*Sorghastrum nutans*).

Two patches of Open Clay Barren (CBO1) occur, one on each side of the river. Here, exposed subsoil is subject to extreme conditions and a difficult rooting environment. Vegetation cover is discontinuous and consists of a thin cover of certain grasses such as flat-stemmed bluegrass (*Poa compressa*), wild strawberry (*Fragaria virginiana*), bird's foot trefoil (*Lotus corniculatus*), and grey goldenrod (*Solidago nemoralis*). There are a few stunted junipers (*Juniperus virginiana* and *J. chinensis*), and apple.

4.3.2 Vegetation Communities of Concern

Being located within the urban zone, Humber Arboretum's vegetation communities of conservation concern include those ranked L4 as well as L1 to L3. However, community ranks alone do not necessarily indicate the intactness or quality of individual examples of communities. A common vegetation community may be of conservation concern because of its age, intact native ground layer, or other considerations aside from rank.

Such communities, where they remain, should be considered of high conservation concern, regardless of L-rank.

Within the study area, there are 28 vegetation communities of conservation concern (7 L3, 21 L4) (Map 9) (Appendix 1a). Communities of regional concern (L3) occupy 4.1 ha and those of urban concern (L4) occupy 13.4 ha.

The L3 communities include the rare and unusual Fresh-Moist Bitternut Hickory Deciduous Forest (FOD9-5), located on a lowland terrace above the main floodplain on the north side of the West Humber River. It is part of the mature forest patch designated as the City of Toronto ESA and forms the western part of that patch. The Bur Oak Non-tallgrass Savannah (CUS1-3B) is also ranked L3. Humber Arboretum is one of only four locations within the TRCA jurisdiction where this community is known to occur; the others are all also within the Peel Plain between the Ebenezer Tract and the Main Humber. On the other hand, this oak savannah community is more akin to successional communities than to the black oak savannahs of High Park, with shrub and ground layers largely of common species.

Open Clay Barren (CBO1) also has a rank of L3 and does have a distinctive species composition of less competitive plants that are more tolerant of difficult conditions, such as poverty oat grass (*Danthonia spicata*) and grey goldenrod.

The remaining L3 communities are riparian-dynamic in nature: Reed Canary Grass Riparian Bar (BBO1-3), Mineral Treed Riparian Bar (BBT1-B), Mineral Open Bluff (BLO1), and Deciduous Treed Bluff (BLT1-B).

The L4 communities include 7 forest, 11 wetland / aquatic, 1 riparian bar, and 2 thicket vegetation types. The largest is the mature Dry-Fresh Sugar Maple – Hickory Deciduous Forest (FOD5-5) that forms the bulk of the ESA and covers 5.7 ha. The forest has a rich ground layer that includes a very large population of cut-leaved toothwort and some other spring ephemerals.

4.3.3 Vegetation Community Disturbances and Changes 2000 - 2020

Vegetation communities within the study area are under pressure from several different anthropogenic disturbances which include but are not limited to the replacement of native species by invasive species, trampling, nutrient and storm water input. Disturbances caused from pest and pathogen outbreaks and tree damage from past and recent storm events are also a major factor at Humber Arboretum.

Trampling is locally intense. Some of the trails in the ESA woodlot are extremely wide. This sort of forest is the most vulnerable because of its more delicate ground vegetation.

The greatest impacts on wetland and aquatic communities are nutrient inputs from local run-off and the incursion of exotic wetland grasses, shrubs, and forbs. Nutrient inputs encourage the growth of algae in aquatic communities and aggressive invasive species in more emergent wetland communities. These come in through storm water as well as from upstream on the West Humber River. One notable instance observed at the Humber Arboretum in 2020 was some kind of sanitary sewage leak on the north side east of Humberwood

Blvd; this produced a foul-smelling flooded area observed throughout the field season from May to September. Hybrid cattail and native species tolerant of eutrophic conditions dominate in ponds and their vegetated edges.

Invasive plant species are described in more detail below (see Section 4.4.4). However, pests and diseases have had a decisive impact on the Humber Arboretum. Gypsy Moth (*Lymantria dispar*) can attack a wide array of tree species and was abundant in the Toronto area in 2020. Beech bark disease (a complex of introduced European scale insects and opportunistic fungi that invade the wounds caused by them) and butternut canker (*Ophiognomonia clavigignenti-juglandacearum*) attack individual tree species. However, other diseases and pests are able to visibly alter the landscape. Dutch elm disease and emerald ash borer may have significantly altered the vegetation structure in places, if one compares present vegetation with the earlier rapid survey done by TRCA in 2000. The year 2000 data followed basic ELC protocols and so can be compared with 2020.

Given Toronto's reasonably moist climate and the absence of logging or fire at the Humber Arboretum, one would expect forest cover to gradually increase and meadow to decrease over time due to natural succession. But this is not exactly what the results show (Figure 2).

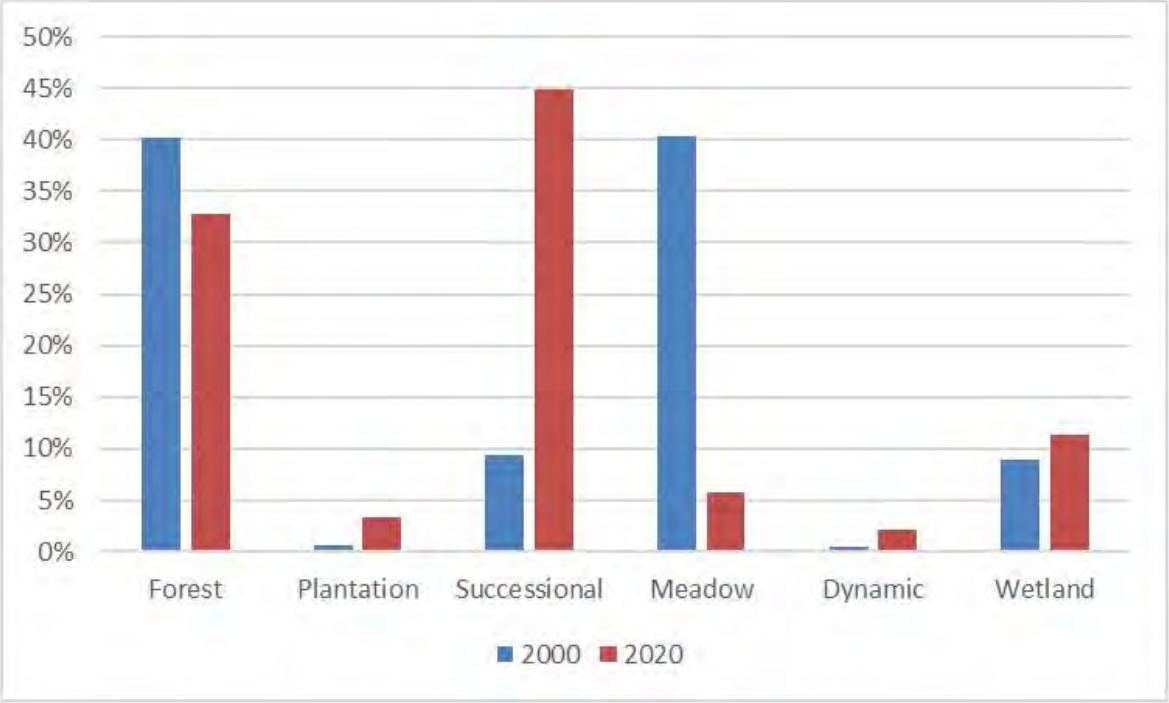


Figure 2. Proportions of different vegetation community classes within area surveyed in both 2000 and 2020 at Humber Arboretum. Values differ slightly from Appendices 1a and 1b which cover total areas surveyed in 2000 and 2020 rather than the overlap.

Meadow has indeed decreased dramatically as woody plants have moved in. It occupied about 40% of the natural cover in 2000 and appeared to be much more than that in mid-20th century air photos taken when the study area was agricultural. By 2020, only about 6% of the natural cover was open meadow. Meanwhile successional communities increased from under 10% to over 40% of the natural cover. Yet forest actually declined slightly, from about 40% to 33%. This suggests that, given the absence of tree-cutting within this protected parkland, tree dieback was intense enough to decrease the amount of treed natural cover with over

60% canopy closure. Red and white ash, and white elm had been major components of young-to-mid aged forests in the Toronto area, and at Humber Arboretum in particular. Since 2002, ash has been decimated by emerald ash borer. Dutch elm disease began a few decades before then but has also caused a drastic decrease in elm populations. Fresh-Moist Ash Deciduous Forest (FOD7-2) and Fresh-Moist Elm Lowland Deciduous Forest (FOD7-1) were both sizeable communities observed in 2000 (Appendix 1b) but were not observed in 2020 (Appendix 1a). This lends credence to the idea that pests and disease are creating holes in forest cover and encouraging "reverse succession": the replacement of closed canopy forest with semi-open disturbed woodlands. Storm events such as the ice storm of December 2013 may be contributing to canopy opening. At the same time, meadows continue to grow in with opportunistic fast-growing trees and shrubs resulting in a convergence on successional communities composed of prolific but short-lived and not tall, often exotic woody plants. Buckthorn and Manitoba maple are prime examples of prolific exotics currently poised to replace the original canopy and redefine future forests. Such successional communities may be becoming the default form of upland natural cover in the jurisdiction. TRCA biological inventories, because of their extensive scope, may be able to detect such a signal even though they collect less information on tree health than long-term monitoring plots.

On the other hand, there does not seem to be much change in wetland cover observed between 2000 and 2020. Purple loosestrife-dominated communities (Purple Loosestrife Meadow Marsh: MAM2-b) have almost disappeared, probably due to beetles introduced for biological control, while cattail marshes have increased. Invasive common reed marshes have increased though not enormously, now occupying 0.7 ha (Appendix 1a).

4.4 Flora Findings for Humber Arboretum

4.4.1 Flora Species Representation

Current records (within the last 15 years 2006-2020) document 508 flora taxa (including subspecies and cultivars); this includes planted observations (Appendix 2). There are 401 naturally occurring species and 107 species introduced through plantings (Table 7).

Of those species that are naturally occurring, native plants account for almost exactly half (200 species) of the total. The fragmented nature of natural cover within the study area and the high degree of disturbance exerted on the site from the surrounding urban landscape is a driving factor affecting the relatively low prevalence of native species. The even division between native and exotic species richness is typical of urban sites in the TRCA jurisdiction.

Table 7: Current flora species, Humber Arboretum, 2006-2020. Regional species of conservation concern (L1-L3), historically extirpated (LX), urban species of conservation concern (L4), secure species (L5), exotic/probable exotic species (L+/L+?).

Species by L-Rank	No. of naturally occurring species	No. of planted species	Total no. of species
L1-L3 (and LX)	18	20	38
L4	50	17	67
L5	132	13	145
L+/L+?	201	57	257
Total no. of species	*401*	*107*	*508*

4.4.2 Flora Species of Concern

There are 18 naturally occurring vascular plant species of regional conservation concern (rank L1 to L3) and 50 of urban conservation concern (L4) in the Humber Arboretum study area (Map 10, Appendix 2). Three of the L1-L4 plants are regionally rare, meaning that they are found in 6 or fewer of the forty-four 10x10 km UTM grid squares that cover the TRCA jurisdiction. Leafy muhly grass (*Muhlenbergia frondosa*) is a southern species usually found near TRCA's major streams. It may be underreported. The other two species are quite conspicuous. In 2008, white trout-lily (*Erythronium albidum*) was found in the ESA woodlot during the City of Toronto's ESA field work (North-South Environmental 2012). This population was observed again in April 2021 and found to be thriving, with at least two smaller satellite clusters (Figure 3). White trout-lily is a Carolinian species, known only from a few locations in the Lower and West Humber and Upper Etobicoke watersheds.

Figure 3. Regionally rare white trout-lily was found at the Humber Arboretum in 2008 and 2021 (photo: TRCA 2021).

Fragrant cudweed (*Pseudognaphalium obtusifolium*) is the third regionally rare plant at Humber Arboretum. This is unusual because it is locally disjunct; the other TRCA records are on the Oak Ridges Moraine. The fragrant cudweed population was first observed in the 2000 TRCA survey and was still large and thriving in 2020 with two closely spaced locations mapped.

Butternut *(Juglans cinerea),* a SAR tree species listed as endangered, was identified within the study area in 2020 (Appendix 2). It is undergoing catastrophic population decline due to butternut canker even though habitat conditions would otherwise be favourable for it (fertile bottomlands with plenty of canopy gaps). Only one tree was found, and it was in poor condition.

Rarity and population trend are just two of four criteria used to derive L-rank. The other criteria are habitat dependence; and sensitivity to human disturbance associated with development (TRCA 2017). Most of the species of regional or urban conservation concern at Humber Arboretum are habitat specialists. Species of conservation concern are clustered in mature deciduous forests, especially the central ESA woodlot, but also can be found in all the habitats such as wetlands, barrens, and successional areas (Map 11). Characteristic of the deciduous forests are spring ephemerals such as cut-leaved toothwort and white (as well as the more common yellow) trout-lily. Shagbark hickory (*Carya ovata*) is a southern (largely Carolinian) tree found in Peel Plain woodlots such as those at Humber Arboretum, and running strawberry bush (*Euonymus obovatus*) can also be found in the ground flora in the ESA woodlot.

Lowland floodplain forests and woodlands at Humber Arboretum have numerous bur oaks and black maple, some of which are truly massive old-growth individuals. At the smaller end of the scale, leafy muhly grass and white grass (*Leersia virginica*) also occur in floodplain forests. Moonseed (*Menispermum canadense*) was last observed in 2000 (therefore considered historic although it may still be present – Appendix 2).

Notable wetland species include sedges found in meadow-marshes: troublesome and woolly sedges (*Carex molesta* and *C. pellita*) along with Canada bluejoint grass (*Calamagrostis canadensis*), turtlehead (*Chelone glabra*), and shining aster (*Symphyotrichum firmum*). Along with the dominant cattails, shallow marshes also have three-square and soft-stemmed bulrushes (*Schoenoplectus pungens* and *S. tabernaemontani*).

Swamps and riparian bars have an abundance of willows, notably the L3 species black willow (*Salix nigra*).

Aquatic species of concern are present in a couple of ponds. They include greater duckweed, leafy and sago pondweeds, and coontail.

The small areas of barren have a few habitat specialists. Fragrant cudweed is found in a dry meadow / savannah in a little pocket of fine sandy soil. Poverty oat grass and golden-fruited sedge (*Carex aurea*) are in clay barren. Sky-blue aster (*Symphyotrichum oolentangiense*) is normally found in barrens (sand or clay) and prairies but was on the edge of a manicured area at Humber Arboretum.

Some species are restricted to successional old-field habitats and clearings. These include the hawthorns as well as Canada plum (*Prunus nigra*). Hawthorns are a diverse and sometimes confusing genus: eight species were recorded, including three L4 species and one that was not identified (Figure 4).

Figure 4. Hawthorns are abundant in parts of Humber Arboretum, including this one that has not yet been identified (photo: TRCA, 2020).

Sensitivity to development refers to the response of flora species to specific land use impacts (Section 3.2; see also TRCA 2017). Examples of such impacts include changes in hydrology and surficial conditions; trampling, with its associated plant tissue damage and soil compaction; competition from invasive exotic species that readily move into disturbed or fragmented habitats from gardens or trails; picking and collection; herbivory and pollution (i.e., soil, water and/or air). Invasive species (exotic plants, pests, and diseases) are present in all habitats and are discussed further in Section 4.4.4. Trampling is an issue for upland forest species. Hydrological and pollution issues affect wetland species. Most flora species of concern are affected by at least one of these impacts.

Trampling is heavy in parts of the Humber Arboretum as discussed in Section 4.3.3. The most affected species would be forest ground flora with slower growth and delicate stems, such as running strawberry-bush and

white trillium (*Trillium grandiflorum*), both of which now have very small populations in the ESA woodlot. Deer browse can also affect this forest ground flora. A few showy species may be prone to collection as wild edibles (e.g., wild leek – *Allium tricoccum*) or for gardens (e.g., yellow lady's-slipper – *Cypripedium parviflorum* var. *makasin*).

Many wetland plants are sensitive to hydrological changes and pollution. Individual species prefer specific hydrological regimes and are vulnerable to disturbances to those regimes. For example, turtlehead is associated with an area of seepage and thus a constant flow of ground water on the south slope of the valley, while false nettle prefers seasonally saturated vernal pool areas. Yellow birch grows in both moist forests and in swamps, but also requires an evenly moist soil often associated with ground water.

Excess phosphorus is most commonly responsible for the rapid growth of algae in Ontario (Ontario Government, 2020). The algae prevent aquatic macrophytes from growing and create other water quality issues. Road-run-off and storm sewer inputs from the surrounding areas are sources of such nutrients to aquatic systems. Coontail and/or pondweeds were almost completely absent from the ponds in the floodplain near Highway 27 which are affected by storm water, while they were much denser in the pond in the formal arboretum area which is more protected. During the 2020 field season, construction to ameliorate this problem in the floodplain ponds was underway as part of Toronto's Ravine Strategy (Humber College 2021).

Excess nutrients can also favour the establishment of exotic species which tend to be more tolerant of eutrophic, disturbed conditions such as hybrid cattail. Nutrient and contaminant deposition from runoff or the atmosphere can also affect upland species such a white pine *(Pinus strobus)*. Most native species, especially specialized ones, are adapted to low levels of nitrate (Brys *et al*. 2005, Sauer 1998).

4.4.3 Planted Flora Species

As one might expect at an arboretum, there is an abundance of planted species in the study area. At least 107 species were introduced through plantings (in some cases it is difficult to ascertain whether something originated through natural establishment or planting). Plantings fit under two general categories: restoration projects that deliberately involve native species, and arboretum collections of unusual species. However, the former can occur in otherwise formal areas (such as the pond and wetland located near Humber College), and the latter can be found in areas that are now natural cover (such as parts of the bottomland below Humber College and towards Hwy 27).

Restoration plantings include 20 species of regional conservation concern (L1-L3, LX); and 17 species of urban conservation concern (L4) (Map 12; Appendix 2). One wetland planting occupying a swale in the west part of the study area (between Humberwood Blvd and Finch Ave W) includes a wide range of species: for example, marsh fern (*Thelypteris palustris*), wild spiraea (*Spiraea alba*), swamp milkweed (*Asclepias incarnata*), and tussock sedge (*Carex stricta*).

The central woodlot has also been the subject of plantings, including natives such as maidenhair fern (*Adiantum pedatum*) which has not been observed since 2008; but also, exotic showcases such as sweet toadshade trillium (*Trillium cuneatum*), native to the south-central USA (Figure 5).

Figure 5. Sweet toadshade trillium, native to southern US and planted in the ESA woodlot.

4.4.4 Invasive Species

Humber Arboretum has 257 exotic plant species; this includes 200 established and 57 planted species (Appendix 2). This is due to past (agricultural) and present (urban) land uses, with most of the landscape having been cleared of original vegetation long ago. Depending on the habitat, most exotic species exhibit only mild to moderate degrees of invasiveness and aggressiveness. However, some are highly invasive, possessing the ability to displace their native counterparts if conditions prove favourable. A total of 41 invasive or potentially invasive species were mapped during the 2020 field season, comprising 600 individual records (Map 13). Invasive plants were found throughout the study area, especially in successional communities. There were fewer records in areas of mature forest, but they were by no means absent.

There were 20 invasive species that had 10 or more mapped records. Dog-strangling vine was number one, with 68 records, while garlic mustard and buckthorn each had 51. These three species, along with hedge parsley, honeysuckles, and Manitoba maple are probably primary or secondary dominant species in most successional communities and exclude native regeneration. However, frequency of occurrence is only one factor in determining the urgency of an invasive problem. Common reed is only moderately established in

wetlands (16 records) but has the potential for explosive growth and should be a high priority for control. Purple loosestrife has 35 mapped records but is less dominant than it was in 2000 due to beetles introduced for biological control. It is still found in many places while occupying less space. Hybrid cattail forms monotypic stands in many of the marshes but provides ecosystem structure and would be extremely difficult to remove.

Other invasive species are worth noting, though they may present in low to moderate numbers, because they have the potential to expand based on their performance in other ravines and natural areas. In fact, the opportunity may exist for eradication at Humber Arboretum while their numbers are still small. In forests, these include Norway maple (*Acer platanoides*), Siberian squill (*Scilla siberica*), lily-of-the-valley (*Convallaria majalis*), goutweed (*Aegopodium podagraria*) and lesser celandine (*Ficaria verna*). In wetlands, these include European water-horehound (*Lycopus europaeus*), European alder (*Alnus glutinosa*), and giant hogweed (*Heracleum mantegazzianum*). The latter attains monstrous dimensions and can cause severe photosensitivity in people.

Invasive pests and diseases affect many of the native trees. The list includes Dutch elm disease, butternut canker, beech bark disease, gypsy moth and emerald ash borer.

4.5 Fauna Species Findings for Humber Arboretum

This section reports primarily on the fauna species observed within the study area between 2011 and 2020 (Section 3.3), with added discussion of relevant historical records. Observations from the 2020 fauna inventory as well as incidental observations of herpetofauna and mammals are discussed in the species representation section. Additional detail is provided in subsequent sections on Species of Regional and Urban Concern (those ranked L1 to L4), and on historical Species of Regional and Urban Concern records.

4.5.1 Fauna Species Representation

Table 8 summarizes the fauna species counts for the 2011 to 2020 period. Appendix 3 lists the species observed, along with scientific names and L-ranks. Fauna species richness (number of species) at the Humber Arboretum study area stands at 72 species (including the one invertebrate species routinely assessed in TRCA's fauna inventories, the Digger Crayfish, *Creaserinus fodiens*). Species richness per unit area in natural cover generally increases with increasing patch size, habitat quality, and increasing habitat diversity (e.g., of vegetation communities and of physical structure) (Rybicki and Hanski 2013).

Table 8: Fauna species and Species of Regional and Urban Concern (ranked L1 to L4) counts for Humber Arboretum study area for the period 2011-2020.

Group	Species Count 2011-2020	Count of Species Ranked L1 – L4 2011-2020
Birds	45	19
Frogs (Herpetofauna)	3	3
Other Herpetofauna*	5	4
Mammals*	18	12
Digger Crayfish*	1	1
Total	72	39

*observations of other herpetofauna, mammals and Digger Crayfish are incidental to the inventory protocols

The bat species identified from the recorders deployed in June 2020 are included in the fauna species totals presented in Table 8 and in the overall inventory list. The 3 species of bats (Big Brown Bat, *Eptesicus fuscus*; Silver-haired Bat, *Lasionycteris noctivagans*; Hoary Bat, *Lasiurus cinereus*) were registered and confirmed through manual vetting of a sample of the sonograms recorded, and are considered to be possibly breeding locally, either within or nearby the study area. For all 3 species the earliest nightly registrations occurred within an hour of sunset suggesting local roosting opportunities were being utilized.

4.5.2 Fauna Species of Concern

The 2020 fauna survey recorded 19 bird, 5 herpetofauna, 9 mammal and 1 crayfish Species of Regional and Urban Concern (Map 14). Confirmed records from iNaturalist for the 2011 to 2020 period can be included for an additional 3 mammal and 2 herpetofauna species, all of which are species that would reasonably have been anticipated at the site and are added to the totals presented in Table 8. Beyond the recent 10-year period there are a few additional records including 3 provincial SAR (MECP 2018): Wood Thrush (*Hylocichla mustelina*, 2000), Barn Swallow (*Hirundo rustica*, 2000) and Western Chorus Frog (*Pseudacris triseriata,* 1994). It is very likely that Barn Swallow is still present in the area, perhaps using the college buildings for nesting opportunities, but the other 2 SAR are likely no longer present on site. This represents a significant loss to the site's biodiversity.

4.5.2.1 Regionally Rare Species

Regionally rare species are those reported as probable or confirmed breeders in fewer than 10 of the forty-four 10x10 km UTM grid squares in the TRCA jurisdiction (TRCA 2017). Over the current 10-year period 4 Species of Regional and Urban Concern (L1 to L4 species) on the fauna list satisfy this criterion, including all 3 of the bat species recorded during the 2020 season. Our current knowledge and understanding of the regional status of bat species is very rudimentary and the assessment of their local occurrence can be assumed to be significantly underestimated. Virginia Opossum (*Didelphis virginiana*) was recorded on iNaturalist in 2019. This is certainly not surprising since this southern species has been steadily increasing its regional population over the past few

decades and is known to be widespread throughout the city of Toronto. The aforementioned Western Chorus Frog also scores as a regional rarity but the last report of this species at Humber Arboretum was in 1994.

4.5.2.2 Fauna Sensitive to Development

The scoring of species for sensitivity to development (Section 3.2; TRCA 2017) considers the large number of impacts related to local land use, both urban and agricultural, that affect the local fauna. Two categories are of importance. The first involves changes that affect the breeding habitat of the species in question. An example would be alteration of the composition and structure of a vegetation community, for example through the removal of dead wood and clearing of shrub understory. The second category relates to changes that directly affect individuals of the species. Examples include:

- Increased predation from an increase in the local population of predators that thrive alongside human developments (e.g., Blue Jays (*Cyanocitta cristata*), American Crows (*Corvus brachyrhynchos),* squirrels (*Sciuridae*)*,* Raccoons (*Procyon lotor*), and House Cats (*Felis catus*).
- Parasitism (facilitation of access for the Brown-headed Cowbird (*Molothrus ater*), a brood parasite, which prefers open, edge-type habitat).
- Competition (for nest-cavities with bird species such as House Sparrows, *Passer domesticus*; and European Starlings, *Sturnus vulgaris*).
- Flushing (causing disturbance and abandonment of the nest).
- Sensitivity to pesticides (bioaccumulation).

A total of 27 of the 39 L1 to L4 ranked species found at the study area over the past 10 years score highly on sensitivity to development (Appendix 3; Map 7), representing a wide variety of sensitivities in what is a heavily urbanized landscape.

Given the urban land use in the surrounding landscape, the matrix influences are extremely negative. But even in rural landscapes many of the negative influences associated with urbanization can be transferred deep within an otherwise intact natural matrix by trail networks used by large numbers of people originating from distant urban and suburban centres. From the perspective of wildlife, humans within their habitat are competitors and/or predators, and to be avoided. A study that tested the effect of people walking through a forest during the period that birds were establishing territories prior to nesting determined that two or three people walking through an area while talking to each other, repeated twice a day, resulted in some birds avoiding that area for territory establishment. The number of territories was reduced by 15% and the species richness was also reduced 15% (Bötsch *et al.* 2017). Other research demonstrates that many bird species respond to human presence during nesting by decreased nest-attentiveness or nest-abandonment, leading to reduced reproduction and survival. Where trail-use is low during territory establishment (e.g., April, May), but increases later (e.g., June, July), birds may establish nests but later abandon them when disturbance becomes too high. Significant negative gradients in abundance and richness of nesting bird species occurred in the vicinity of active forest trails compared to seldom-used forest trails (Bötsch *et al.* 2018). In another study, dog-walking in natural habitats caused a 35% reduction in bird diversity and a 41% reduction in abundance, with even higher impacts on ground-nesting species (Banks and Bryant 2007). Similarly, clearing of forest understory

to accommodate trails, and the introduction of invasive species from trails both displace sensitive low-nesting species.

However, despite all of this, some species have become surprisingly habituated to the presence of humans and are able to thrive even in the most disturbed of habitats. The success of various raptor species in the city has been remarkable, with Red-tailed Hawks (*Buteo jamaicensis*) and Cooper's Hawk (*Accipiter cooperii*) adapting to new prey opportunities (squirrels, pigeons, and starlings), and nesting successfully in generally less visited parts of many urban parks and ravines.

Of the 13 development sensitive bird species recorded in the period 2011-2020, 4 are ground- or low-nesting species. Of these species, Swamp Sparrow (*Melospizza georgiana*) and Common Yellowthroat (*Geothlypis trichas)* are associated with wetlands. Wetlands confer a degree of protection from disturbance by the various negative matrix influences – cats, dogs, hikers, cyclists – that would otherwise impact any low-nesting species. The other 2 low-nesting species are Spotted Sandpiper (*Actitis macularius*) – nesting in long grass cover along the edges of creeks and wetlands - and Indigo Bunting (*Passerina cyanea*), a species that nests low in shrubs and other cover at the edges of forest patches. Of the two species, the Indigo Bunting is perhaps the more at risk from persistent disturbance; hatchling Spotted Sandpipers, as with all shorebird species, are nidifugous, leaving the nest very shortly after hatching and thereby not quite as susceptible to disturbance/predation as the nestling buntings which remain prone in the nest for about 8 days.

The near absence of sensitive ground- or low-nesting breeding bird species is a consequence of heavy pressures exerted on such species in the urban landscape, particularly in habitat patches where all corners are accessible to human disturbance. Recreational trails, dog-walking, and off-leash dog activity, along with other pressures such as subsidized predators (Raccoon, domestic/feral cats) have evidently impacted ground nesting species to an extent to which they are represented by minimal territories in a given year. This, in large part, is why ground-nesting forest-dwelling birds such as Ovenbirds, *Seiurus aurocapilla*, and Eastern Meadowlarks, *Sturnella magna*, have long since vacated the remaining urban forest and meadow patches throughout the City. Species that habitually nest higher in the vegetation, above the unwanted attentions of dogs and humans, and beyond easy reach for predators such as Raccoons, skunks and opossums, fare considerably better in urban parks like Humber Arboretum. Grey Catbird (*Dumetella carolinensis*) and Red-eyed Vireo (*Vireo olivaceus*) are typically well-represented in such urban parks; in more recent years American Redstarts (*Setophaga ruticilla*) have become a very welcome addition to many of the larger parks that feature broad and well-vegetated riparian corridors (Figure 6). The 11 redstart territories mapped in 2020 is a substantial increase from the zero mapped in 2000. This latter addition to the site fauna list makes the apparent loss of nesting Wood Thrush somewhat difficult to understand in the local context, however, as a ground-foraging species the thrush may now find the busy park too disturbed. Redstarts and vireos, on the other hand, forage in the canopy above any potential disturbance. Furthermore, the apparent loss of Wood Thrush at this site may simply reflect the much broader continental decline that has been identified for this and many other neotropical migrants.

Figure 6. American Redstarts established as many as 11 territories at Humber Arboretum in 2020, up from zero in 2000 (photo: TRCA 2016).

Of the 13 sensitive bird species, 6 are considered forest or forest-edge dependent: Red-eyed Vireo, Black-billed Cuckoo (*Coccyzus erythropthalmus*), American Redstart, Indigo Bunting, Blue-grey Gnatcatcher (*Polioptila caerulea*) and Rose-breasted Grosbeak (*Pheucticus ludovicianus*). For both the vireo and the gnatcatcher, their forest-dependence can be attributed largely to a need for a more or less continuous tree canopy which provides plenty of foraging and nesting opportunities. Ample foraging opportunities are an important factor in the recruitment of additional bird species into the local biodiversity and in this respect 2020 was an unusual year given the massive Gypsy Moth infestation throughout the region. This abundant food source almost certainly influenced the presence of Black-billed Cuckoo at this and many other sites in 2020.

Non-avian fauna populations do not have the option of abandoning an area if local pressures and stresses compromise their survival. Therefore, taxa including frogs, snakes and turtles tend to persist longer in such sub-standard environments. Again, frogs and turtles benefit from being wetland associated – as long as the wetland persists. Within the Humber Arboretum study area almost half of the L1 to L4 fauna species that are sensitive to development are represented by non-avian species: Digger Crayfish, three amphibians, two turtles, two snakes and four mammal species. Of this group, seven species are aquatic for at least part of their lives. The list includes one provincial Species at Risk: Snapping Turtle (*Chelydra serpentina*); and Midland Painted Turtle

(*Chrysemys picta marginata*), designated as Special Concern under the federal Species at Risk Act (2018). The persistence of these two species at Humber Arboretum is in line with their status elsewhere in the City. However, the presence of the non-native Red-eared Sliders (*Trachemys scripta elegans*) will need to be addressed soon, ideally with the removal of the sliders and interpretive signage to explain the ecological impact and alternatives available for people wanting to dispose of their pets; this larger and more aggressive turtle out-competes the native painted turtles for essential basking opportunities and food.

Development related impacts includes the fragmentation of habitat by roads. Such effects are discussed under the more specific criterion of patch isolation (Section 4.5.2.4).

4.5.2.3 Area Sensitive Fauna

Fauna species deemed area sensitive require ≥ 5 ha of contiguous habitat; those scoring at the high end for this criterion require >100 ha (TRCA 2017). Some species of forest birds that require large total habitat area are able to utilize multiple patches across the landscape to meet this need; for this group, the overall proportion of forest cover within the larger landscape is the important limiting factor (Arroyo-Rodriguez 2020). Area sensitivity for various species relates to a variety of underlying factors. The needs for isolation within a habitat block during sensitive periods (e.g., the nesting season) and for foraging requirements for sparsely distributed food items are examples.

The current fauna inventory for the Humber Arboretum study area lists 8 area sensitive species all of which are Species of Regional and Urban Concern (Map 5). The 7 area sensitive bird species are all forest or forest-edge dependent and each requires at least 5 ha of forest habitat. Cooper's Hawk currently scores slightly higher, requiring at least 20 ha of forest habitat, but it should be understood that this score was assigned before the relatively recent move by this species into the more urban landscape. As this erstwhile forest species becomes more habituated to city-living it is certain that its area sensitivity score will be reset at a lower figure. Encompassing a total of 27.9 ha of forest habitat, the area requirements of all 8 of the sensitive species are amply met within the study area. Certainly, the apparent loss of the 2 Wood Thrush territories (another area sensitive species requiring more than 5 ha of forest) reported in 2000 cannot be explained by a subsequent decrease in the habitat available, in fact, in the absence of any other factors, the amount of forest habitat would currently accommodate many other such area sensitive species. Of the 11 L4 ranked area sensitive bird species in the region over half of them (6 species) are represented at Humber Arboretum; on the other hand, only 1 (Black-billed Cuckoo) of the 42 L1 to L3 ranked bird species (at least, those requiring greater than 5 ha of habitat) is represented. Size of habitat patch - the amount of forest habitat available – is not a limiting factor for fauna biodiversity at Humber Arboretum.

4.5.2.4 Fauna Sensitive to Patch Isolation

Sensitivity to patch isolation considers the overall response of fauna species to fragmentation and isolation of habitat patches from one another. One underlying consideration is the physical ability, or the predisposition, of a species to move about within the landscape and how this ability is affected by the connectivity of habitat. A second is the potential impact that roads and other habitat breaks have on fauna species that need to be mobile. Bird species generally score lower than herpetofauna for the latter consideration (although they do forage and move along connecting corridors). Most herpetofauna score very highly because their life cycles

require them to move between different habitat types; their mobility exposes them to impacts, most often roadkill. At the population level, birds too will be affected if the need for adult birds to forage for food during the nestling and fledgling stage of the breeding season is not provided for.

All 7 of the herpetofauna species of concern and 7 of the 12 mammal species of concern that were reported in the current 10-year period score highly for patch isolation sensitivity. American Toad (*Anaxyrus americanus*), both turtle species and both snake species undertake annual migrations to and from either terrestrial nesting areas with suitable substrate (for both turtles), breeding wetlands (for the toads) or communal hibernacula (for the snakes). Such migrations expose these taxa to the very high likelihood of roadkill, particularly in such a heavily urbanized landscape as at the Humber Arboretum. However, it appears that the populations of these herpetofauna are managing to persist; it is likely that the remaining populations are surviving primarily because they have established migration routes that currently do not place individuals in harm's way. The herpetofauna at the study area may well find all of their life cycle requirements provided within the relatively safe confines of the park itself, precluding the need to venture onto surrounding roads. The observations of both Snapping and Painted Turtles are significant when one considers that the current understanding of turtle status in Toronto is that the vast majority of nesting attempts are predated by Raccoons and other urban "subsidized predators".

All herpetofauna and many mammals are sensitive to development, and all but the hardiest species have disappeared from the more urbanized landscapes, such as the City of Toronto. However, parks such as Humber Arboretum provide potential havens within the local landscape. Unfortunately, the potential for local extirpation of such small populations is high given the degree of isolation of such urban oases; the opportunity for recruitment from other populations is often very restricted (non-existent in many cases), consequently once a population disappears due to, for example, high mortality from a particularly harsh winter, or a severe polluting event, the chances of such populations recovering are low. For the Humber Arboretum study area, the proximity of the Humber River provides a potential route for recruitment of more aquatic species such as the turtles, frogs, beavers and muskrats. One notable absence from the 2020 inventory was the L3 ranked Red-backed Salamander (*Plethodon cinereus*), a species that is often considered indicative of a quality forest habitat. Unfortunately, being a mobility restricted species any local extirpation due to either stochastic events (such as deep winter freezes and flooding) or localized issues (depletion by local anglers – salamanders have been popular bait species in the past) are potentially more long-term since there are no opportunities to recruit from surviving populations elsewhere in the landscape (this is an entirely terrestrial species that would be unable to utilize rivers and streams).

As long as traffic on trails within the study area is not too high (preferably restricted to foot traffic at the crucial periods of herpetofauna migration) these species are less likely to be impacted by "road kill". However, heavy visitation to such areas increases the threat of predation and/or disturbance by off-leash dogs, etc. Trails with bike traffic or off-leash dogs may result in herpetofauna and small mammal fatalities (Burgin and Hardiman 2012; Weston and Stankowich 2014). In any such urban landscape the habitat within remaining natural spaces becomes more critical to regional biodiversity; if connectivity between such natural spaces can be maintained or improved the potential for persistence of these species will be enhanced.

4.5.2.5 Fauna Habitat Specialists

Fauna species that score highly under the ***habitat dependence*** criterion (TRCA 2017) are considered habitat specialists. These species exhibit a combination of very specific habitat requirements that range from the microhabitat (e.g., decaying logs, aquatic vegetation) and requirements for particular moisture conditions, vegetation structure or spatial landscape structures, to preferences for certain vegetation community series and macro-habitat types. As one might expect within such a completely urbanized landscape the occurrence of such habitat dependent species is minimal. Three habitat dependent L1 to L4 species were recorded during the current 10-year period: Cooper's Hawk, Black-billed Cuckoo, and Northern Rough-winged Swallow (*Stelidopteryx serripennis*). The hawk has already been discussed as a species that has fairly recently adapted to urban forest situations; the cuckoo has also been previously mentioned as having been present in 2020 potentially due to the exceptional Gypsy Moth abundance in that year. Finally, the Northern Rough-winged Swallow scores as habitat dependent due to its very specific nest-location requirements. This species nests in cavities in banks and often in duct and pipe openings on man-made structures and is therefore often associated with urban situations alongside water courses.

A healthy functioning system will accommodate a whole suite of species that are adapted to the habitat types at the site and will allow those species to thrive and breed successfully. As the quality of the habitat improves, so will the representation of flora and fauna species associated with it. In this way, representation by self-sustaining populations of diverse species (which varies from species to species) over the long term is an excellent measure of the health of a natural system.

5.0 SUMMARY

The 104 ha Humber Arboretum study area is located entirely within the urban landscape and consists of a combination of flood plain and tableland, wetlands and ponds. Natural cover at this site is dominated by several types of deciduous forest, successional scrubland, and smaller areas of wetland and aquatics. Although natural cover is limited within such an urbanized landscape, the natural cover that is present ultimately contributes to the natural heritage system and biodiversity of the region. The area of natural cover within the study area has the potential to maintain populations of many flora and fauna Species of Regional and Urban Concern (other than ground- to low-nesting breeding bird species), and to contribute to overall regional biodiversity. The extent to which this potential is realized is dependent upon the strategies used to manage public use, protect the integrity of the habitats that exist, and restore degraded or invaded habitats.

5.1 Site Summary

1. Inventory data for the natural cover within the study area is primarily from the surveys conducted in 2020. Existing datasets document a total of 68 vegetation types. Communities are largely forest and successional with smaller areas of wetland and dynamic habitats. This is broken down into 15 forest, 11 plantation, 9 dynamic, 12 successional, 3 meadow, 13 wetland, and 5 aquatic community types. Over the last 20 years, meadow has steeply declined, successional steeply increased, and forest cover has moderately decreased. The community diversity reflects historical and current land-use practices within and around the study area.

2. Vegetation communities of conservation concern are concentrated in the central woodlot designated as an Environmentally Significant Area (ESA) but also present in wetland areas with seepage zones, vernal pools, and aquatic communities. There are also some riparian bar and upland barren communities. All support flora Species of Conservation Concern.

3. A total of 401 naturally occurring flora species have been recorded within the study area over the last 15 years. Among them are 18 Species of Regional Concern (ranked L1-L3) and 50 Species of Urban Concern (ranked L4). Species of Concern were associated with all habitat types, but the highest concentrations are in forest and wetland, particularly those found in the central ESA woodlot. Other species of concern are found in the wetlands and dry sandy area on the southwest side of the West Humber River. Native species richness is relatively low with natives accounting for exactly half of the total floristic biodiversity. Historic land use and present-day urban uses surrounding urban landscape are driving factors affecting the persistence of native species throughout the study area.

4. The study area is in a heavily urbanized landscape and thus is vulnerable to matrix-related disturbances. The main disturbances affecting Humber Arboretum at present are invasive species (both plants and pathogens), trampling, herbivory, garbage deposition, and storm water runoff in the wetlands and riparian areas causing nutrient loading and flash flooding.

5. Invasive plants are widespread. In upland areas dog-strangling vine, garlic mustard and common buckthorn are the main invasives present, while Manitoba maple is abundant in lowland areas. Both upland and lowland forests are at risk from invasion by escaped ground covers such as periwinkle and lily-of-the-valley. In wetlands, common reed, hybrid cattails, European water-horehound, and European alder are the main threats. Several pests and diseases threaten native trees, and Dutch elm disease and emerald ash borer may be having a significant effect on ecosystem structure by reducing forest canopy.

6. Fauna surveys conducted over the past 10 years combined with incidental observations over the same period have reported 19 bird species, 7 herpetofauna, 1 crayfish and 9 mammal species of Regional and Urban Concern for a total of 36 such species.

7. Only one regionally rare native fauna species – Virginia Opossum - was recorded for the study area, and this species, a recent newcomer to the region, continues to increase its local population.

8. One provincial (Snapping Turtle) and one federal (Midland Painted Turtle) fauna Species at Risk (SAR) were recorded over the past 10 years (both Special Concern). There are older reports of three additional SAR: the 2000 inventory reported 2 territorial Wood Thrush and Barn Swallow; and there is a 1994 record of Western Chorus Frog from the Ontario Herpetological Survey. One flora SAR: butternut (status endangered due to butternut canker) occurs within the area.

9. The large size of the park and the natural habitat patches within it means that many of the non-avian species that breed there are able to satisfy all aspects of their life cycles within the safe confines of the park.

10. Three species of bats (Big Brown, Silver-haired and Hoary Bats) were identified as present at the site during a period in June 2020. The breeding status of these 3 species remains unknown at this stage but it is possible that they are using the forest habitat for day-roosting; certainly the 3 species can be identified as foraging within the natural habitat at Humber Arboretum.

6.0 REFERENCES

Arroyo-Rodríguez, V., Fahrig, L., Tabarelli, M., Watling, J.I., Tischendorf, L., Benchimol, M., Cazetta, E., Faria, D., Leal, I.R., Melo, F.P.L., Morante-Filho, J.C., Santos, B.A., Arasa-Gisbert, R., Arce-Peña, N., Cervantes-López, M.J., Cudney-Valenzuela, S., Galán-Acedo, C., San-José, M., Vieira, I.C.G., Slik, J.F., Nowakowski, A.J. and Tscharntke, T. 2020. *Designing optimal human-modified landscapes for forest biodiversity conservation*. **Ecol. Lett.**, 23: 1404-1420. Available on-line at: https://doi.org/10.1111/ele.13535 [Accessed 19 February 2021].

Banks P.B. and Bryant J.V. 2007. *Four-legged friend or foe? Dog walking displaces native birds from natural areas*. **Biol. Lett**. 3:611-613. Available on-line at: http://rsbl.royalsocietypublishing.org/content/3/6/611.full.pdf [Accessed 14 October 2020].

Bötsch Y., Tablado Z., and Jenni L. 2017. *Experimental evidence of human recreational disturbance effects on bird-territory establishment*. **Proc. R. Soc. B**. 284. Available on-line at: http://dx.doi.org/10.1098/rspb.2017.0846 [Accessed 15 October 2020].

Bötsch Y, Tablado Z, Scherl D, Kéry M, Graf RF and Jenni L. 2018. *Effect of Recreational Trails on Forest Birds: Human Presence Matters.* ***Front. Ecol. Evol*****.** 6:175. doi: 10.3389/fevo.2018.00175 [Accessed 11 February 2021].

Brys R., Jacquemyn H., Endels P., de Blust G. and Hermy M. 2005. *Effect of habitat deterioration on population dynamics and extinction risks in a previously common perennial*. **Conserv. Biol**. 19(5): 1633-1643.

Burgin S. and Hardiman N. 2012. *Is the evolving sport of mountain biking compatible with fauna conservation in national parks?* **Aust. Zool.** 36(2):201-208.

Cadman M.D., Sutherland D.A., Beck G.G., Lepage D., and Couturier A.R. (Eds). 2007. ***Atlas of the Breeding Birds of Ontario, 2001 – 2005***. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, xxii + 706pp.

Hoffman D.W. and Richards N.R. 1955. *Soil Survey of York County*. Map. Guelph, ON: Experimental Farms Service, Canada Department of Agriculture and the Ontario Agricultural College. Available online: https://sis.agr.gc.ca/cansis/publications/surveys/on/on19/index.html [Accessed 19 February 2021].

Humber College. 2021. *Humber Pond Revitalization Project*. Toronto: Humber Arboretum. Available online: https://humber.ca/arboretum/explore/ecosystems/humber-pond.html [Accessed 18 February 2021].

Kilgour B. 2003. *Landscape and patch character as a determinant of occurrence of eighty selected bird species in the Toronto area.* A report prepared for the TRCA. Jacques-Whitford Ltd.

Lee H., Bakowsky W.D., Riley J., Bowles J., Puddister M., Uhlig P. and McMurray S. 1998. *Ecological land classification for southern Ontario: first approximation and its application.* Peterborough, Ontario: Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch.

Marks P.L. 2001. *Pastures of plenty: a case study in field biology*. **Arnoldia** 61(2): 22-25. Available on-line at: http://arnoldia.arboretum.harvard.edu/pdf/articles/619.pdf [Accessed 16 February 2021].

McKenzie T., Normand L., Iwanycki N., Miller G., Prior P. 2018. *Assessing the utility of a novel terrestrial biodiversity quality indicator with 10 years of monitoring data*. **Ecol. Indic**. 85: 422–431.

MECP (Ministry of the Environment, Conservation and Parks). 2018. *Species at Risk in Ontario (SARO) list*. O. Reg. 230/08. Available online at: https://www.ontario.ca/laws/regulation/080230 [Accessed 28 October 2020].

MNRF (Ontario Ministry of Natural Resources and Forestry). 2013. ***Ontario Wetland Evaluation System, 3rd Edition (Southern)***. Toronto: Queen's Printer.

North-South Environmental. 2012. *Environmentally Significant Areas (ESAs) in the City of Toronto*. City of Toronto. Available online: https://www.researchgate.net/publication/316256779_Environmentally_Significant_Areas_ESAs_in_the_city_of_Toronto [Accessed 19 February 2021].

Ontario Government. 2020. Environment and Energy: *Blue-green algae*. Available on-line at: https://www.ontario.ca/page/blue-green-algae [Accessed 16 November 2020].

Rybicki J. and Hanski I. 2013. *Species–area relationships and extinctions caused by habitat loss and fragmentation*. **Ecol. Lett.** 16: 27–38.

Sauer 1998. ***The Once and Future Forest***. Washington, DC: Island Press.

Toronto and Region Conservation Authority (TRCA). 2001. *City of Toronto Natural Heritage Study*.

Toronto and Region Conservation Authority (TRCA). 2007a. *The Terrestrial Natural Heritage System Strategy*. Toronto Region Conservation Authority. Available on-line at: https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/ [Accessed 15 October 2020].

Toronto and Region Conservation Authority (TRCA). 2007b. *Setting Terrestrial Natural Heritage System Targets.* Toronto and Region Conservation Authority. Available on-line at: https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/ [Accessed 15 October 2020].

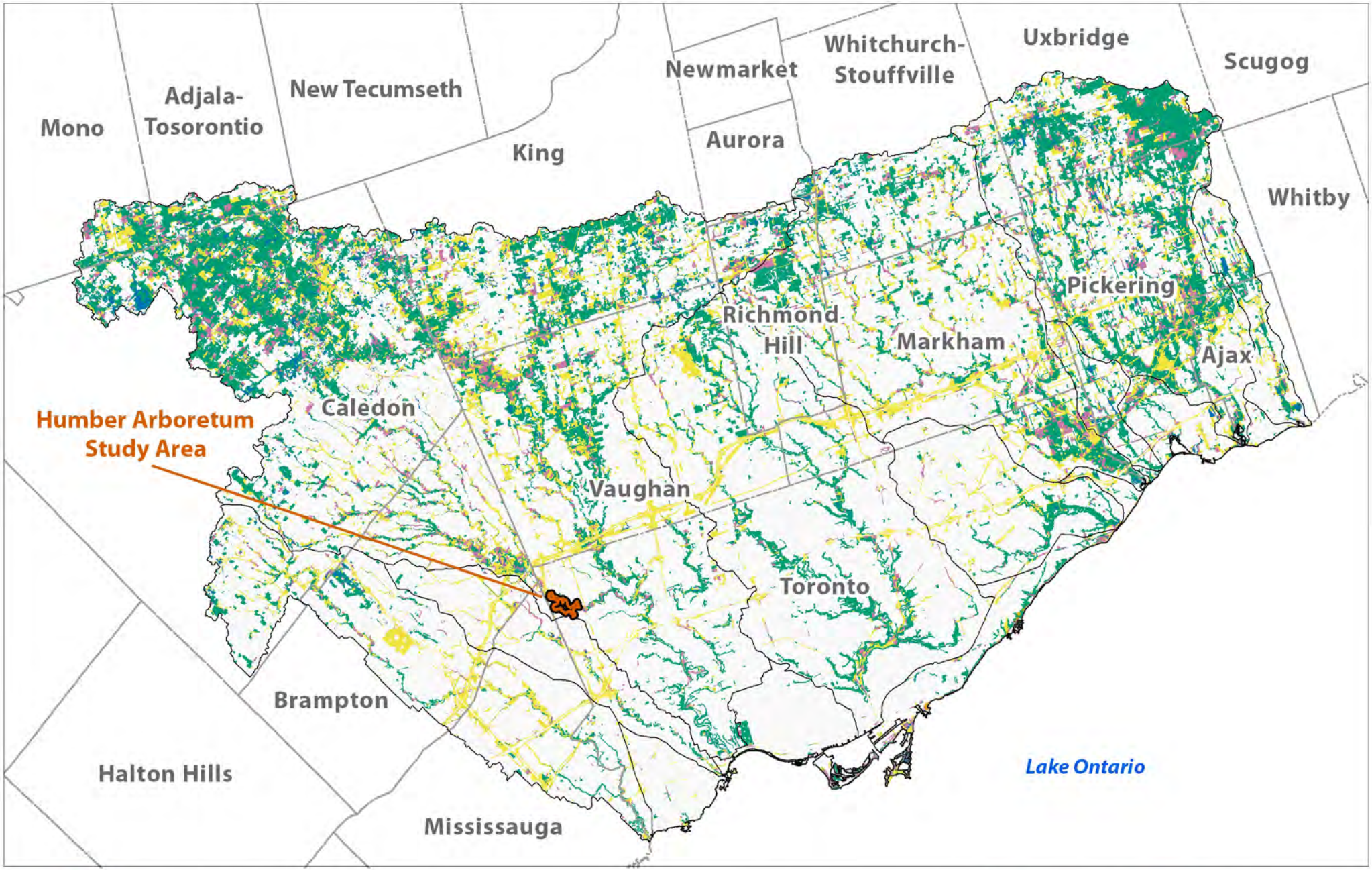
Toronto and Region Conservation Authority (TRCA). 2007c. *Evaluating and Designing Terrestrial Natural Heritage Systems*. Toronto and Region Conservation Authority. Available on-line at: https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/ [Accessed 15 October 2020].

Toronto and Region Conservation Authority (TRCA). 2007d. *Terrestrial Natural Heritage Program Data Collection Methodology*. Toronto and Region Conservation Authority. Available on-line at:

https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/ [Accessed 15 October 2020].

Toronto and Region Conservation Authority (TRCA). 2017. *Scoring and Ranking TRCA's Vegetation Communities, Flora, and Fauna Species*. Toronto and Region Conservation Authority. Available on-line at: https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2016/02/17173841/Ranking-Scoring-Protocol-Final.pdf [Accessed 15 October 2020].

Weston M.A. and Stankowich T. 2014. *Dogs as agents of disturbance. In*: Gompper ME (ed) **Free-ranging dogs and wildlife conservation**. Oxford: Oxford University Press



Toronto and Region Conservation Authority

N W E S

0 2.5 5 10 15 20 Kilometers

Date: February 2021

* Landscape analysis based on 2017 Orthophotography

Map 1: Humber Arboretum Study Area in the Context of Regional Natural Cover

Natural Cover *

- Forest
- Successional
- Meadow
- Wetland
- Beach/Bluff

- Humber Arboretum Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

Toronto and Region Conservation Authority

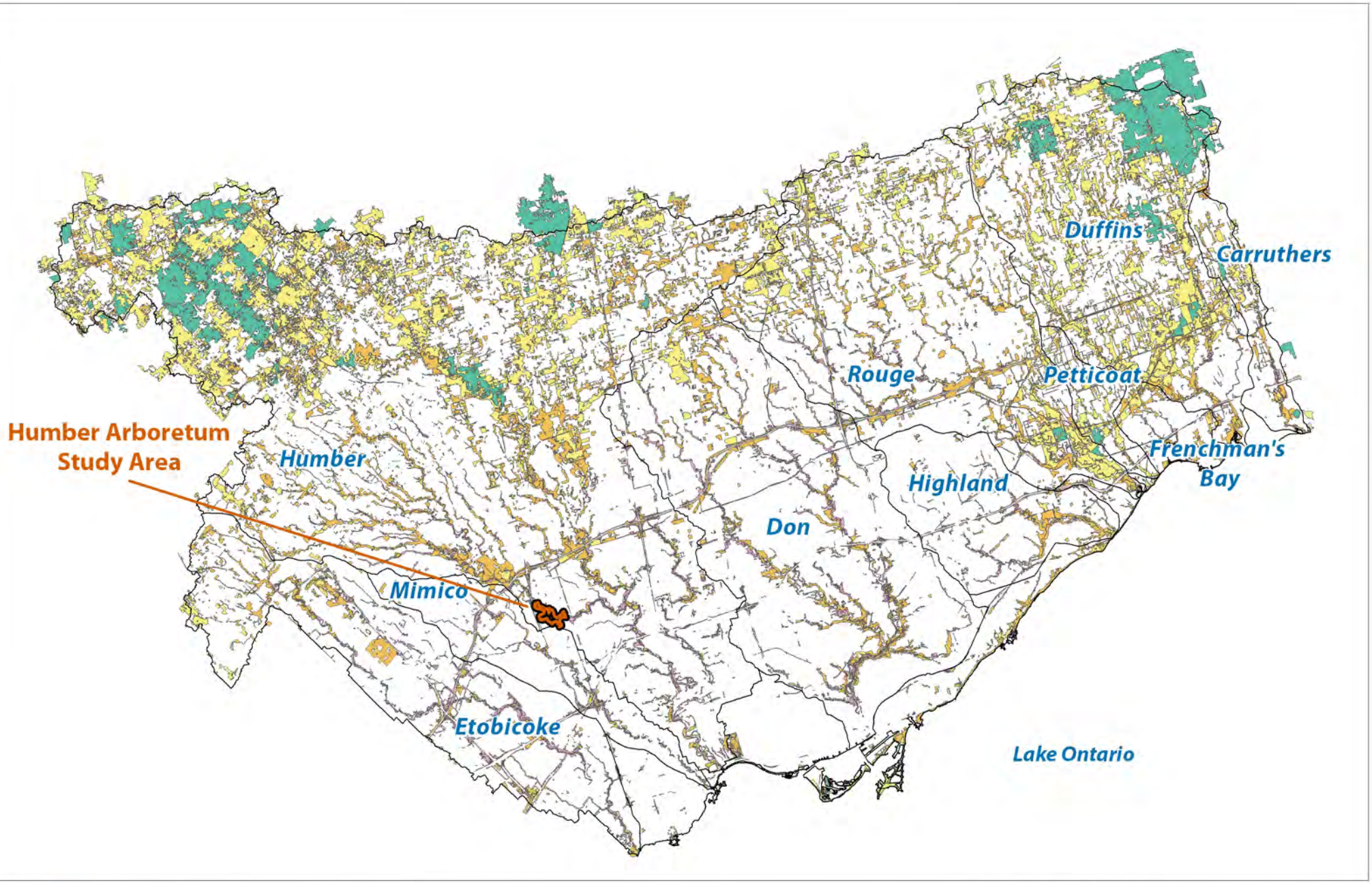
N W E S

0 100 200 400 m

February 2021
Orthophoto: Spring 2019, MNRF

Map 2: Humber Arboretum Study Area

- Humber Arboretum Study Area
- City of Toronto ESA
- Watercourse



Toronto and Region Conservation Authority

N W E S

0 2.5 5 10 15 20 Kilometers

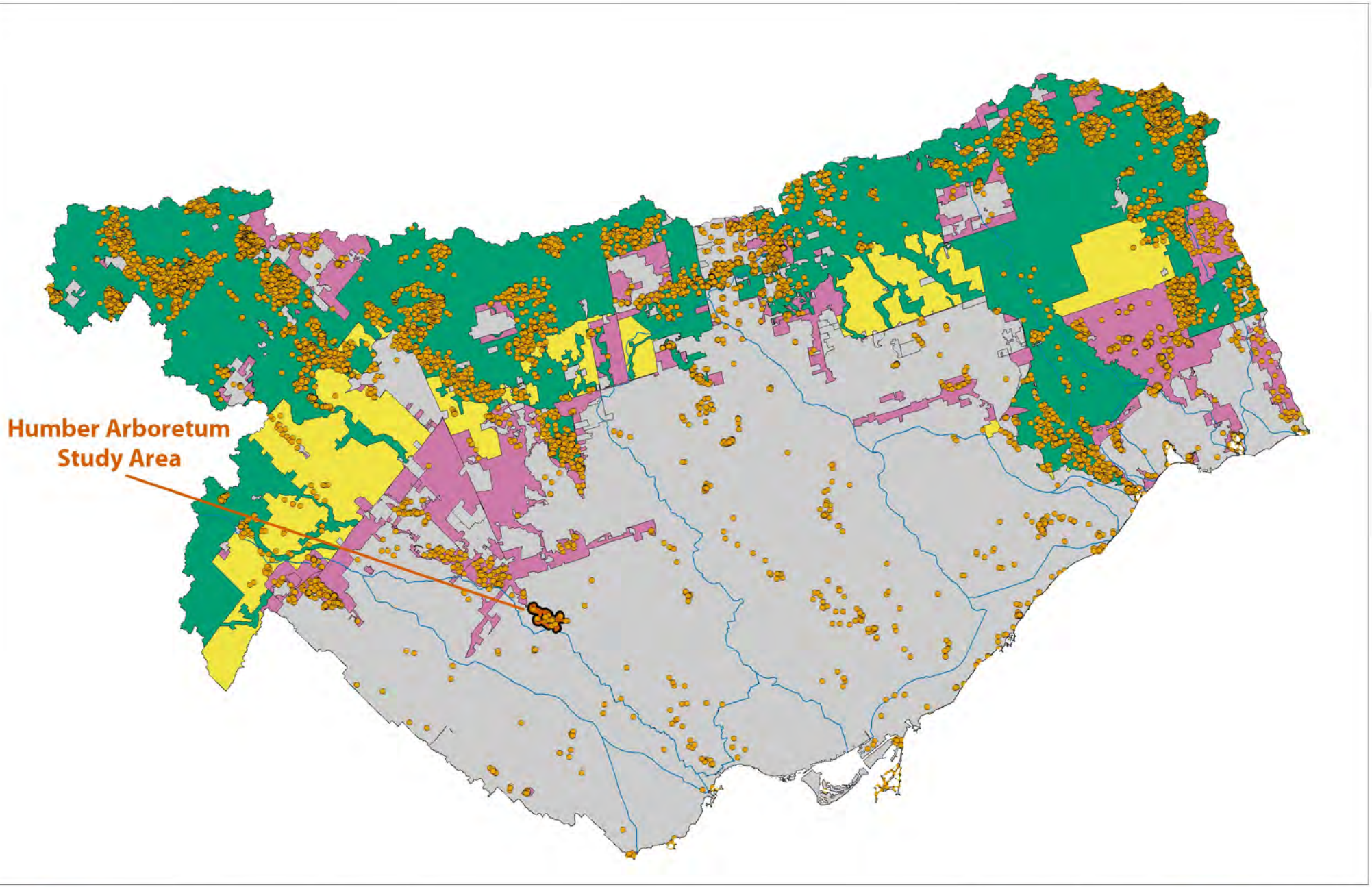
Date: February 2021
* Landscape analysis based on 2017 Orthophotography

Map 3:
Regional Natural System
Habitat Patch Quality

Habitat Patch Quality *

- L1 - Excellent
- L2 - Good
- L3 - Fair
- L4 - Poor
- L5 - Very Poor

- Humber Arboretum Study Area
- TRCA Jurisdiction
- Watershed



Toronto and Region Conservation Authority

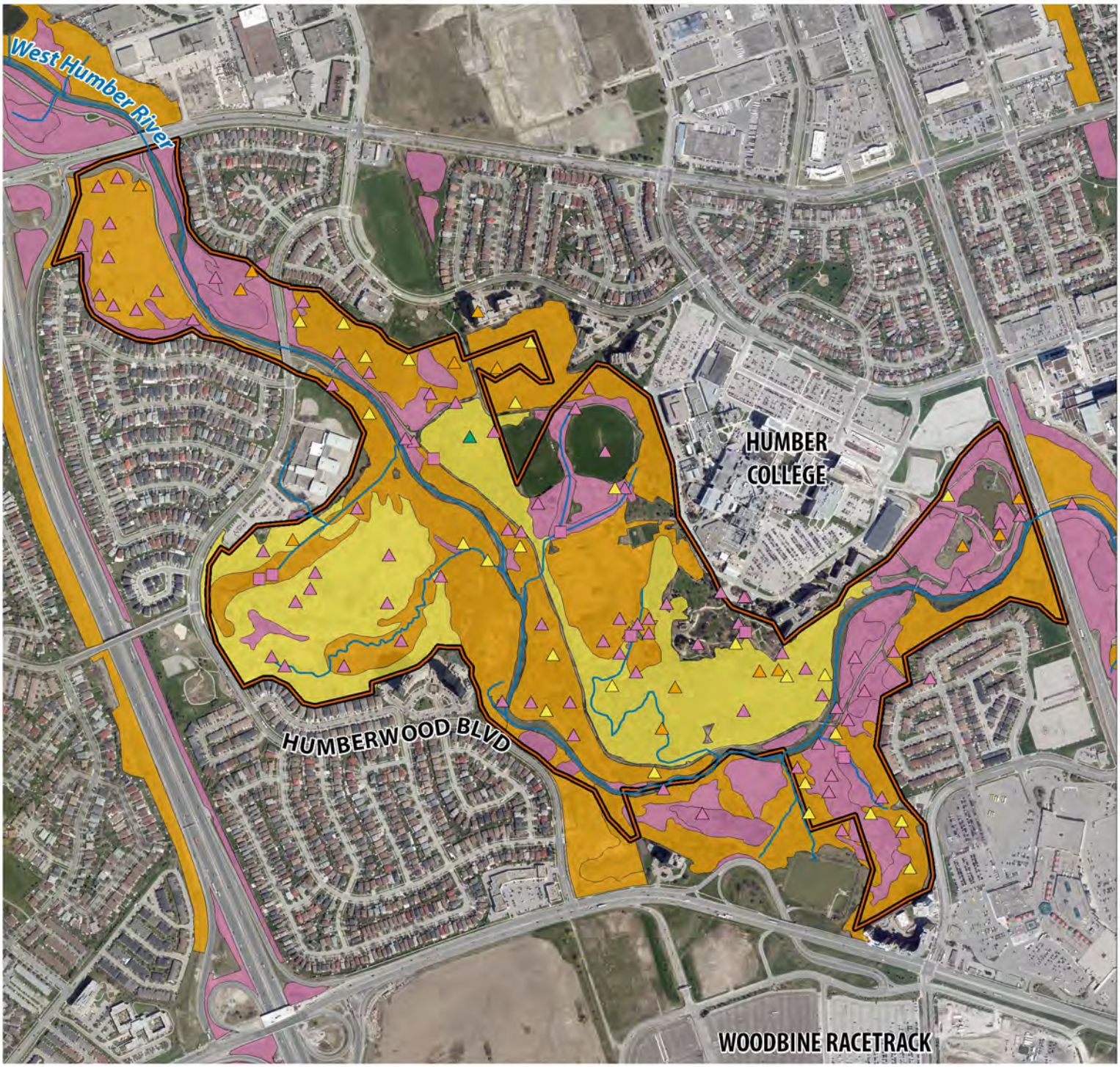
N
W E
S

0 2.5 5 10 15 20 Kilometers

Date: February 2021

Map 4:
Distribution of Fauna
Regional Species of Concern

- Fauna Species of Concern (L1 - L3)
- Humber Arboretum Study Area
- TRCA Jurisdiction
- Watershed
- Agricultural & Rural Area
- Built-up Area
- Designated Greenfield Area
- Greenbelt Area



Fauna Area Sensitivity Scores

- 5 - >100ha
- 4 - >20ha
- 3 - > 5ha
- 2 - > 1ha
- 1 - < 1ha

- Fauna Species
- Frog Species
- Humber Arboretum Study Area

Habitat Patch Size Scores *

- 5 - Excellent
- 4 - Good
- 3 - Fair
- 2 - Poor
- 1 - Very Poor

Toronto and Region Conservation Authority

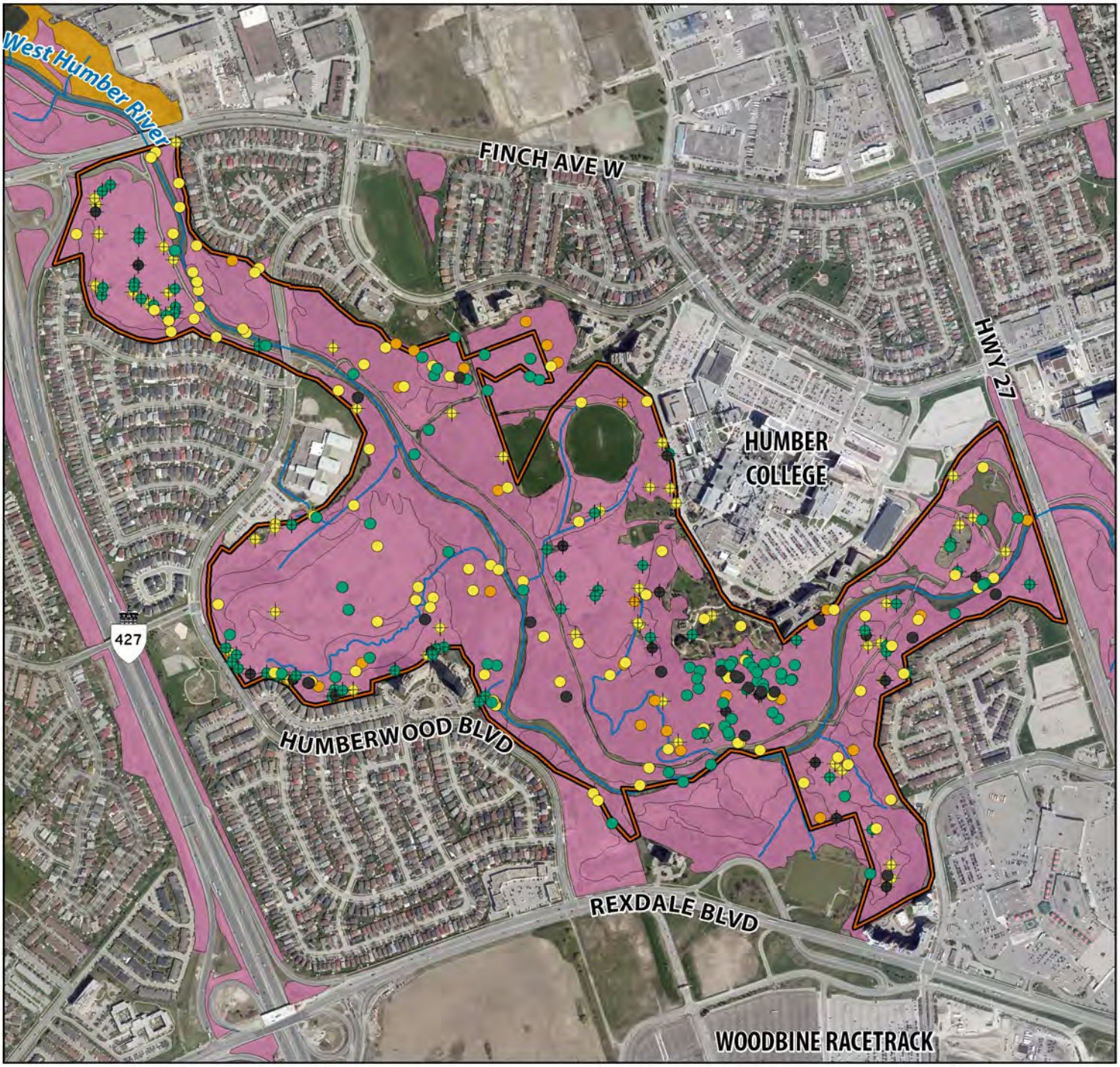
N

0 100 200 400 m

Date: February 2021
Orthophoto: Spring 2019, MNRF
* Landscape analysis based on 2017 Orthophotography

Map 5: Habitat Patch Size Scores with Fauna Area Sensitivity Scores

NOTE: All fauna species with their associated scores for area sensitivity can be found in Appendix #3.



Flora Sensitivity to Development Scores

- 5 - Species receives severe negative impact from development-related disturbances
- 4 - Species receives moderately severe negative impact from development-related disturbances
- 3 - Species receives significant negative impact from development-related disturbances
- 2 - Species receives slight negative impact from development-related disturbances
- 1 - Species experiences no overall benefit or detriment from development-related disturbances (neutral)
- 0 - Species benefits significantly from development-related disturbances

Habitat Matrix Influence Scores *

- 5 - Excellent
- 4 - Good
- 3 - Fair
- 2 - Poor
- 1 - Very Poor

- Flora Species
- Planted Flora Species
- Humber Arboretum Study Area

Toronto and Region Conservation Authority

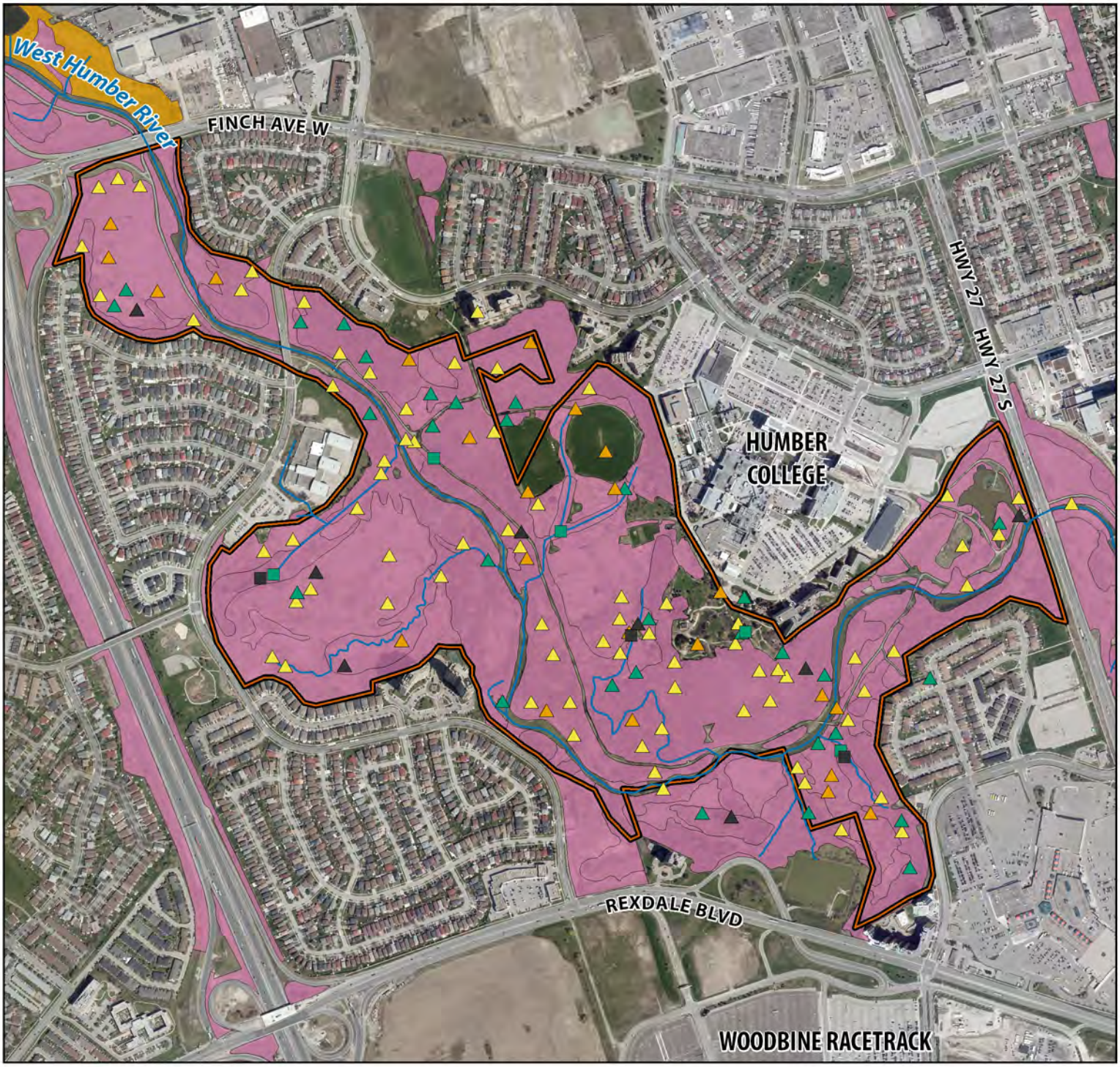
N

0 100 200 400 m

Date: February 2021
Orthophoto: Spring 2017, First Base Solutions
* Landscape analysis based on 2017 Orthophotography

Map 6: Scores for Matrix Influence and Flora Sensitivity to Development

NOTE: All flora species with their associated scores for sensitivity to development can be found in Appendix #2.



Fauna Sensitivity to Development Scores

- 5 - Species receives severe negative impact from development-related disturbances
- 4 - Species receives moderately severe negative impact from development-related disturbances
- 3 - Species receives significant negative impact from development-related disturbances
- 2 - Species receives slight negative impact from development-related disturbances
- 1 - Species experiences no overall benefit or detriment from development-related disturbances (neutral)
- 0 - Species benefits significantly from development-related disturbances

Habitat Matrix Influence Scores *

- 5 - Excellent
- 4 - Good
- 3 - Fair
- 2 - Poor
- 1 - Very Poor
- Fauna Species
- Frog Species
- Humber Arboretum Study Area

Toronto and Region Conservation Authority

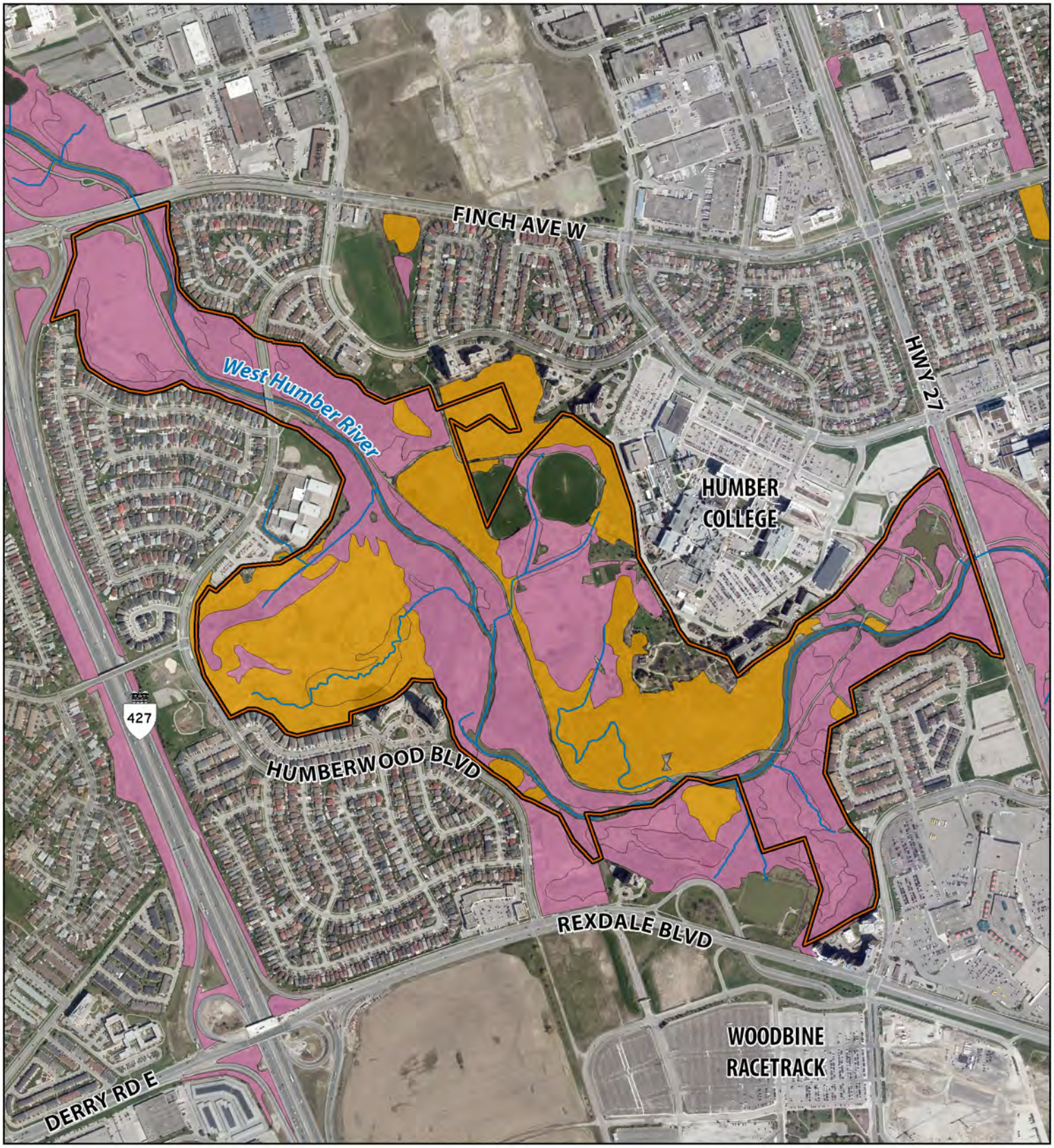
N

0 100 200 400 m

Date: February 2021
Orthophoto: Spring 2018, First Base Solutions
* Landscape analysis based on 2017 Orthophotography

Map 7: Scores for Matrix Influence and Fauna Sensitivity to Development

NOTE: All fauna species with their associated scores for sensitivity to development can be found in Appendix #3.



Toronto and Region Conservation Authority

N W E S

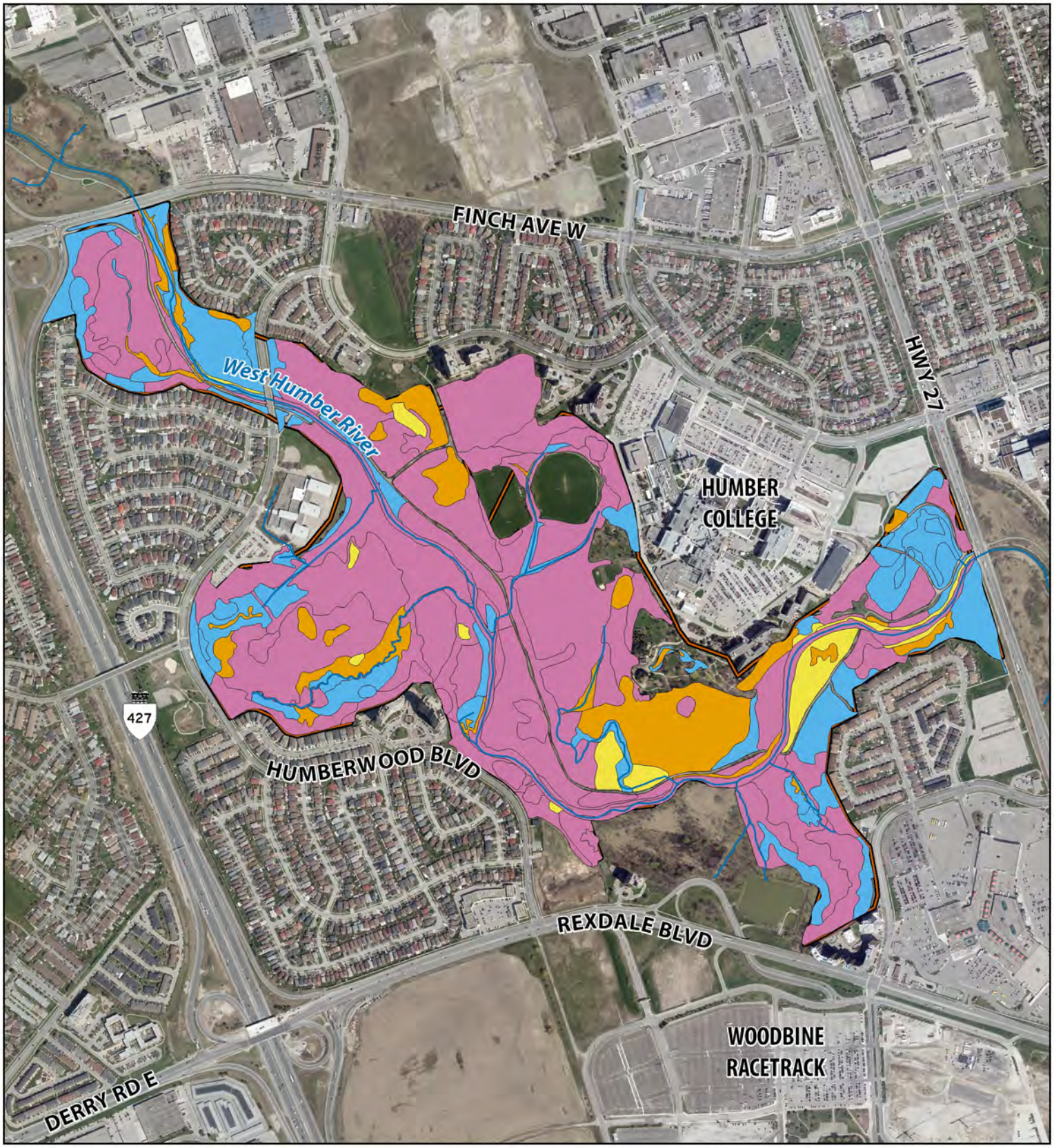
0 100 200 400 m

Orthophoto: Spring 2019
* Landscape analysis based on 2017 Orthophotography

Map 8: Habitat Patch Quality

Habitat Patch Quality *

- L1 - Excellent
- L2 - Good
- L3 - Fair
- L4 - Poor
- L5 - Very Poor
- Humber Arboretum Study Area



Toronto and Region Conservation Authority

N W E S

0 100 200 400 m

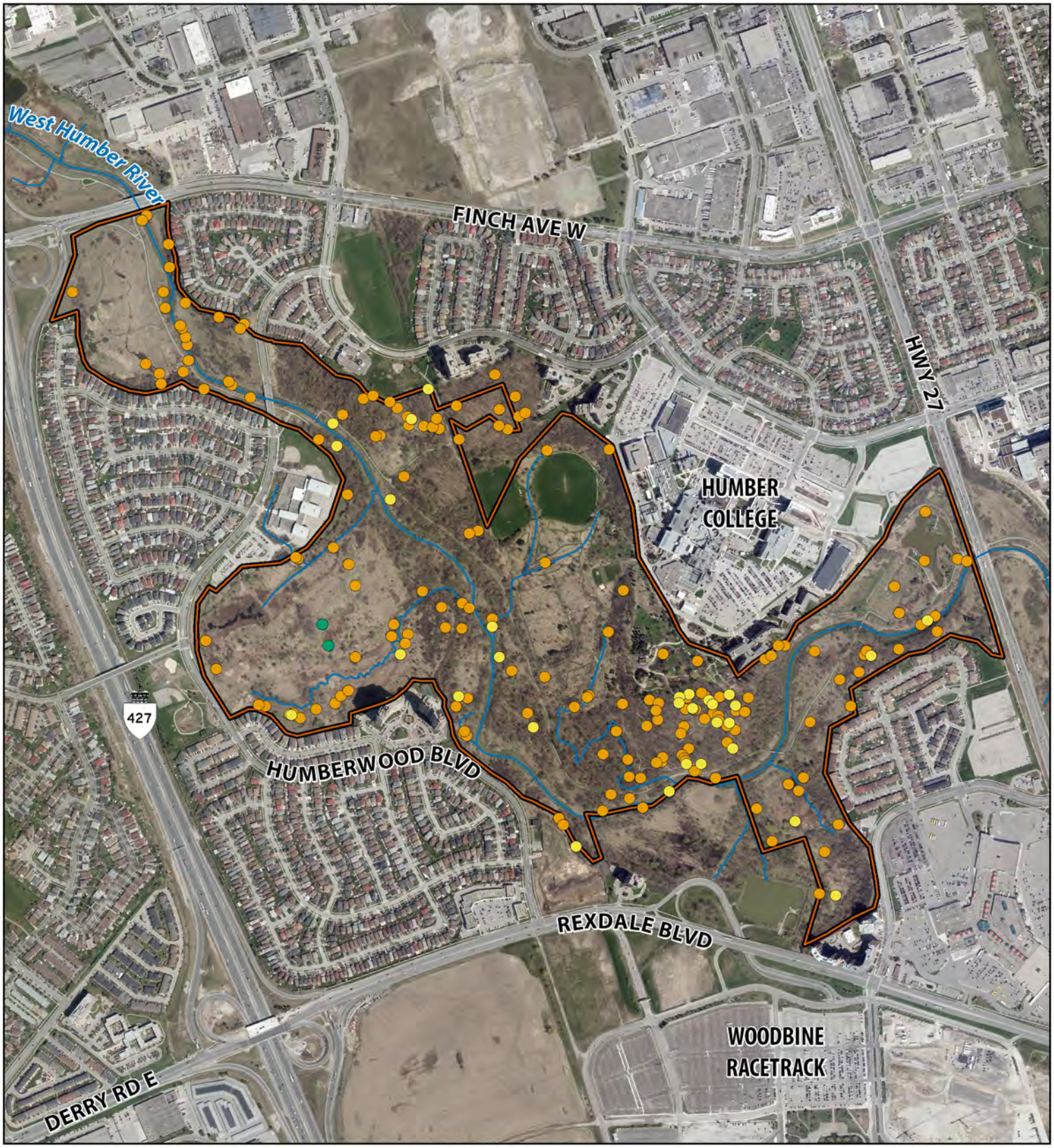
Date: February 2021
Orthophoto: Spring 2019, First Base Solutions

Map 9: Vegetation Communities with their Associated Local Ranks

Vegetation Community Ranks

- L1
- L2
- L3
- L4
- L5
- L+
- Humber Arboretum Study Area

NOTE: All vegetation communities with their associated scores and ranks can be found in Appendix #1.



Toronto and Region Conservation Authority

N W E S

0 100 200 400 m

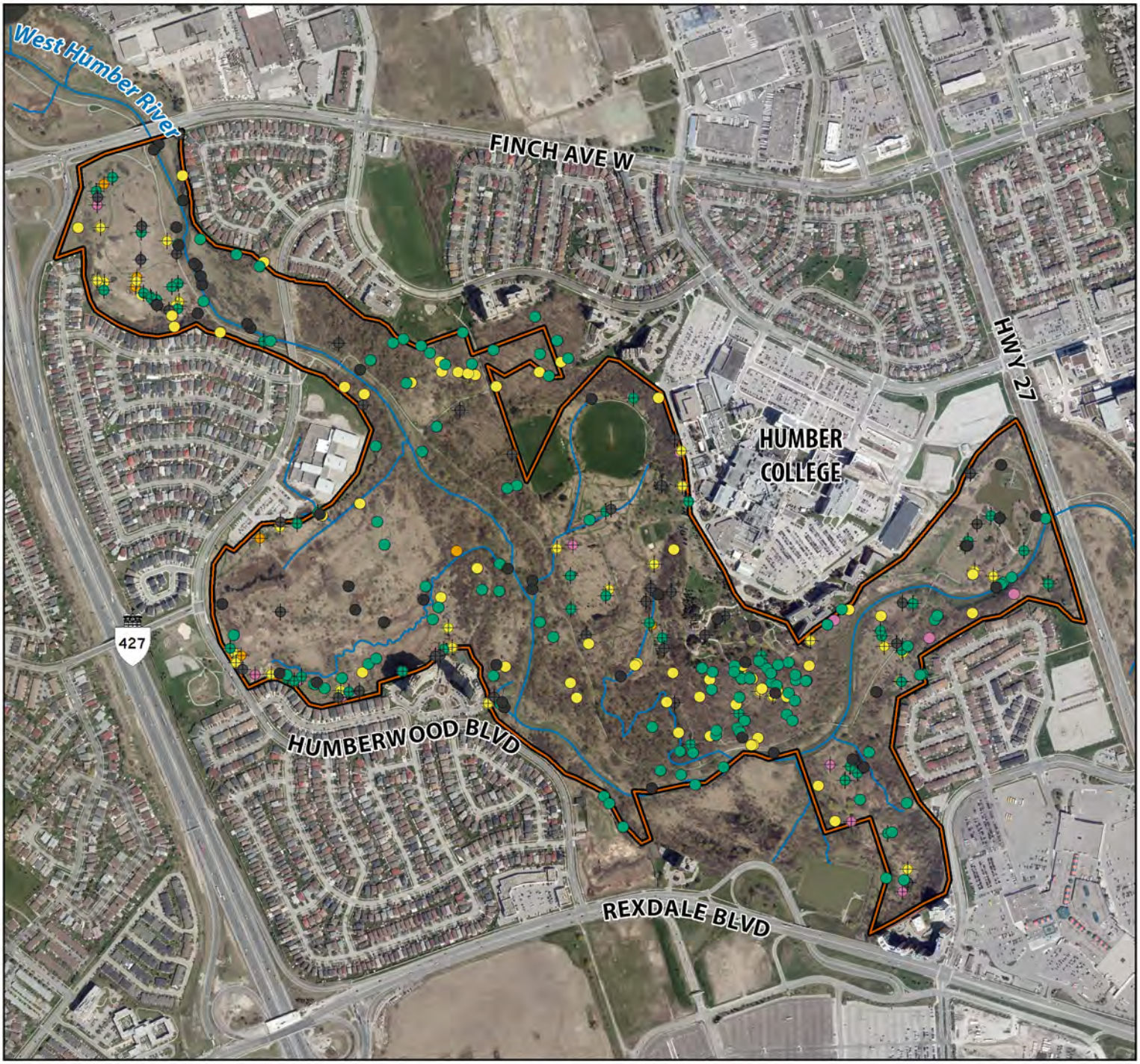
Orthophoto: Spring 2019
* Landscape analysis based on 2017 Orthophotography

Map 10: Location of Flora Species of Concern L1-L4

Flora Species of Concern (L1-L4)

- L1
- L2
- L3
- L4

Humber Arboretum Study Area



Flora Habitat Dependence Scores

- 5 - Extreme habitat specialist
- 4 - Strong habitat specialist
- 3 - Moderate habitat specialist
- 2 - Moderate habitat generalist
- 1 - Strong habitat generalist
- 0 - Extreme habitat generalist

- Flora Species
- Planted Flora Species
- Humber Arboretum Study Area

Toronto and Region Conservation Authority

N

0 100 200 400 m

Date: February 2021
Orthophoto: Spring 2018, First Base Solutions

Map 11: Flora Species Habitat Dependence Scores

NOTE: All flora species with their associated scores for habitat dependence can be found in Appendix #2.

Toronto and Region Conservation Authority

N W E S

0 100 200 400 m

Orthophoto: Spring 2019
* Landscape analysis based on 2017 Orthophotography

Map 12: Location of Planted Flora Species of Concern L1-L4

Planted Flora Species of Concern (L1-L4)

- L1
- L2
- L3
- L4

Humber Arboretum Study Area

Toronto and Region Conservation Authority

N
W E
S

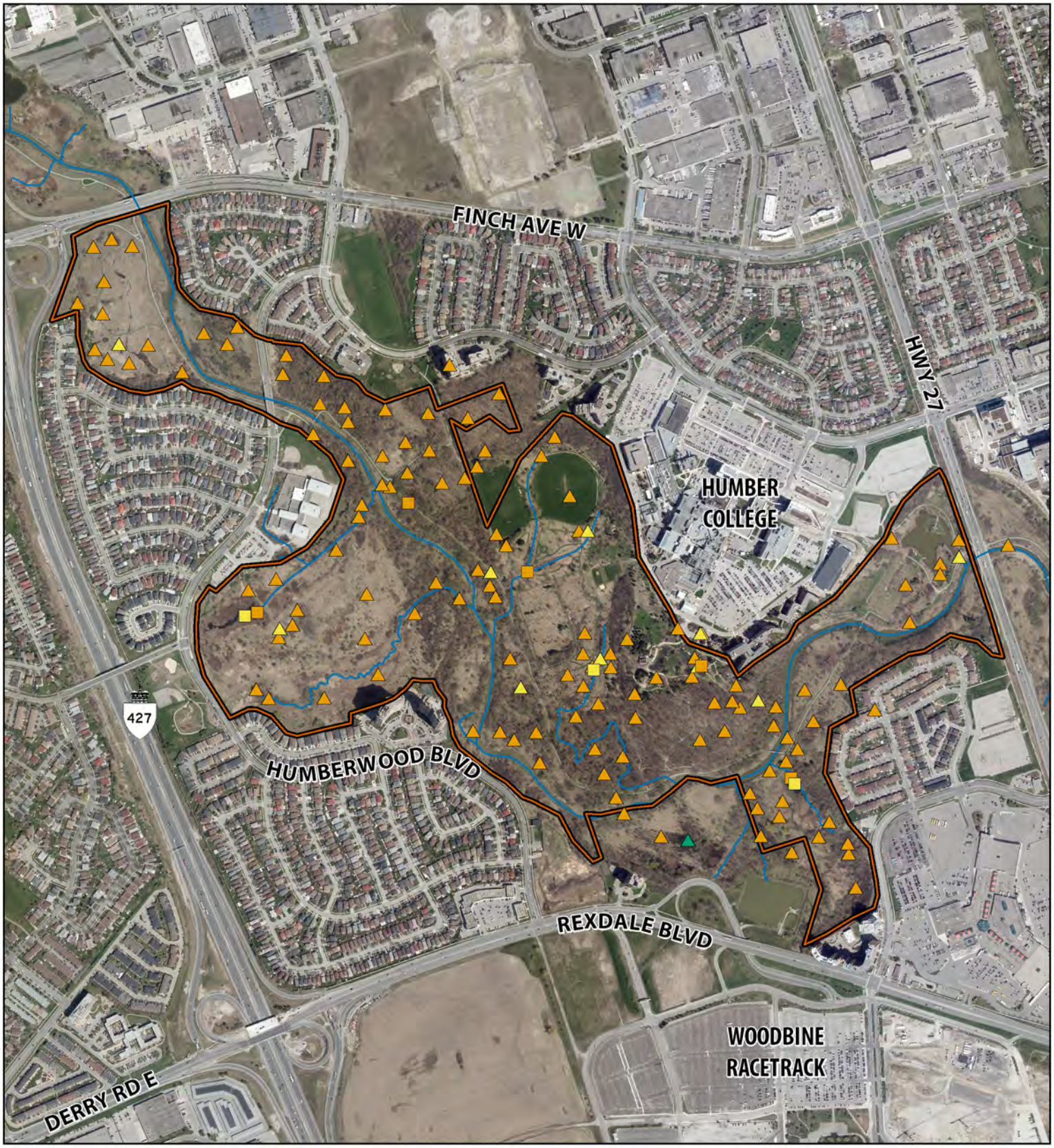
0 100 200 400 m

Orthophoto: Spring 2019
* Landscape analysis based on 2017 Orthophotography

Map 13: Location of Invasive Flora Species

Invasive Flora Species Intensity

- Dominant
- Abundant
- Occasional
- Humber Arboretum Study Area



Toronto and Region Conservation Authority

N
W E
S

0 100 200 400 m

Date: February 2021
Orthophoto: Spring 2019, MNRF

Map 14: Locations of Fauna Species of Concern

Fauna Species of Concern

- L1
- L2
- L3
- L4

Frog Species of Concern

- L1
- L2
- L3
- L4

Humber Arboretum Study Area

Appendix 1a: Vegetation Communities for Humber Arboretum (2020)

ELC Code	Vegetation Type *(* indicates present as inclusion and/or complex only)*	Tot. Area # ha	Scores			Local Rank May-19
			Local Occur.	Geophy. Requir.	2019 Score	
	Forest					
FOD2-4	Dry-Fresh Oak - Hardwood Deciduous Forest	0.3	2.5	2.0	4.5	**L4**
FOD4-e	Dry-Fresh Exotic Deciduous Forest	0.1	3.0	0.0	3.0	**L+**
FOD4-H	Dry-Fresh Hawthorn - Apple Deciduous Forest	0.1	3.5	0.0	3.5	**L4**
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest	3.2	1.5	0.0	1.5	**L5**
FOD5-3	Dry-Fresh Sugar Maple - Oak Deciduous Forest	0.9	2.0	2.0	4.0	**L4**
FOD5-5	Dry-Fresh Sugar Maple - Hickory Deciduous Forest	5.7	3.5	1.0	4.5	**L4**
FOD5-6	Dry-Fresh Sugar Maple - Basswood Deciduous Forest	0.4	2.5	0.0	2.5	**L5**
FOD5-8	Dry-Fresh Sugar Maple - White Ash Deciduous Forest	1.0	2.0	0.0	2.0	**L5**
FOD6-2	Fresh-Moist Sugar Maple - Black Maple Deciduous Forest	0.7	2.5	1.0	3.5	**L4**
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest	2.8	2.0	0.0	2.0	**L5**
FOD7-4	Fresh-Moist Black Walnut Lowland Deciduous Forest	0.2	2.5	1.0	3.5	**L4**
FOD7-a	Fresh-Moist Manitoba Maple Lowland Deciduous Forest	9.6	2.0	0.0	2.0	**L5**
FOD7-E	Fresh-Moist Hawthorn - Apple Deciduous Forest	1.4	2.5	0.0	2.5	**L5**
FOD9-3	Fresh-Moist Bur Oak Deciduous Forest	0.3	3.5	1.0	4.5	**L4**
FOD9-5	Fresh-Moist Bitternut Hickory Deciduous Forest	1.1	3.5	2.0	5.5	**L3**
*CUP1-1	Sugar Maple Deciduous Plantation	i	4.0	0.0	4.0	**L5**
*CUP1-5	*Silver Maple Deciduous Plantation	c	3.0	0.0	3.0	**L5**
CUP1-A	Restoration Deciduous Plantation	0.7	2.0	0.0	2.0	**L5**
CUP1-c	Locust Deciduous Plantation	0.6	2.0	0.0	2.0	**L+**
CUP2-A	Restoration Mixed Plantation	2.5	2.0	0.0	2.0	**L5**
CUP3-2	White Pine Coniferous Plantation	0.1	2.0	0.0	2.0	**L5**
*CUP3-A	*Restoration Coniferous Plantation	c	2.5	0.0	2.5	**L5**
CUP3-b	Austrian Pine Coniferous Plantation	0.1	3.0	0.0	3.0	**L+**
CUP3-C	White Spruce Coniferous Plantation	0.3	2.0	0.0	2.0	**L5**
*CUP3-e	*Norway Spruce Coniferous Plantation	i	4.0	0.0	4.0	**L+**
CUP3-G	White Cedar Coniferous Plantation	0.1	2.0	0.0	2.0	**L5**

Appendix 1a: Vegetation Communities for Humber Arboretum (2020)

ELC Code	Vegetation Type *(* indicates present as inclusion and/or complex only)*	Tot. Area # ha	Scores			Local Rank May-19
			Local Occur.	Geophy. Requir.	2019 Score	
	Successional					
CUT1-1	Sumac Deciduous Thicket	0.1	2.0	0.0	2.0	**L5**
CUT1-5	Raspberry Deciduous Thicket	0.3	3.0	0.0	3.0	**L4**
CUT1-A1	Native Deciduous Sapling Regeneration Thicket	0.5	2.0	0.0	2.0	**L5**
CUT1-b	Buckthorn Deciduous Thicket	0.5	2.0	0.0	2.0	**L+**
CUT1-c	Exotic Deciduous Thicket	2.6	2.0	0.0	2.0	**L+**
CUT1-G	Willow Deciduous Thicket	0.05	3.5	0.0	3.5	**L4**
CUS1-1	Hawthorn Successional Savannah	1.0	2.0	0.0	2.0	**L5**
CUS1-A1	Native Deciduous Successional Savannah	18.3	2.0	0.0	2.0	**L5**
CUS1-b	Exotic Successional Savannah	2.7	2.0	0.0	2.0	**L+**
CUW1-A3	Native Deciduous Successional Woodland	11.1	1.5	0.0	1.5	**L5**
CUW1-b	Exotic Successional Woodland	3.7	1.5	0.0	1.5	**L+**
CUW1-D	Hawthorn Successional Woodland	1.3	2.5	0.0	2.5	**L5**
	Wetland					
SWD4-1	Willow Mineral Deciduous Swamp	1.7	2.0	1.0	3.0	**L4**
SWD4-3	Paper Birch - Poplar Mineral Deciduous Swamp	0.1	2.0	2.0	4.0	**L4**
SWT2-2	Willow Mineral Thicket Swamp	0.1	2.0	2.0	4.0	**L4**
SWT2-5	Red-osier Mineral Thicket Swamp	0.2	2.0	2.0	4.0	**L4**
MAM2-2	Reed Canary Grass Mineral Meadow Marsh	0.2	2.0	1.0	3.0	**L+**
MAM2-10	Forb Mineral Meadow Marsh	1.8	2.0	1.0	3.0	**L4**
MAM2-a	Common Reed Mineral Meadow Marsh	0.1	2.5	0.0	2.5	**L+**
*MAM2-b	*Purple Loosestrife Mineral Meadow Marsh	i	3.5	0.0	3.5	**L+**
*MAS2-1A	*Broad-leaved Cattail Mineral Shallow Marsh	c	2.0	1.0	3.0	**L4**
MAS2-1b	Hybrid Cattail Mineral Shallow Marsh	3.2	2.0	0.0	2.0	**L+**
MAS2-2	Bulrush Mineral Shallow Marsh	0.02	3.0	1.0	4.0	**L4**
MAS2-9	Forb Mineral Shallow Marsh	0.02	3.0	1.0	4.0	**L4**
MAS2-a	Common Reed Mineral Shallow Marsh	0.6	2.5	0.0	2.5	**L+**

Appendix 1a: Vegetation Communities for Humber Arboretum (2020)

ELC Code	Vegetation Type *(* indicates present as inclusion and/or complex only)*	Tot. Area # ha	Scores			Local Rank May-19
			Local Occur.	Geophy. Requir.	2019 Score	
	Aquatic					
SAS1-1	Pondweed Submerged Shallow Aquatic	0.05	2.0	2.0	4.0	**L4**
SAS1-A	Coon-tail Submerged Shallow Aquatic	0.1	3.0	1.0	4.0	**L4**
SAF1-3	Duckweed Floating-leaved Shallow Aquatic	0.1	2.5	1.0	3.5	**L4**
OAO1	Open Aquatic (deep or riverine unvegetated)	4.1	1.5	0.0	1.5	**L5**
OAO1-T	Turbid Open Aquatic (disturbed unvegetated)	1.4	2.0	0.0	2.0	**L+**
	Dynamic (Beach, Bluff, Barren, Prairie, Savannah)					
BBO1-3	Reed Canary Grass Riparian Bar	0.4	3.5	2.0	5.5	**L3**
*BBO2-B	*Rubble Open Riparian Bank	i	4.0	0.0	4.0	**L5**
BBS1-2B	Willow Shrub Riparian Bar	0.7	3.0	1.0	4.0	**L4**
BBT1-B	Mineral Treed Riparian Bar	0.7	3.5	2.0	5.5	**L3**
BLO1	Mineral Open Bluff	0.1	3.0	2.0	5.0	**L3**
BLT1-B	Deciduous Treed Bluff	0.1	3.0	2.0	5.0	**L3**
CBO1	Open Clay Barren	0.4	3.5	2.0	5.5	**L3**
*TPO2-A	*Fresh-Moist Tallgrass Prairie Planting	c	2.5	1.0	3.5	**L5**
CUS1-3B	Bur Oak Non-tallgrass Savannah	1.4	4.5	1.0	5.5	**L3**
	Meadow					
CUM1-A	Native Forb Meadow	6.9	1.0	0.0	1.0	**L5**
CUM1-b	Exotic Cool-season Grass Graminoid Meadow	1.9	1.0	0.0	1.0	**L+**
CUM1-c	Exotic Forb Meadow	0.9	1.5	0.0	1.5	**L+**

Legend

L1-L3: community of regional conservation concern
L4: community of conservation concern in urban area
L5: community not of concern at this time
L+: community of predominantly introduced species
*c,i: community only present as complex (c) or inclusion (i)

ELC Code	Vegetation Type *(* indicates present as inclusion and/or complex only)*	Tot. Area # ha	Scores			Local Rank May-19
			Local Occur.	Geophy. Requir.	2019 Score	
	Forest					
FOD2-4	Dry-Fresh Oak - Hardwood Deciduous Forest	0.5	2.5	2.0	4.5	**L4**
FOD3-1	Dry-Fresh Poplar Deciduous Forest	0.1	2.0	2.0	4.0	**L4**
FOD4-2	Dry-Fresh White Ash Deciduous Forest	0.9	3.0	0.0	3.0	**L4**
FOD4-b	Dry-Fresh Manitoba Maple Deciduous Forest	0.4	3.0	0.0	3.0	**L+**
FOD5	Dry Fresh Sugar Maple Decidous Forest Ecosite	3.8	1.5	0.0	1.5	**L5**
FOD5-5	Dry-Fresh Sugar Maple - Hickory Deciduous Forest	0.6	3.5	1.0	4.5	**L4**
FOD6-2	Fresh-Moist Sugar Maple - Black Maple Deciduous Forest	1.6	2.5	1.0	3.5	**L4**
FOD6-5	Fresh-Moist Sugar Maple - Hardwood Deciduous Forest	4.0	2.0	0.0	2.0	**L5**
FOD7-1	Fresh-Moist White Elm Lowland Deciduous Forest	2.5	3.0	1.0	4.0	**L4**
FOD7-2	Fresh-Moist Ash Deciduous Forest	1.9	2.0	1.0	3.0	**L4**
FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest	10.3	2.0	0.0	2.0	**L5**
FOD7-4	Fresh-Moist Black Walnut Lowland Deciduous Forest	2.2	2.5	1.0	3.5	**L4**
FOD7-a	Fresh-Moist Manitoba Maple Lowland Deciduous Forest	6.2	2.0	0.0	2.0	**L5**
FOD8-1	Fresh-Moist Poplar Deciduous Forest	0.6	2.0	0.0	2.0	**L5**
FOD9-2	Fresh-Moist Oak - Lowland Maple Deciduous Forest	0.2	3.5	1.0	4.5	**L4**
FOD9-3	Fresh-Moist Bur Oak Deciduous Forest	1.4	3.5	1.0	4.5	**L4**
FOD9-5	Fresh-Moist Bitternut Hickory Deciduous Forest	0.2	3.5	2.0	5.5	**L3**
CUP1-A	Restoration Deciduous Plantation	0.05	2.0	0.0	2.0	**L5**
CUP1-c	Locust Deciduous Plantation	0.4	2.0	0.0	2.0	**L+**
CUP3-1	Red Pine Coniferous Plantation	0.04	1.5	0.0	1.5	**L5**
CUP3-2	White Pine Coniferous Plantation	0.1	2.0	0.0	2.0	**L5**
	Successional					
CUT1-1	Sumac Deciduous Thicket	0.1	2.0	0.0	2.0	**L5**
CUT1-A1	Native Deciduous Sapling Regeneration Thicket	1.3	2.0	0.0	2.0	**L5**
CUT1-b	Buckthorn Deciduous Thicket	3.6	2.0	0.0	2.0	**L+**
CUT1-c	Exotic Deciduous Thicket	1.0	2.0	0.0	2.0	**L+**
CUS1-1	Hawthorn Successional Savannah	2.0	2.0	0.0	2.0	**L5**
CUS1-b	Exotic Successional Savannah	0.5	2.0	0.0	2.0	**L+**
	Wetland					
SWD4-1	Willow Mineral Deciduous Swamp	0.5	2.0	1.0	3.0	**L4**
SWT2-1	Alder Mineral Thicket Swamp	0.1	3.5	1.0	4.5	**L4**
SWT2-2	Willow Mineral Thicket Swamp	1.2	2.0	2.0	4.0	**L4**
MAM2-2	Reed Canary Grass Mineral Meadow Marsh	0.9	2.0	1.0	3.0	**L+**

MAM2-10	Forb Mineral Meadow Marsh	0.1	2.0	1.0	3.0	**L4**
MAM2-b	Purple Loosestrife Mineral Meadow Marsh	2.9	3.5	0.0	3.5	**L+**
MAS2-1b	Hybrid Cattail Mineral Shallow Marsh	2.7	2.0	0.0	2.0	**L+**
MAS2-a	Common Reed Mineral Shallow Marsh	0.02	2.5	0.0	2.5	**L+**
	Dynamic (Beach, Bluff, Barren, Prairie, Savannah)					
BBO1-A	Open Riparian Sand / Gravel Bar	0.1	3.5	2.0	5.5	**L5**
BLO1	Mineral Open Bluff	0.1	3.0	2.0	5.0	**L3**
BLS1	Mineral Shrub Bluff Ecosite	0.1	3.0	2.0	5.0	**L3**
BLT1-B	Deciduous Treed Bluff	0.2	3.0	2.0	5.0	**L3**
CUS1-3B	Bur Oak Non-tallgrass Savannah	0.3	4.5	1.0	5.5	**L3**
	Meadow					
CUM1	Meadow Ecosite	44.5	1.0	0.0	1.0	**L5**

Legend

L1-L3: community of regional conservation concern
L4: community of conservation concern in urban area
L5: community not of concern at this time
L+: community of predominantly introduced species
*c,i: community only present as complex (c) or inclusion (i)

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Adoxaceae	SAMCANA	*Sambucus canadensis*	common elderberry	1	3	2	2	8	**L5**	xp		
Adoxaceae	VIBLANA	*Viburnum lantana*	wayfaring tree	1	ns	ns	ns	1	**L+**	x		
Adoxaceae	VIBLENT	*Viburnum lentago*	nannyberry	1	3	1	2	7	**L5**	xp		
Adoxaceae	VIBOPUL	*Viburnum opulus* ssp. *opulus*	European highbush cranberry	1	ns	ns	ns	1	**L+**	xpn		
Alismataceae	ALITRIV	*Alisma triviale*	common water-plantain	1	2	4	2	9	**L5**	x		
Alismataceae	SAGLATI	*Sagittaria latifolia*	common arrowhead	1	2	4	4	11	**L4**	xpn		
Amaranthaceae	AMARETR	*Amaranthus retroflexus*	red-root pigweed	2	ns	ns	ns	2	**L+**	x		
Amaranthaceae	ATRPATU	*Atriplex patula*	halberd-leaved orache	2	ns	ns	ns	2	**L+?**	x		
Amaranthaceae	ATRPROS	*Atriplex prostrata*	spreading orache	2	ns	ns	ns	2	**L+?**	x		
Amaranthaceae	CHEALBU	*Chenopodium album*	lamb's quarters	1	ns	ns	ns	1	**L+**	x		
Amaranthaceae	CHEGLAU	*Oxybasis glauca* ssp. *glauca*	oak-leaved goosefoot	2	ns	ns	ns	2	**L+**	x		
Amaryllidaceae	ALLTRIC	*Allium tricoccum*	wild leek	1	3	4	4	12	**L4**	x	x	x
Amaryllidaceae	NARPSEU	*Narcissus pseudonarcissus*	daffodil	2	ns	ns	ns	2	**L+**	xpr		
Anacardiaceae	RHUAROM	*Rhus aromatica*	fragrant sumach	3	ns	ns	ns	3	**L+**	xp		
Anacardiaceae	RHUTYPH	*Rhus typhina*	staghorn sumach	1	1	2	2	6	**L5**	xpn		
Anacardiaceae	RHUTYLA	*Rhus typhina* 'Laciniata'	staghorn sumach 'Laciniata'	1	1	2	2	6	**L5**	xp		
Anacardiaceae	RHURARY	*Toxicodendron radicans* var. *rydbergii*	shrubby poison ivy	1	2	0	2	5	**L5**	x		
Apiaceae	AEGPODA	*Aegopodium podagraria*	goutweed	1	ns	ns	ns	1	**L+**	x		
Apiaceae	ANEGRAV	*Anethum graveolens*	dill	5	ns	ns	ns	5	**L+**	x		
Apiaceae	CICMACU	*Cicuta maculata*	spotted water-hemlock	1	2	2	2	7	**L5**	x		
Apiaceae	CONMACU	*Conium maculatum*	poison-hemlock	5	ns	ns	ns	5	**L+**	x		
Apiaceae	CRYCANA	*Cryptotaenia canadensis*	honewort	1	2	4	1	8	**L5**	x		
Apiaceae	DAUCARO	*Daucus carota*	Queen Anne's lace	1	ns	ns	ns	1	**L+**	x		
Apiaceae	HERMANT	*Heracleum mantegazzianum*	giant hog-weed	3	ns	ns	ns	3	**L+**	x		
Apiaceae	HERLANA	*Heracleum maximum*	cow-parsnip	2	2	3	2	9	**L5**	x		
Apiaceae	PASSATI	*Pastinaca sativa*	wild parsnip	1	ns	ns	ns	1	**L+**	x		
Apiaceae	TORJAPO	*Torilis japonica*	hedge-parsley	1	ns	ns	ns	1	**L+**	x		
Apocynaceae	APOANDR	*Apocynum androsaemifolium*	spreading dogbane	1	3	2	4	10	**L5**	x		
Apocynaceae	APOCACA	*Apocynum cannabinum* var. *cannabinum*	hemp dogbane	2	2	3	2	9	**L5**	x		
Apocynaceae	ASCINCA	*Asclepias incarnata* ssp. *incarnata*	swamp milkweed	1	3	4	4	12	**L4**	xpr		
Apocynaceae	ASCSYRI	*Asclepias syriaca*	common milkweed	1	2	0	2	5	**L5**	x		
Apocynaceae	VINMINO	*Vinca minor*	periwinkle	1	ns	ns	ns	1	**L+**	xpn		
Apocynaceae	CYNROSS	*Vincetoxicum rossicum*	dog-strangling vine	1	ns	ns	ns	1	**L+**	x		
Araceae	ARITRIP	*Arisaema triphyllum*	Jack-in-the-pulpit	1	3	2	3	9	**L5**	x	x	x
Araceae	LEMMINO	*Lemna minor*	common duckweed	1	2	4	2	9	**L5**	x		
Araceae	LEMTURI	*Lemna turionifera*	turion duckweed	1	2	3	3	9	**L5**	x		
Araceae	SPIPOLY	*Spirodela polyrhiza*	greater duckweed	1	4	5	3	13	**L4**	x		
Asparagaceae	ASPOFFI	*Asparagus officinalis*	asparagus	1	ns	ns	ns	1	**L+**	x		
Asparagaceae	CONMAJA	*Convallaria majalis*	lily-of-the-valley	1	ns	ns	ns	1	**L+**	x		
Asparagaceae	HOSVENT	*Hosta ventricosa*	hosta	3	ns	ns	ns	3	**L+**	xpr		
Asparagaceae	MAIRACE	*Maianthemum racemosum*	false Solomon's seal	1	3	2	3	9	**L5**	x		
Asparagaceae	MAISTEL	*Maianthemum stellatum*	starry false Solomon's seal	1	2	1	3	7	**L5**	x		
Asparagaceae	ORNUMBE	*Ornithogalum umbellatum*	summer snowflake	4	ns	ns	ns	4	**L+**	x		
Asparagaceae	SCISIBE	*Scilla siberica*	Siberian squill	2	ns	ns	ns	2	**L+**	x		
Asteraceae	ACHMILA	*Achillea borealis* var. *borealis*	woolly yarrow	1	2	0	1	4	**L5**	x		
Asteraceae	AMBARTE	*Ambrosia artemisiifolia*	common ragweed	1	1	3	0	5	**L5**	x		
Asteraceae	ARCLAPP	*Arctium lappa*	great burdock	1	ns	ns	ns	1	**L+**	x		
Asteraceae	ARCMIMI	*Arctium minus*	common burdock	1	ns	ns	ns	1	**L+**	x		
Asteraceae	ARTBIEN	*Artemisia biennis*	biennial wormwood	2	ns	ns	ns	2	**L+**	x		
Asteraceae	ARTVULG	*Artemisia vulgaris*	common mugwort	1	ns	ns	ns	1	**L+**	x		
Asteraceae	BIDCERN	*Bidens cernua*	nodding bur-marigold	1	2	2	3	8	**L5**	x		
Asteraceae	BIDFRON	*Bidens frondosa*	common beggar's-ticks	1	1	2	0	4	**L5**	x		
Asteraceae	BIDVULG	*Bidens vulgata*	tall beggar's-ticks	2	2	2	2	8	**L5**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Asteraceae	CARACAN	*Carduus acanthoides*	plumeless thistle	2	ns	ns	ns	2	**L+**	x		
Asteraceae	CENXMON	*Centaurea × moncktonii*	meadow knapweed	5	ns	ns	ns	5	**L+**	x		
Asteraceae	CENJACE	*Centaurea jacea*	brown knapweed	2	ns	ns	ns	2	**L+**	x		
Asteraceae	CICINTY	*Cichorium intybus*	chicory	1	ns	ns	ns	1	**L+**	x		
Asteraceae	CIRARVE	*Cirsium arvense*	creeping thistle	1	ns	ns	ns	1	**L+**	x		
Asteraceae	CIRVULG	*Cirsium vulgare*	bull thistle	1	ns	ns	ns	1	**L+**	x		
Asteraceae	CORTINC	*Coreopsis tinctoria*	plains coreopsis	5	ns	ns	ns	5	**L+**	xpr		
Asteraceae	ECHPURP	*Echinacea purpurea*	purple coneflower	3	ns	ns	ns	3	**L+**	xpr		
Asteraceae	ECHSPHA	*Echinops sphaerocephalus*	common globe-thistle	3	ns	ns	ns	3	**L+**	x		
Asteraceae	ERIANNU	*Erigeron annuus*	daisy fleabane	1	2	0	1	4	**L5**	x		
Asteraceae	CONCANA	*Erigeron canadensis*	horse-weed	1	1	2	0	4	**L5**	x		
Asteraceae	ERIPHIL	*Erigeron philadelphicus* var. *philadelphicus*	Philadelphia fleabane	1	2	0	1	4	**L5**	x		
Asteraceae	ERISTRI	*Erigeron strigosus*	rough fleabane	2	2	1	1	6	**L5**	x		
Asteraceae	EUPPERF	*Eupatorium perfoliatum*	boneset	1	2	2	3	8	**L5**	x		x
Asteraceae	ASTMACR	*Eurybia macrophylla*	big-leaved aster	1	3	1	4	9	**L5**	x		
Asteraceae	EUTGRAM	*Euthamia graminifolia*	grass-leaved goldenrod	1	1	4	1	7	**L5**	x		
Asteraceae	EUPFIST	*Eutrochium fistulosum*	hollow-stemmed Joe-Pye weed	4	ns	ns	ns	4	**L+**	xpr		
Asteraceae	EUPMACU	*Eutrochium maculatum* var. *maculatum*	spotted Joe-Pye weed	1	2	0	3	6	**L5**	x		
Asteraceae	HELANNU	*Helianthus annuus*	common sunflower	3	ns	ns	ns	3	**L+**	x		
Asteraceae	HELGIGA	*Helianthus giganteus*	tall sunflower	5	2	4	3	14	**LX**	xpr		
Asteraceae	HELHELI	*Heliopsis helianthoides*	ox-eye	5	5	4	4	18	**L2**	xpr		
Asteraceae	HIELACH	*Hieracium vulgatum*	blotched hawkweed	3	ns	ns	ns	3	**L+**	x		
Asteraceae	INUHELE	*Inula helenium*	elecampane	1	ns	ns	ns	1	**L+**	x		
Asteraceae	LACBIEN	*Lactuca biennis*	tall blue lettuce	2	4	2	4	12	**L4**	x		
Asteraceae	LACSERR	*Lactuca serriola*	prickly lettuce	1	ns	ns	ns	1	**L+**	x		
Asteraceae	LAPCOMM	*Lapsana communis*	nipplewort	1	ns	ns	ns	1	**L+**	x		
Asteraceae	CHRLEUC	*Leucanthemum vulgare*	ox-eye daisy	1	ns	ns	ns	1	**L+**	x		
Asteraceae	LIASPIC	*Liatris spicata*	spike blazing-star	5	3	5	5	18	**L2**	xpr		
Asteraceae	MATMATR	*Matricaria discoidea*	pineappleweed	1	ns	ns	ns	1	**L+**	x		
Asteraceae	ONOACAN	*Onopordum acanthium*	Scotch thistle	5	ns	ns	ns	5	**L+**	x		
Asteraceae	PICHIER	*Picris hieracioides*	hawkweed oxtongue	3	ns	ns	ns	3	**L+**	x		
Asteraceae	HIEPILD	*Pilosella piloselloides*	smooth yellow hawkweed	1	ns	ns	ns	1	**L+**	x		
Asteraceae	GNAOBTU	*Pseudognaphalium obtusifolium*	fragrant cudweed	4	4	5	4	17	**L2**	x		x
Asteraceae	RATPINN	*Ratibida pinnata*	grey-headed coneflower	3	ns	ns	ns	3	**L+**	xpr		
Asteraceae	RUDFULG	*Rudbeckia fulgida*	orange coneflower	3	ns	ns	ns	3	**L+**	xpr		
Asteraceae	RUDHIRT	*Rudbeckia hirta*	black-eyed Susan	1	4	4	3	12	**L4**	xpr		
Asteraceae	RUDLACI	*Rudbeckia laciniata*	cut-leaved coneflower	3	2	4	2	11	**L4**	xpr		
Asteraceae	RUDTRIL	*Rudbeckia triloba*	brown-eyed Susan	2	ns	ns	ns	2	**L+**	x		
Asteraceae	SILPERF	*Silphium perfoliatum*	cup-plant	3	1	3	2	9	**L5**	xpr		
Asteraceae	SOLALTI	*Solidago altissima*	tall goldenrod	1	2	0	0	3	**L5**	x		
Asteraceae	SOLCAES	*Solidago caesia*	blue-stemmed goldenrod	1	2	4	2	9	**L5**	x		
Asteraceae	SOLCANA	*Solidago canadensis* var. *canadensis*	Canada goldenrod	1	2	0	1	4	**L5**	x		
Asteraceae	SOLFLEX	*Solidago flexicaulis*	zig-zag goldenrod	1	1	3	2	7	**L5**	x		
Asteraceae	SOLGIGA	*Solidago gigantea*	late goldenrod	1	1	1	1	4	**L5**	x		
Asteraceae	SOLNEMO	*Solidago nemoralis* ssp. *nemoralis*	grey goldenrod	1	2	2	2	7	**L5**	x		
Asteraceae	SOLRIGI	*Solidago rigida* ssp. *rigida*	stiff goldenrod	5	5	5	4	19	**LX**	xpr		
Asteraceae	SONARAR	*Sonchus arvensis* ssp. *arvensis*	glandular perennial sow-thistle	1	ns	ns	ns	1	**L+**	x		
Asteraceae	SONOLER	*Sonchus oleraceus*	annual sow-thistle	1	ns	ns	ns	1	**L+**	x		
Asteraceae	ASTCORD	*Symphyotrichum cordifolium*	heart-leaved aster	1	1	0	2	4	**L5**	x		
Asteraceae	ASTERIC	*Symphyotrichum ericoides* var. *ericoides*	heath aster	1	1	2	1	5	**L5**	x		
Asteraceae	ASTFIRM	*Symphyotrichum firmum*	shining aster	3	3	4	3	13	**L4**	x		
Asteraceae	ASTLANC	*Symphyotrichum lanceolatum* var. *lanceolatum*	panicled aster	1	2	2	1	6	**L5**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Asteraceae	ASTLALT	*Symphyotrichum lateriflorum* var. *lateriflorum*	calico aster	1	2	3	2	8	**L5**	x		
Asteraceae	ASTNOVA	*Symphyotrichum novae-angliae*	New England aster	1	2	2	1	6	**L5**	x		
Asteraceae	ASTOOLE	*Symphyotrichum oolentangiense*	sky-blue aster	2	1	4	4	11	**L4**	x		x
Asteraceae	ASTPIPI	*Symphyotrichum pilosum* var. *pilosum*	hairy aster	3	4	4	4	15	**L3**	x		
Asteraceae	TANVULG	*Tanacetum vulgare*	tansy	1	ns	ns	ns	1	**L+**	x		
Asteraceae	TAROFFI	*Taraxacum officinale*	dandelion	1	ns	ns	ns	1	**L+**	x		
Asteraceae	TRADUBI	*Tragopogon dubius*	lemon-yellow goat's beard	1	ns	ns	ns	1	**L+**	x		
Asteraceae	TRAPRAT	*Tragopogon pratensis*	meadow goat's beard	1	ns	ns	ns	1	**L+**	x		
Asteraceae	MATPERF	*Tripleurospermum inodorum*	scentless chamomile	2	ns	ns	ns	2	**L+**	x		
Asteraceae	TUSFARF	*Tussilago farfara*	coltsfoot	1	ns	ns	ns	1	**L+**	x		
Asteraceae	XANSTRU	*Xanthium strumarium*	clotbur	2	1	4	0	7	**L5**	x		
Balsaminaceae	IMPCAPE	*Impatiens capensis*	orange touch-me-not	1	2	0	2	5	**L5**	x		
Balsaminaceae	IMPPALL	*Impatiens pallida*	yellow touch-me-not	2	3	4	2	11	**L4**	xcf		
Berberidaceae	PODPELT	*Podophyllum peltatum*	May-apple	1	3	3	2	9	**L5**	x	x	
Betulaceae	ALNGLUT	*Alnus glutinosa*	European alder	1	ns	ns	ns	1	**L+**	xpn		
Betulaceae	ALNX	*Alnus glutinosa* x *incana* ssp. *rugosa*	hybrid European-speckled alder	3	ns	ns	ns	3	**L+**	xpr		
Betulaceae	BETALLE	*Betula alleghaniensis*	yellow birch	1	4	3	5	13	**L4**	xpn		
Betulaceae	BETNIGR	*Betula nigra*	river birch	5	ns	ns	ns	5	**L+**	xp		
Betulaceae	BETPAPY	*Betula papyrifera*	paper birch	1	4	2	4	11	**L4**	xp		
Betulaceae	BETPEND	*Betula pendula*	European white birch	2	ns	ns	ns	2	**L+**	xp		
Betulaceae	CARBETU	*Carpinus betulus*	European hornbeam	5	ns	ns	ns	5	**L+**	xpr		
Betulaceae	CARCARO	*Carpinus caroliniana* ssp. *virginiana*	blue beech	1	3	4	3	11	**L4**	x		
Betulaceae	OSTVIRG	*Ostrya virginiana*	ironwood	1	3	2	2	8	**L5**	x		
Bignoniaceae	CATSPEC	*Catalpa speciosa*	northern catalpa	3	ns	ns	ns	3	**L+**	x		
Boraginaceae	CYNOFFI	*Cynoglossum officinale*	hound's-tongue	1	ns	ns	ns	1	**L+**	x		
Boraginaceae	HACVIRG	*Hackelia virginiana*	Virginia stickseed	1	2	0	2	5	**L5**	x		
Boraginaceae	HYDCANE	*Hydrophyllum canadense*	Canada waterleaf	2	3	5	4	14	**L3**	x**(2021)**	x	x
Boraginaceae	HYDVIRG	*Hydrophyllum virginianum*	Virginia waterleaf	1	2	1	2	6	**L5**	x		
Boraginaceae	LITOFFI	*Lithospermum officinale*	Eurasian gromwell	1	ns	ns	ns	1	**L+**	x		
Brassicaceae	ALLPETI	*Alliaria petiolata*	garlic mustard	1	ns	ns	ns	1	**L+**	x		
Brassicaceae	BARVULG	*Barbarea vulgaris*	winter cress	1	ns	ns	ns	1	**L+**	x		
Brassicaceae	BRAJUNC	*Brassica juncea*	brown mustard	3	ns	ns	ns	3	**L+**	x		
Brassicaceae	CARCONC	*Cardamine concatenata*	cut-leaved toothwort	2	3	4	4	13	**L4**	x	x	
Brassicaceae	CARIMPA	*Cardamine impatiens*	balsam bitter cress	3	ns	ns	ns	3	**L+**	x		
Brassicaceae	CARXMAX	*Cardamine maxima*	hybrid toothwort	1	3	3	3	10	**L5**	x		
Brassicaceae	HESMATR	*Hesperis matronalis*	dame's rocket	1	ns	ns	ns	1	**L+**	x		
Brassicaceae	LEPCAMP	*Lepidium campestre*	field pepper-grass	1	ns	ns	ns	1	**L+**	x		
Brassicaceae	RORPAFE	*Rorippa palustris* ssp. *palustris*	Fernald's marsh cress	1	2	4	2	9	**L5**	x		
Brassicaceae	SISALTI	*Sisymbrium altissimum*	tumble mustard	3	ns	ns	ns	3	**L+**	x		
Brassicaceae	THLARVE	*Thlaspi arvense*	penny-cress	1	ns	ns	ns	1	**L+**	x		
Campanulaceae	CAMPERS	*Campanula persicifolia*	peach-leaved bellflower	3	ns	ns	ns	3	**L+**	x		
Campanulaceae	CAMRAPU	*Campanula rapunculoides*	creeping bellflower	1	ns	ns	ns	1	**L+**	x		
Cannabaceae	CELOCCI	*Celtis occidentalis*	hackberry	3	ns	ns	ns	3	**L+**	xpn		
Caprifoliaceae	DIPFULL	*Dipsacus fullonum*	teasel	1	ns	ns	ns	1	**L+**	x		
Caprifoliaceae	LONMAAC	*Lonicera maackii*	Amur honeysuckle	3	ns	ns	ns	3	**L+**	x		
Caprifoliaceae	LONMORR	*Lonicera morrowii*	Morrow's honeysuckle	1	ns	ns	ns	1	**L+**	x		
Caprifoliaceae	LONTATA	*Lonicera tatarica*	Tartarian honeysuckle	1	ns	ns	ns	1	**L+**	x		
Caprifoliaceae	LONXBEL	*Lonicera* x *bella*	shrub honeysuckle	1	ns	ns	ns	1	**L+**	x		
Caryophyllaceae	CERFONT	*Cerastium fontanum*	mouse-ear chickweed	1	ns	ns	ns	1	**L+**	x		
Caryophyllaceae	SAPOFFI	*Saponaria officinalis*	bouncing Bet	1	ns	ns	ns	1	**L+**	x		
Caryophyllaceae	SPEMEDI	*Spergularia media*	intermediate sand spurrey	3	ns	ns	ns	3	**L+**	x		
Celastraceae	EUOALAT	*Euonymus alatus*	winged spindle-tree	2	ns	ns	ns	2	**L+**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Celastraceae	EUOEURO	*Euonymus europaeus*	European spindle-tree	2	ns	ns	ns	2	**L+**	x		
Celastraceae	EUOOBOV	*Euonymus obovatus*	running strawberry-bush	2	4	4	4	14	**L3**	x		x
Ceratophyllaceae	CERDEME	*Ceratophyllum demersum*	coontail	1	3	5	3	12	**L4**	x		
Cleomaceae	CLEHASS	*Tarenaya hassleriana*	spiderflower	5	ns	ns	ns	5	**L+**	x		
Convolvulaceae	CALSEAM	*Calystegia sepium* ssp. *americana*	pink hedge bindweed	2	2	2	2	8	**L5**	x		
Convolvulaceae	CALSEAN	*Calystegia sepium* ssp. *angulata*	white hedge bindweed	3	2	2	2	9	**L5**	x		
Convolvulaceae	CONARVE	*Convolvulus arvensis*	field bindweed	1	ns	ns	ns	1	**L+**	x		
Cornaceae	CORALTE	*Cornus alternifolia*	alternate-leaved dogwood	1	2	1	2	6	**L5**	x		
Cornaceae	CORAMOM	*Cornus obliqua*	silky dogwood	2	3	5	3	13	**L4**	xp		
Cornaceae	CORFOEM	*Cornus racemosa*	grey dogwood	2	2	3	2	9	**L5**	xp		
Cornaceae	CORSTOL	*Cornus sericea*	red-osier dogwood	1	2	0	3	6	**L5**	xpn		
Cucurbitaceae	ECHLOBA	*Echinocystis lobata*	wild cucumber	1	2	3	1	7	**L5**	x		
Cupressaceae	JUNCHIN	*Juniperus chinensis*	Chinese juniper	3	ns	ns	ns	3	**L+**	x		
Cupressaceae	JUNVIRG	*Juniperus virginiana*	red cedar	1	2	4	3	10	**L5**	xp		
Cupressaceae	JUNXMED	*Juniperus* x *pfitzeriana*	pfitzer juniper	3	ns	ns	ns	3	**L+**	x		
Cupressaceae	THUOCCI	*Thuja occidentalis*	white cedar	1	4	0	5	10	**L5**	xp		
Cyperaceae	CARALBU	*Carex albursina*	white bear sedge	2	3	5	4	14	**L3**	x		
Cyperaceae	CARALOP	*Carex alopecoidea*	foxtail wood sedge	2	3	5	4	14	**L3**		x	
Cyperaceae	CARAURE	*Carex aurea*	golden-fruited sedge	1	2	4	4	11	**L4**	x		
Cyperaceae	CARBLAN	*Carex blanda*	common wood sedge	1	2	1	2	6	**L5**	x		
Cyperaceae	CARCRIS	*Carex cristatella*	crested sedge	1	2	4	1	8	**L5**	x		
Cyperaceae	CARTEEC	*Carex echinodes*	marsh straw sedge	2	3	2	3	10	**L5**	x		
Cyperaceae	CARGRAN	*Carex granularis*	meadow sedge	1	2	1	3	7	**L5**	x		
Cyperaceae	CARHYST	*Carex hystericina*	porcupine sedge	1	3	2	5	11	**L4**	x		
Cyperaceae	CARMOLE	*Carex molesta*	troublesome sedge	3	3	4	4	14	**L3**	x		
Cyperaceae	CARPELL	*Carex pellita*	woolly sedge	2	3	4	3	12	**L4**	x		
Cyperaceae	CARRADI	*Carex radiata*	straight-styled sedge	1	2	2	2	7	**L5**	x		
Cyperaceae	CARROSE	*Carex rosea*	curly-styled sedge	1	2	3	2	8	**L5**	x		
Cyperaceae	CARSPIC	*Carex spicata*	spiked sedge	1	ns	ns	ns	1	**L+**	x		
Cyperaceae	CARSTRI	*Carex stricta*	tussock sedge	2	3	3	4	12	**L4**	xpn		
Cyperaceae	CARVULP	*Carex vulpinoidea*	fox sedge	1	2	4	1	8	**L5**	x		
Cyperaceae	CYPBIPA	*Cyperus bipartitus*	two-parted umbrella-sedge	3	3	4	4	14	**L3**	x		
Cyperaceae	CYPESCU	*Cyperus esculentus*	yellow nut-sedge	2	ns	4	1	7	**L+?**	x		
Cyperaceae	ELEERYT	*Eleocharis erythropoda*	creeping spike-rush	1	2	4	1	8	**L5**	x		
Cyperaceae	SCIPUNG	*Schoenoplectus pungens* var. *pungens*	three-square	3	2	5	3	13	**L4**	x		
Cyperaceae	SCIVALI	*Schoenoplectus tabernaemontani*	soft-stemmed bulrush	1	2	5	3	11	**L4**	xpn		
Cyperaceae	SCIATRO	*Scirpus atrovirens*	black-fruited bulrush	1	2	4	2	9	**L5**	x		
Cyperaceae	SCIMICR	*Scirpus microcarpus*	barber-pole bulrush	1	2	4	3	10	**L5**	x		
Cyperaceae	SCIPEND	*Scirpus pendulus*	drooping bulrush	3	4	5	4	16	**L3**	xp		
Dryopteridaceae	DRYINTE	*Dryopteris intermedia*	evergreen wood fern	1	4	4	3	12	**L4**		x	x
Dryopteridaceae	DRYMARG	*Dryopteris marginalis*	marginal wood fern	1	3	3	4	11	**L4**		x	x
Dryopteridaceae	POLACRO	*Polystichum acrostichoides*	Christmas fern	2	3	5	3	13	**L4**	xp	xp	x
Elaeagnaceae	ELAANGU	*Elaeagnus angustifolia*	Russian olive	1	ns	ns	ns	1	**L+**	x		
Elaeagnaceae	ELAUMBE	*Elaeagnus umbellata*	autumn olive	1	ns	ns	ns	1	**L+**	x		
Elaeagnaceae	SHEARGE	*Shepherdia argentea*	silver buffalo-berry	5	ns	ns	ns	5	**L+**	xp		
Equisetaceae	EQUARVE	*Equisetum arvense*	field horsetail	1	2	1	1	5	**L5**	x		
Euphorbiaceae	ACAVIRG	*Acalypha rhomboidea*	three-seeded mercury	2	1	2	0	5	**L5**	x		
Euphorbiaceae	CHAMACU	*Euphorbia maculata*	spotted spurge	2	ns	ns	ns	2	**L+?**	x		
Euphorbiaceae	EUPMARG	*Euphorbia marginata*	snow-on-the-mountain	5	ns	ns	ns	5	**L+**	x		
Euphorbiaceae	EUPPEPL	*Euphorbia peplus*	petty spurge	4	ns	ns	ns	4	**L+**	x		
Fabaceae	AMOFRUT	*Amorpha fruticosa*	shrubby false indigo	3	ns	ns	ns	3	**L+**	xpr		
Fabaceae	AMPBRAC	*Amphicarpaea bracteata*	hog-peanut	1	2	2	2	7	**L5**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Fabaceae	CARARBO	*Caragana arborescens*	Siberian pea-shrub	2	ns	ns	ns	2	**L+**	xpn		
Fabaceae	DESCANA	*Desmodium canadense*	showy tick-trefoil	2	2	3	3	10	**L5**	xpr		
Fabaceae	LOTCORN	*Lotus corniculatus*	bird's foot trefoil	1	ns	ns	ns	1	**L+**	x		
Fabaceae	MEDLUPU	*Medicago lupulina*	black medick	1	ns	ns	ns	1	**L+**	x		
Fabaceae	MEDSASA	*Medicago sativa* ssp. *sativa*	alfalfa	1	ns	ns	ns	1	**L+**	x		
Fabaceae	MELALBA	*Melilotus albus*	white sweet clover	1	ns	ns	ns	1	**L+**	x		
Fabaceae	MELOFFI	*Melilotus officinalis*	yellow sweet clover	1	ns	ns	ns	1	**L+**	x		
Fabaceae	ROBPSEU	*Robinia pseudoacacia*	black locust	1	ns	ns	ns	1	**L+**	xpn		
Fabaceae	CORVARI	*Securigera varia*	crown vetch	1	ns	ns	ns	1	**L+**	x		
Fabaceae	TRIPRAT	*Trifolium pratense*	red clover	1	ns	ns	ns	1	**L+**	x		
Fabaceae	TRIREPE	*Trifolium repens*	white clover	1	ns	ns	ns	1	**L+**	x		
Fabaceae	VICCRAC	*Vicia cracca*	cow vetch	1	ns	ns	ns	1	**L+**	x		
Fagaceae	FAGGRAN	*Fagus grandifolia*	American beech	1	4	3	4	12	**L4**	xpn	x	
Fagaceae	FAGSYRI	*Fagus sylvatica* 'Riversii'	European beech 'Riversii'	5	ns	ns	ns	5	**L+**	xp		
Fagaceae	FAGSYRO	*Fagus sylvatica* 'Rohanii'	European beech 'Rohanii'	5	ns	ns	ns	5	**L+**	xp		
Fagaceae	QUEALBA	*Quercus alba*	white oak	3	5	4	5	17	**L2**	xp		
Fagaceae	QUEBICO	*Quercus bicolor*	swamp white oak	5	ns	ns	ns	5	**L+**	xp		
Fagaceae	QUEMACR	*Quercus macrocarpa*	bur oak	1	4	3	3	11	**L4**	xpn	x	
Fagaceae	QUEMUEH	*Quercus muehlenbergii*	chinquapin oak	5	ns	ns	ns	5	**L+**	xp		
Fagaceae	QUEPALU	*Quercus palustris*	pin oak	5	ns	ns	ns	5	**L+**	xp		
Fagaceae	QUEROBU	*Quercus robur*	English oak	3	ns	ns	ns	3	**L+**	xp		
Fagaceae	QUERUBR	*Quercus rubra*	red oak	1	4	1	5	11	**L4**	xpn		
Fagaceae	QUEXBIM	*Quercus x bimundorum*	English-white hybrid oak	5	ns	ns	ns	5	**L+**	xp		
Gentianaceae	CENPULC	*Centaurium pulchellum*	branching centaury	3	ns	ns	ns	3	**L+**	x		
Geraniaceae	GERMACU	*Geranium maculatum*	wild geranium	2	3	4	3	12	**L4**	xpn		
Geraniaceae	GERROBE	*Geranium robertianum*	herb Robert	1	ns	ns	ns	1	**L+?**	x		
Grossulariaceae	GINBILO	*Ginkgo biloba*	ginkgo	5	ns	ns	ns	5	**L+**	xp		
Grossulariaceae	RIBRUBR	*Ribes rubrum*	garden red currant	1	ns	ns	ns	1	**L+**	x		
Hypericaceae	HYPPERF	*Hypericum perforatum*	common St. John's-wort	1	ns	ns	ns	1	**L+**	x		
Iridaceae	IRIPSEU	*Iris pseudacorus*	yellow flag	2	ns	ns	ns	2	**L+**	x		
Iridaceae	IRIVIRG	*Iris virginica* var. *shrevei*	southern blue flag	4	2	4	3	13	**L4**	xpr		
Iridaceae	SISMONT	*Sisyrinchium montanum*	blue-eyed grass	2	3	3	5	13	**L4**			x
Juglandaceae	CARCORD	*Carya cordiformis*	bitternut hickory	1	4	4	2	11	**L4**	x	x	x
Juglandaceae	CAROVAT	*Carya ovata*	shagbark hickory	3	4	4	4	15	**L3**	x	x	x
Juglandaceae	JUGAILA	*Juglans ailantifolia*	Japanese walnut	3	ns	ns	ns	3	**L+**	xp		
Juglandaceae	JUGCINE	*Juglans cinerea*	butternut	1	5	4	4	14	**L3**	x		
Juglandaceae	JUGNIGR	*Juglans nigra*	black walnut	1	1	2	1	5	**L5**	x		
Juglandaceae	JUGREGI	*Juglans regia*	English walnut	5	ns	ns	ns	5	**L+**	xp		
Juncaceae	JUNARTI	*Juncus articulatus*	jointed rush	1	2	4	2	9	**L5**	xpn		
Juncaceae	JUNCOMP	*Juncus compressus*	round-fruited rush	2	ns	ns	ns	2	**L+**	x		
Juncaceae	JUNDUDL	*Juncus dudleyi*	Dudley's rush	1	2	3	1	7	**L5**	xpr		
Juncaceae	JUNEFFU	*Juncus effusus*	soft rush	1	2	4	3	10	**L5**	x		
Juncaceae	JUNTENU	*Juncus tenuis*	path rush	1	2	1	1	5	**L5**	x		
Juncaceae	JUNTORR	*Juncus torreyi*	Torrey's rush	2	2	4	2	10	**L5**	xpr		
Lamiaceae	AJUREPT	*Ajuga reptans*	common bugle	2	ns	ns	ns	2	**L+**	x		
Lamiaceae	GALTETR	*Galeopsis tetrahit*	hemp-nettle	2	ns	ns	ns	2	**L+**	x		
Lamiaceae	LAMGALE	*Lamiastrum galeobdolon*	golden archangel	3	ns	ns	ns	3	**L+**	x		
Lamiaceae	LEOCARD	*Leonurus cardiaca* ssp. *cardiaca*	motherwort	1	ns	ns	ns	1	**L+**	x		
Lamiaceae	LYCAMER	*Lycopus americanus*	cut-leaved water-horehound	1	4	3	3	11	**L4**	x		
Lamiaceae	LYCEURO	*Lycopus europaeus*	European water-horehound	1	ns	ns	ns	1	**L+**	x		
Lamiaceae	LYCUNIF	*Lycopus uniflorus*	northern water-horehound	1	3	2	3	9	**L5**	x		
Lamiaceae	MENARVE	*Mentha canadensis*	wild mint	1	2	2	2	7	**L5**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Lamiaceae	MENSPIC	*Mentha spicata*	spear mint	1	ns	ns	ns	1	**L+**	x		
Lamiaceae	MENXPIP	*Mentha* x *piperita*	peppermint	4	ns	ns	ns	4	**L+**	x		
Lamiaceae	MONFIST	*Monarda fistulosa*	wild bergamot	1	3	2	3	9	**L5**	xpn		
Lamiaceae	NEPCATA	*Nepeta cataria*	catnip	1	ns	ns	ns	1	**L+**	x		
Lamiaceae	ORIVULG	*Origanum vulgare*	wild marjoram	3	ns	ns	ns	3	**L+**	x		
Lamiaceae	PRUVULA	*Prunella vulgaris* ssp. *lanceolata*	heal-all (native)	1	2	2	2	7	**L5**	x		
Lamiaceae	PRUVUVU	*Prunella vulgaris* ssp. *vulgaris*	heal-all (European)	2	ns	ns	ns	2	**L+**	x		
Lamiaceae	TEUCACA	*Teucrium canadense*	wood-sage	3	3	3	4	13	**L4**	x		
Lamiaceae	THYPULE	*Thymus pulegioides*	broad-leaved thyme	5	ns	ns	ns	5	**L+**	x		
Lauraceae	LINBENZ	*Lindera benzoin*	spice-bush	4	5	4	4	17	**L2**	xp		
Liliaceae	ERYALBI	*Erythronium albidum*	white trout-lily	4	3	4	4	15	**L3**	x**(2021)**	x	
Liliaceae	ERYAMER	*Erythronium americanum* ssp. *americanum*	yellow trout-lily	1	3	2	2	8	**L5**	x		
Liliaceae	LILMICH	*Lilium michiganense*	Michigan lily	2	4	3	5	14	**L3**	x		
Lythraceae	LYTSALI	*Lythrum salicaria*	purple loosestrife	1	ns	ns	ns	1	**L+**	x		
Magnoliaceae	LIRTULI	*Liriodendron tulipifera*	tulip tree	5	ns	ns	ns	5	**L+**	xp		
Malvaceae	ABUTHEO	*Abutilon theophrasti*	velvet-leaf	2	ns	ns	ns	2	**L+**	x		
Malvaceae	ALTOFFI	*Althaea officinalis*	marsh mallow	5	ns	ns	ns	5	**L+**	x		
Malvaceae	TILAMER	*Tilia americana*	basswood	1	3	1	3	8	**L5**	xpn		
Malvaceae	TILCORD	*Tilia cordata*	little-leaf linden	2	ns	ns	ns	2	**L+**	xpn		
Marantaceae	THADEAL	*Thalia dealbata*	alligator flag	5	ns	ns	ns	5	**L+**	xp		
Melanthiaceae	TRICUNE	*Trillium cuneatum*	sweet toadshade trillium	5	ns	ns	ns	5	**L+**	xpr		
Melanthiaceae	TRIGRAN	*Trillium grandiflorum*	white trillium	1	3	3	5	12	**L4**	x	x	
Menispermaceae	MENCANA	*Menispermum canadense*	moonseed	2	4	4	4	14	**L3**			x
Montiaceae	CLAVIRG	*Claytonia virginica*	narrow-leaved spring beauty	2	4	4	5	15	**L3**	x	x	
Moraceae	MORALBA	*Morus alba*	white mulberry	1	ns	ns	ns	1	**L+**	x		
Nymphaeaceae	NUPVARI	*Nuphar variegata*	bullhead lily	3	4	5	3	15	**L3**	xp!		
Nymphaeaceae	NYM_SP	*Nymphaea* sp.	ornamental pink water-lily	ns	ns	ns	ns	0	**L+**	xp		
Oleaceae	FORXINT	*Forsythia* x *intermedia*	border forsythia	5	ns	ns	ns	5	**L+**	xpr		
Oleaceae	FRAAMER	*Fraxinus americana*	white ash	1	5	0	3	9	**L5**	x		
Oleaceae	FRAPENN	*Fraxinus pennsylvanica*	red ash	1	5	0	3	9	**L5**	xpn		
Oleaceae	LIGVULG	*Ligustrum vulgare*	privet	1	ns	ns	ns	1	**L+**	x		
Oleaceae	SYRRETI	*Syringa reticulata*	Japanese tree lilac	3	ns	ns	ns	3	**L+**	xpr		
Oleaceae	SYRVULG	*Syringa vulgaris*	common lilac	1	ns	ns	ns	1	**L+**	x		
Onagraceae	CIRLUTE	*Circaea canadensis* ssp. *canadensis*	enchanter's nightshade	1	1	1	1	4	**L5**	x		
Onagraceae	OENBIEN	*Oenothera biennis*	common evening-primrose	1	1	1	1	4	**L5**	xpn		
Onocleaceae	MATSTRU	*Matteuccia struthiopteris* var. *pensylvanica*	ostrich fern	1	2	1	2	6	**L5**	xpn		
Onocleaceae	ONOSENS	*Onoclea sensibilis*	sensitive fern	1	3	1	3	8	**L5**	x		
Orchidaceae	CYPCAPA	*Cypripedium parviflorum* var. *makasin*	smaller yellow lady's-slipper	2	4	4	5	15	**L3**	x		
Orchidaceae	EPIHELL	*Epipactis helleborine*	helleborine	1	ns	ns	ns	1	**L+**	x		
Oxalidaceae	OXASTRI	*Oxalis stricta*	common yellow wood-sorrel	1	1	1	1	4	**L5**	x		
Papaveraceae	SANCANG	*Sanguinaria canadensis*	bloodroot	1	3	2	3	9	**L5**	x		x
Pinaceae	ABICONC	*Abies concolor*	Rocky Mountain white fir	5	ns	ns	ns	5	**L+**	xp		
Pinaceae	ABIFRAS	*Abies fraseri*	fraser fir	5	ns	ns	ns	5	**L+**	xp		
Pinaceae	LARDECI	*Larix decidua*	European larch	3	ns	ns	ns	3	**L+**	xp		
Pinaceae	LARLARI	*Larix laricina*	tamarack	2	4	4	4	14	**L3**	xp		
Pinaceae	PICABIE	*Picea abies*	Norway spruce	2	ns	ns	ns	2	**L+**	xp		
Pinaceae	PICGLAU	*Picea glauca*	white spruce	2	5	4	4	15	**L3**	xp		
Pinaceae	PICPUNG	*Picea pungens*	Colorado spruce	5	ns	ns	ns	5	**L+**	xp		
Pinaceae	PINBANK	*Pinus banksiana*	Jack pine	5	ns	ns	ns	5	**L+**	xp		
Pinaceae	PINMUGO	*Pinus mugo*	mugo pine	5	ns	ns	ns	5	**L+**	xp		
Pinaceae	PINNIGR	*Pinus nigra*	Austrian pine	3	ns	ns	ns	3	**L+**	xp		
Pinaceae	PINRESI	*Pinus resinosa*	red pine	4	5	5	5	19	**L1**	xp		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Pinaceae	PINSTRO	*Pinus strobus*	white pine	1	4	3	4	12	**L4**	xp	xp	
Pinaceae	PINSYLV	*Pinus sylvestris*	Scots pine	1	ns	ns	ns	1	**L+**	xp		
Pinaceae	TSUCANA	*Tsuga canadensis*	eastern hemlock	1	4	3	5	13	**L4**	xp		
Plantaginaceae	CHAMINU	*Chaenorhinum minus* ssp. *minus*	dwarf snapdragon	2	ns	ns	ns	2	**L+**	x		
Plantaginaceae	CHEGLAB	*Chelone glabra*	white turtlehead	2	3	4	5	14	**L3**	x		x
Plantaginaceae	PLALANC	*Plantago lanceolata*	English plantain	1	ns	ns	ns	1	**L+**	x		
Plantaginaceae	PLAMAJO	*Plantago major*	common plantain	1	ns	ns	ns	1	**L+**	x		
Plantaginaceae	PLARUGE	*Plantago rugelii*	red-stemmed plantain	1	2	0	1	4	**L5**	x		
Plantaginaceae	VERARVE	*Veronica arvensis*	corn speedwell	2	ns	ns	ns	2	**L+**	x		
Plantaginaceae	VERSERP	*Veronica serpyllifolia*	thyme-leaved speedwell	1	ns	ns	ns	1	**L+**	x		
Platanaceae	PLAXACE	*Platanus* x *hispanica*	London plane tree	4	ns	ns	ns	4	**L+**	xp		
Poaceae	AGRGIGA	*Agrostis gigantea*	redtop	1	ns	ns	ns	1	**L+**	x		
Poaceae	AGRSTOL	*Agrostis stolonifera*	creeping bent grass	1	ns	ns	ns	1	**L+?**	x		
Poaceae	ALOPRAT	*Alopecurus pratensis*	meadow foxtail	2	ns	ns	ns	2	**L+**	x		
Poaceae	ANDGERA	*Andropogon gerardi*	big bluestem	4	3	4	4	15	**L3**	xpr		
Poaceae	BROININ	*Bromus inermis*	smooth brome grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	BROJAPO	*Bromus japonicus*	Japanese chess	3	ns	ns	ns	3	**L+**	x		
Poaceae	CALCANA	*Calamagrostis canadensis*	Canada blue-joint	2	3	4	4	13	**L4**	xpn		
Poaceae	DACGLOM	*Dactylis glomerata*	orchard grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	DANSPIC	*Danthonia spicata*	poverty oat grass	2	3	3	4	12	**L4**	x		x
Poaceae	PANACAC	*Dichanthelium implicatum*	hairy panic grass	2	3	3	3	11	**L4**	x		
Poaceae	DIGISCH	*Digitaria ischaemum*	smooth crab grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	ECHCRUS	*Echinochloa crus-galli*	barnyard grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	ECHMICR	*Echinochloa muricata* var. *microstachya*	small-spiked barnyard grass	2	2	4	0	8	**L5**	x		
Poaceae	ELYCANA	*Elymus canadensis*	Canada wild rye	3	2	5	3	13	**L4**	xp		
Poaceae	ELYREPE	*Elymus repens*	quack grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	ELYVIRG	*Elymus virginicus* var. *virginicus*	Virginia wild rye	2	2	3	2	9	**L5**	x		
Poaceae	ERAMINO	*Eragrostis minor*	little love grass	2	ns	ns	ns	2	**L+**	x		
Poaceae	FESRUBR	*Festuca rubra* ssp. *rubra*	red fescue	1	ns	ns	ns	1	**L+**	x		
Poaceae	FESTRAC	*Festuca trachyphylla*	hard fescue	3	ns	ns	ns	3	**L+**	x		
Poaceae	GLYGRAN	*Glyceria grandis*	tall manna grass	1	3	4	2	10	**L5**	x		
Poaceae	HORJUBA	*Hordeum jubatum* ssp. *jubatum*	squirrel-tail barley	2	ns	ns	ns	2	**L+**	x		
Poaceae	LEEORYZ	*Leersia oryzoides*	rice cut grass	1	2	2	2	7	**L5**	x		
Poaceae	LEEVIRG	*Leersia virginica*	white grass	2	2	4	3	11	**L4**	x	x	x
Poaceae	FESARUN	*Lolium arundinaceum*	tall fescue	2	ns	ns	ns	2	**L+**	x		
Poaceae	LOLPERE	*Lolium perenne*	perennial rye	1	ns	ns	ns	1	**L+**	x		
Poaceae	FESPRAT	*Lolium pratense*	meadow fescue	1	ns	ns	ns	1	**L+**	x		
Poaceae	MISSACC	*Miscanthus sacchariflorus*	eulalia	3	ns	ns	ns	3	**L+**	x		
Poaceae	MUHFRON	*Muhlenbergia frondosa*	wire-stemmed muhly grass	4	2	4	2	12	**L4**	x		
Poaceae	MUHMEFI	*Muhlenbergia mexicana* var. *filiformis*	slender muhly grass	3	2	0	2	7	**L5**	x		
Poaceae	ORYASPE	*Oryzopsis asperifolia*	white-fruited mountain-rice	2	4	3	4	13	**L4**		x	
Poaceae	PANCAPI	*Panicum capillare*	panic grass	1	1	4	1	7	**L5**	x		
Poaceae	PANDICF	*Panicum dichotomiflorum*	fall panic grass	2	ns	ns	ns	2	**L+**	x		
Poaceae	PANVIRG	*Panicum virgatum*	switch grass	4	2	5	5	16	**L3**	xpr		
Poaceae	PHAARUN	*Phalaris arundinacea*	reed canary grass	1	ns	ns	ns	1	**L+?**	x		
Poaceae	PHLPRAT	*Phleum pratense*	Timothy grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	PHRAUST	*Phragmites australis* ssp. *australis*	common reed	1	ns	ns	ns	1	**L+**	x		
Poaceae	POACOMP	*Poa compressa*	flat-stemmed blue grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	POANEMO	*Poa nemoralis*	woodland spear grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	POAPALU	*Poa palustris*	fowl meadow-grass	1	2	3	2	8	**L5**	x		
Poaceae	POAPRAT	*Poa pratensis* ssp. *pratensis*	Kentucky blue grass	1	ns	ns	ns	1	**L+**	x		
Poaceae	PUCDIST	*Puccinellia distans*	alkali grass	2	ns	ns	ns	2	**L+**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Poaceae	SETFABE	*Setaria faberi*	giant foxtail	2	ns	ns	ns	2	**L+**	x		
Poaceae	SETITAL	*Setaria italica*	foxtail millet	3	ns	ns	ns	3	**L+**	x		
Poaceae	SETGLAU	*Setaria pumila*	yellow foxtail	1	ns	ns	ns	1	**L+**	x		
Poaceae	SETVIRI	*Setaria viridis*	green foxtail	1	ns	ns	ns	1	**L+**	x		
Poaceae	SORNUTA	*Sorghastrum nutans*	Indian grass	5	4	5	4	18	**L2**	xpr		
Polygonaceae	POLLAPA	*Persicaria lapathifolia*	pale smartweed	1	1	4	0	6	**L5**	x		
Polygonaceae	POLPERS	*Persicaria maculosa*	lady's thumb	1	ns	ns	ns	1	**L+**	x		
Polygonaceae	POLPENS	*Persicaria pensylvanica*	Pennsylvania smartweed	2	2	4	3	11	**L4**	x		
Polygonaceae	POLACHO	*Polygonum achoreum*	striate knotweed	2	ns	ns	ns	2	**L+**	x		
Polygonaceae	POLAVIC	*Polygonum aviculare* ssp. *aviculare*	prostrate knotweed	1	ns	ns	ns	1	**L+**	x		
Polygonaceae	RUMCRIS	*Rumex crispus*	curly dock	1	ns	ns	ns	1	**L+**	x		
Pontederiaceae	PONCORD	*Pontederia cordata*	pickerel-weed	4	4	5	4	17	**L2**	xp		
Portulacaceae	POROLER	*Portulaca oleracea*	purslane	2	ns	ns	ns	2	**L+**	x		
Potamogetonaceae	POTFOLI	*Potamogeton foliosus*	leafy pondweed	1	3	5	4	13	**L4**	x		
Potamogetonaceae	POTPECT	*Stuckenia pectinata*	sago pondweed	1	2	5	3	11	**L4**	x		
Primulaceae	ANAARVE	*Lysimachia arvensis*	scarlet pimpernel	2	ns	ns	ns	2	**L+**	x		
Primulaceae	LYSCILI	*Lysimachia ciliata*	fringed loosestrife	1	2	2	2	7	**L5**	x		
Pteridaceae	ADIPEDA	*Adiantum pedatum*	northern maidenhair fern	2	3	5	5	15	**L3**		xp	xp
Ranunculaceae	ACTPACH	*Actaea pachypoda*	white baneberry	1	3	3	3	10	**L5**	x	x	x
Ranunculaceae	ACTRUBR	*Actaea rubra* ssp. *rubra*	red baneberry	1	3	1	3	8	**L5**	x		x
Ranunculaceae	ANECANA	*Anemonastrum canadense*	Canada anemone	1	2	2	2	7	**L5**	x		
Ranunculaceae	ANEQUIN	*Anemone quinquefolia* var. *quinquefolia*	wood anemone	2	4	3	5	14	**L3**	x		
Ranunculaceae	ANEVIRG	*Anemone virginiana*	common thimbleweed	1	3	0	3	7	**L5**	x		
Ranunculaceae	CLEVIRG	*Clematis virginiana*	virgin's bower	1	2	2	3	8	**L5**	x		
Ranunculaceae	RANFICA	*Ficaria verna*	lesser celandine	4	ns	ns	ns	4	**L+**	x		
Ranunculaceae	RANABOR	*Ranunculus abortivus*	kidney-leaved buttercup	1	3	1	2	7	**L5**	x		
Ranunculaceae	RANACRI	*Ranunculus acris*	tall buttercup	1	ns	ns	ns	1	**L+**	x		
Ranunculaceae	RANREPE	*Ranunculus repens*	creeping buttercup	1	ns	ns	ns	1	**L+**	x		
Ranunculaceae	RANSCEL	*Ranunculus sceleratus* var. *sceleratus*	cursed crowfoot	1	2	3	2	8	**L+?**	x		
Ranunculaceae	THADIOI	*Thalictrum dioicum*	early meadow rue	1	3	3	2	9	**L5**	x		
Ranunculaceae	THAPUBE	*Thalictrum pubescens*	tall meadow rue	1	3	2	2	8	**L5**	x		
Rhamnaceae	RHACATH	*Rhamnus cathartica*	common buckthorn	1	ns	ns	ns	1	**L+**	x		
Rosaceae	AGRGRYP	*Agrimonia gryposepala*	agrimony	1	2	0	2	5	**L5**	x		
Rosaceae	AMEARBO	*Amelanchier arborea*	downy serviceberry	1	3	4	3	11	**L4**	x		
Rosaceae	AMEXINT	*Amelanchier interior*	serviceberry complex	2	3	3	3	11	**L4**	x		
Rosaceae	AMELAEV	*Amelanchier laevis*	smooth serviceberry	1	2	4	3	10	**L5**	xpn		
Rosaceae	AMEXGRA	*Amelanchier* x *grandiflora*	showy serviceberry	5	2	4	2	13	**L4**	xp		
Rosaceae	CRAPEDI	*Crataegus coccinea* var. *coccinea*	scarlet hawthorn	2	2	3	3	10	**L5**	xcf		
Rosaceae	CRAPRIN	*Crataegus coccinea* var. *pringlei*	Pringle's hawthorn	2	3	4	3	12	**L4**	x		
Rosaceae	CRAHOLM	*Crataegus holmesiana*	Holmes' hawthorn	2	3	4	3	12	**L4**	xcf		
Rosaceae	CRAMACA	*Crataegus macracantha*	long-spined hawthorn	1	2	4	3	10	**L5**	x		
Rosaceae	CRAMONO	*Crataegus monogyna*	English hawthorn	1	1	4	ns	6	**L+**	x		
Rosaceae	CRAPUNC	*Crataegus punctata*	dotted hawthorn	1	2	3	3	9	**L5**	x		
Rosaceae	CRA_SP	*Crataegus* sp.	unidentified hawthorn (photo & specimen	ns	ns	ns	ns	ns	**L5**	x		
Rosaceae	CRASUBM	*Crataegus submollis*	Emerson's hawthorn	2	3	4	3	12	**L4**	x		
Rosaceae	POTFRUT	*Dasiphora fruticosa*	shrubby cinquefoil	5	ns	ns	ns	5	**L+**	xp		
Rosaceae	FRAVIGL	*Fragaria virginiana* ssp. *glauca*	blue-leaved wild strawberry	2	2	0	2	6	**L5**	x		
Rosaceae	FRAVIVI	*Fragaria virginiana* ssp. *virginiana*	common wild strawberry	1	2	0	2	5	**L5**	x		
Rosaceae	GEUCANA	*Geum canadense*	white avens	1	2	1	2	6	**L5**	x		
Rosaceae	GEULACI	*Geum laciniatum*	cut-leaved avens	3	3	4	2	12	**L4**	x		
Rosaceae	GEUURBA	*Geum urbanum*	urban avens	1	ns	ns	ns	1	**L+**	x		
Rosaceae	GEUXCAT	*Geum* x *catlingii*	hybrid avens	5	ns	ns	ns	5	**L+**	x		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Rosaceae	MALPUMI	*Malus pumila*	apple	1	ns	ns	ns	1	**L+**	x		
Rosaceae	PYRSIEB	*Malus toringo*	Toringo crab-apple	4	ns	ns	ns	4	**L+**	x		
Rosaceae	PHYOPUL	*Physocarpus opulifolius*	ninebark	3	2	5	4	14	**L3**	xp		
Rosaceae	POTANSE	*Potentilla anserina* ssp. *anserina*	silverweed	2	2	3	2	9	**L5**	x		
Rosaceae	DUCINDI	*Potentilla indica* var. *indica*	mock strawberry	4	ns	ns	ns	4	**L+**	x		
Rosaceae	POTRECT	*Potentilla recta*	sulphur cinquefoil	1	ns	ns	ns	1	**L+**	x		
Rosaceae	POTREPT	*Potentilla reptans* 'Pleniflora'	royal cinquefoil	5	ns	ns	ns	5	**L+**	xpr		
Rosaceae	PRUAVIU	*Prunus avium*	mazzard cherry	2	ns	ns	ns	2	**L+**	x		
Rosaceae	PRUNIGR	*Prunus nigra*	Canada plum	2	4	4	4	14	**L3**	x		x
Rosaceae	PRUSERO	*Prunus serotina*	black cherry	1	2	0	2	5	**L5**	x		
Rosaceae	PRUVIRG	*Prunus virginiana* var. *virginiana*	choke cherry	1	2	0	1	4	**L5**	x		
Rosaceae	PYRCOMM	*Pyrus communis*	pear	1	ns	ns	ns	1	**L+**	x		
Rosaceae	ROSACIC	*Rosa acicularis*	prickly wild rose	5	ns	ns	ns	5	**L+**	xp!		
Rosaceae	ROSCANI	*Rosa canina*	dog rose	2	ns	ns	ns	2	**L+**	x		
Rosaceae	ROSCARO	*Rosa carolina*	pasture rose	5	5	4	3	17	**L2**	xp		
Rosaceae	ROSGLAU	*Rosa glauca*	red-leaved rose	4	ns	ns	ns	4	**L+**	xp		
Rosaceae	ROSMULT	*Rosa multiflora*	multiflora rose	1	ns	ns	ns	1	**L+**	xpn		
Rosaceae	ROSRUBI	*Rosa rubiginosa* var. *rubiginosa*	sweet brier rose	3	ns	ns	ns	3	**L+**	x		
Rosaceae	ROSVIRG	*Rosa virginiana*	Virginia rose	3	ns	ns	ns	3	**L+?**	xp		
Rosaceae	RUBALLE	*Rubus allegheniensis*	common blackberry	1	3	0	1	5	**L5**	x		
Rosaceae	RUBIDME	*Rubus idaeus* ssp. *strigosus*	wild red raspberry	1	1	0	1	3	**L5**	x		
Rosaceae	RUBOCCI	*Rubus occidentalis*	wild black raspberry	1	1	0	1	3	**L5**	x		
Rosaceae	RUBODOR	*Rubus odoratus*	purple-flowering raspberry	1	2	2	2	7	**L5**	xp		
Rosaceae	SPIALBA	*Spiraea alba*	wild spiraea	2	4	2	3	11	**L4**	xpr		
Rubiaceae	CEPOCCI	*Cephalanthus occidentalis*	buttonbush	4	4	4	3	15	**L3**	xp		
Rubiaceae	GALAPAR	*Galium aparine*	cleavers	1	1	1	2	5	**L5**	x		
Rubiaceae	GALMOLL	*Galium mollugo*	white bedstraw	1	ns	ns	ns	1	**L+**	x		
Rubiaceae	GALODOR	*Galium odoratum*	sweet woodruff	3	ns	ns	ns	3	**L+**	x		
Rubiaceae	GALPALU	*Galium palustre*	marsh bedstraw	1	2	3	3	9	**L5**	x		
Rubiaceae	GALVERU	*Galium verum*	yellow bedstraw	2	ns	ns	ns	2	**L+**	x		
Salicaceae	POPALBA	*Populus alba*	white poplar	1	ns	ns	ns	1	**L+**	xpr		
Salicaceae	POPBALS	*Populus balsamifera*	balsam poplar	1	2	2	2	7	**L5**	xpn		
Salicaceae	POPDELT	*Populus deltoides*	cottonwood	1	1	3	1	6	**L5**	x	x	
Salicaceae	POPGRAN	*Populus grandidentata*	large-toothed aspen	1	3	4	3	11	**L4**	xp		
Salicaceae	POPNIIT	*Populus nigra* 'Italica'	Lombardy poplar	5	ns	ns	ns	5	**L+**	xp		
Salicaceae	POPTREM	*Populus tremuloides*	trembling aspen	1	3	1	3	8	**L5**	xpr		
Salicaceae	POPXCAN	*Populus* x *canadensis*	Carolina poplar	1	ns	ns	ns	1	**L+**	xpr		
Salicaceae	POPXJAC	*Populus* x *jackii*	Jack's poplar	3	2	5	1	11	**L4**	x		
Salicaceae	SALALBA	*Salix alba*	white willow	1	ns	ns	ns	1	**L+**	x		
Salicaceae	SALAMYG	*Salix amygdaloides*	peach-leaved willow	1	2	5	3	11	**L4**	xpn		
Salicaceae	SALCINE	*Salix cinerea*	grey willow	4	ns	ns	ns	4	**L+**	xp		
Salicaceae	SALDISC	*Salix discolor*	pussy willow	1	3	4	3	11	**L4**	xp		
Salicaceae	SALERIO	*Salix eriocephala*	narrow heart-leaved willow	1	1	3	1	6	**L5**	x		
Salicaceae	SALEXIG	*Salix interior*	sandbar willow	1	1	5	2	9	**L5**	x		
Salicaceae	SALMATS	*Salix matsudana*	corkscrew willow	3	ns	ns	ns	3	**L+**	xpr		
Salicaceae	SALNIGR	*Salix nigra*	black willow	3	2	5	4	14	**L3**	x		
Salicaceae	SALPETI	*Salix petiolaris*	slender willow	2	3	5	3	13	**L4**	x		
Salicaceae	SALPURP	*Salix purpurea*	purple-osier willow	2	ns	ns	ns	2	**L+**	x		
Salicaceae	SALVIMI	*Salix viminalis*	basket willow	4	ns	ns	ns	4	**L+**	xp		
Salicaceae	SALXRUB	*Salix* x *fragilis*	crack willow	1	ns	ns	ns	1	**L+**	x		
Salicaceae	SALXSEP	*Salix* x *sepulcralis*	weeping willow	1	ns	ns	ns	1	**L+**	xpn		
Sapindaceae	ACECAMP	*Acer campestre*	hedge maple	4	ns	ns	ns	4	**L+**	xp		

Appendix 2: Flora Species for Humber Arboretum (2000-2020)

Family	Sp_code	Scientific Name	Common Name	Local Occur 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (Apr-20)	2020 survey	2008 ESA study	2000 ELC
Sapindaceae	ACEJAPO	*Acer japonicum*	Japanese maple	5	ns	ns	ns	5	**L+**	xp		
Sapindaceae	ACENEGU	*Acer negundo*	Manitoba maple	1	ns	ns	ns	1	**L+?**	x		
Sapindaceae	ACESANI	*Acer nigrum*	black maple	2	3	4	2	11	**L4**	x	x	x
Sapindaceae	ACEPLAT	*Acer platanoides*	Norway maple	1	ns	ns	ns	1	**L+**	xpn		
Sapindaceae	ACERUBR	*Acer rubrum*	red maple	1	4	1	5	11	**L4**	xp		
Sapindaceae	ACESACI	*Acer saccharinum*	silver maple	1	2	5	3	11	**L4**	xpn		
Sapindaceae	ACESASA	*Acer saccharum*	sugar maple	1	3	0	2	6	**L5**	xpn		
Sapindaceae	ACEGINN	*Acer tataricum* ssp. *ginnala*	Amur maple	2	ns	ns	ns	2	**L+**	xp		
Sapindaceae	ACEXFRE	*Acer* x *freemanii*	hybrid swamp maple	2	3	5	2	12	**L4**	xp		
Sapindaceae	AESGLAB	*Aesculus glabra*	Ohio buckeye	3	ns	ns	ns	3	**L+**	xpr		
Sapindaceae	AESHIPP	*Aesculus hippocastanum*	horse-chestnut	1	ns	ns	ns	1	**L+**	xp		
Scrophulariaceae	VERBLAT	*Verbascum blattaria*	moth mullein	4	ns	ns	ns	4	**L+**	x		
Scrophulariaceae	VERTHAP	*Verbascum thapsus*	common mullein	1	ns	ns	ns	1	**L+**	x		
Simaroubaceae	AILALTI	*Ailanthus altissima*	tree-of-heaven	2	ns	ns	ns	2	**L+**	x		
Solanaceae	DATWRIG	*Datura innoxia*	big-flowered jimsonweed	4	ns	ns	ns	4	**L+**	x		
Solanaceae	DATSTRA	*Datura stramonium*	jimsonweed	5	ns	ns	ns	5	**L+**	x		
Solanaceae	PHYHETE	*Physalis heterophylla*	clammy ground-cherry	2	2	3	3	10	**L5**	x		x
Solanaceae	SOLDULC	*Solanum dulcamara*	bittersweet nightshade	1	ns	ns	ns	1	**L+**	x		
Staphyleaceae	STATRIF	*Staphylea trifolia*	bladdernut	4	3	4	4	15	**L3**	xpr		
Thelypteridaceae	THEPALU	*Thelypteris palustris* var. *pubescens*	marsh fern	1	4	2	4	11	**L4**	xpr		
Typhaceae	TYPANGU	*Typha angustifolia*	narrow-leaved cattail	1	ns	ns	ns	1	**L+**	x		
Typhaceae	TYPLATI	*Typha latifolia*	broad-leaved cattail	1	4	4	4	13	**L4**	x		
Typhaceae	TYPXGLA	*Typha* x *glauca*	hybrid cattail	1	ns	ns	ns	1	**L+**	x		
Ulmaceae	ULMAMER	*Ulmus americana*	white elm	1	4	0	2	7	**L5**	x		
Ulmaceae	ULMGLAB	*Ulmus glabra*	Scotch elm	2	ns	ns	ns	2	**L+**	x		
Ulmaceae	ULMPUMI	*Ulmus pumila*	Siberian elm	1	ns	ns	ns	1	**L+**	x		
Ulmaceae	ZELCARP	*Zelkova carpinifolia*	zelkova	5	ns	ns	ns	5	**L+**	xpr		
Urticaceae	BOECYLI	*Boehmeria cylindrica*	false nettle	2	4	3	2	11	**L4**	x	x	
Urticaceae	PILPUMI	*Pilea pumila*	dwarf clearweed	1	2	0	1	4	**L5**	x		
Urticaceae	URTDIDI	*Urtica dioica* ssp. *dioica*	European stinging nettle	1	ns	ns	ns	1	**L+**	x		
Urticaceae	URTDIGR	*Urtica dioica* ssp. *gracilis*	American stinging nettle	1	3	1	2	7	**L5**	x		
Verbenaceae	VERBONA	*Verbena bonariensis*	cluster-top vervain	5	ns	ns	ns	5	**L+**	x		
Verbenaceae	VERHAST	*Verbena hastata*	blue vervain	1	2	4	2	9	**L5**	x		
Verbenaceae	VERURTI	*Verbena urticifolia*	white vervain	1	2	2	2	7	**L5**	x		
Violaceae	VIOAFFI	*Viola affinis*	Le Conte's violet	2	4	4	3	13	**L4**	x		
Violaceae	VIOPUSC	*Viola pubescens* var. *scabriuscula*	smooth yellow violet	2	4	1	2	9	**L5**	x		
Violaceae	VIOSORO	*Viola sororia*	common blue violet	1	2	0	2	5	**L5**	x		
Vitaceae	PARINSE	*Parthenocissus vitacea*	thicket creeper	1	2	0	1	4	**L5**	x		
Vitaceae	VITRIPA	*Vitis riparia*	riverbank grape	1	1	0	0	2	**L5**	x		
Woodsiaceae	ATHFILI	*Athyrium filix-femina* var. *angustum*	northeastern lady fern	1	3	1	3	8	**L5**	xp		x
Xanthorrhoeaceae	HEMFULV	*Hemerocallis fulva*	orange day-lily	1	ns	ns	ns	1	**L+**	x		

Legend

L1-L3: species of regional conservation concern	ns: criterion not scored
L4: species of conservation concern in urban area	!: 2019 iNaturalist record
L5: species not of conservation concern at this time	cf: identification not certain
LX: species is extirpated from TRCA	p: planted only
L+: introduced species, not native to TRCA	pr: regenerating but of planted origin
L+?: species is probably introduced	pn: both natural origin and planted

Appendix 3: Fauna List with Ranks and Scores for Humber Arboretum.

Survey Species: species for which the TRCA protocol effectively surveys.

Common Name	Scientific Name	Code	pre-2011	max status	2020	max status	LO	PTn	PTt	AS	PIS	StD	HD	+	TS	L-Rank	comments
Birds																	
black-billed cuckoo	*Coccyzus erythropthalmus*	BBCU			1	PO	1	3	3	3	1	3	3	0	17	**L3**	
wood thrush	*Hylocichla mustelina*	WOTH	2	PO			0	4	2	3	2	4	2	0	17	**L3**	
American redstart	*Setophaga ruticilla*	AMRE			11	PR	0	3	1	3	1	4	2	0	14	**L4**	
barn swallow	*Hirundo rustica*	BARS	1	PO			0	4	2	1	1	1	2	0	11	**L4**	
belted kingfisher	*Ceryle alcyon*	BEKI	1	PO			0	3	2	2	1	2	2	0	12	**L4**	
blue-grey gnatcatcher	*Polioptila caerulea*	BGGN			6	CO	0	1	1	3	1	3	1	0	10	**L4**	
common yellowthroat	*Geothlypis trichas*	COYE			2	PO	0	4	2	1	2	4	1	0	14	**L4**	
Cooper's hawk	*Accipiter cooperii*	COHA			1	CO	0	2	2	4	1	2	3	0	14	**L4**	
eastern kingbird	*Tyrannus tyrannus*	EAKI	(1)	PO	5	PR	0	4	2	2	1	3	1	0	13	**L4**	
great-crested flycatcher	*Myiarchus crinitus*	GCFL			2	PR	0	2	1	3	1	2	2	0	11	**L4**	
grey catbird	*Dumetella carolinensis*	GRCA	(1)	PO	33	CO	0	2	2	1	1	3	1	0	10	**L4**	
hairy woodpecker	*Picoides villosus*	HAWO			2	PR	0	2	2	3	1	2	2	0	12	**L4**	
indigo bunting	*Passerina cyanea*	INBU			3	PR	0	3	2	1	1	4	2	0	13	**L4**	
killdeer	*Charadrius vociferus*	KILL	(1)	PO	2	PO	0	4	3	1	2	2	0	0	12	**L4**	
northern flicker	*Colaptes auratus*	NOFL			1	PR	0	4	2	1	1	3	2	0	13	**L4**	
northern rough-winged swallow	*Stelgidopteryx serripennis*	NRWS			2	PO	0	3	2	1	1	2	3	0	12	**L4**	
red-eyed vireo	*Vireo olivaceus*	REVI			6	PR	0	1	2	2	1	3	1	0	10	**L4**	
rose-breasted grosbeak	*Pheucticus ludovicianus*	RBGR			1	PO	0	3	2	3	1	3	2	0	14	**L4**	
spotted sandpiper	*Actitis macularius*	SPSA			3	PO	0	3	2	1	2	4	1	0	13	**L4**	
swamp sparrow	*Melospiza georgiana*	SWSP			3	PR	0	1	2	1	2	5	1	1	13	**L4**	
tree swallow	*Tachycineta bicolor*	TRES	1	PO	4	CO	0	4	2	1	1	2	2	0	12	**L4**	nest boxes
willow flycatcher	*Empidonax traillii*	WIFL			7	PR	0	4	3	1	1	3	1	0	13	**L4**	
American Crow	*Corvus brachyrhynchos*	AMCR	x	PO	x	CO	0	2	3	1	1	0	0	0	7	**L5**	
American goldfinch	*Spinus tristis*	AMGO	x	PO	x	PR	0	3	1	1	1	1	0	0	7	**L5**	
American robin	*Turdus migratorius*	AMRO	x	PO	x	CO	0	1	1	1	1	1	0	0	5	**L5**	
Baltimore oriole	*Icterus galbula*	BAOR	x	PR	x	PR	0	4	1	1	1	1	0	0	8	**L5**	
black-capped chickadee	*Parus atricapillus*	BCCH	x	PO	x	PR	0	1	1	1	1	1	0	0	5	**L5**	
blue jay	*Cyanocitta cristata*	BLJA	x	PO	x	CO	0	3	2	1	1	1	0	0	8	**L5**	
brown-headed cowbird	*Molothrus ater*	BHCO	x	PO	x	CO	0	3	1	1	1	1	0	0	7	**L5**	
Canada goose	*Branta canadensis*	CANG			x	CO	0	0	3	1	2	0	1	0	7	**L5**	
cedar waxwing	*Bombycilla cedrorum*	CEDW	x	PO	x	PR	0	2	2	1	1	1	0	0	7	**L5**	
chipping sparrow	*Spizella passerina*	CHSP			x	PO	0	3	1	1	1	2	0	0	8	**L5**	
cliff swallow	*Petrochelidon pyrrhonota*	CLSW			15n	CO	0	1	1	1	1	1	2	0	7	**L5**	
common grackle	*Quiscalus quiscula*	COGR	x	PO	x	PR	0	4	1	1	1	1	0	0	8	**L5**	

Appendix 3: Fauna List with Ranks and Scores for Humber Arboretum.

Common Name	Scientific Name	Code	pre-2011	max status	2020	max status	LO	PTn	PTt	AS	PIS	StD	HD	+	TS	L-Rank	comments
downy woodpecker	*Picoides pubescens*	DOWO	x	PO	x	PR	0	2	2	1	1	1	1	0	8	**L5**	
house wren	*Troglodytes aedon*	HOWR	x	PO	x	PR	0	1	2	1	2	1	1	0	8	**L5**	
mallard	*Anas platyrhynchos*	MALL	x	PO	x	CO	0	1	2	1	2	1	0	0	7	**L5**	
mourning dove	*Zenaida macroura*	MODO	x	PO	x	PR	0	3	2	1	1	0	0	0	7	**L5**	
northern cardinal	*Cardinalis cardinalis*	NOCA	x	PO	x	PR	0	1	1	1	1	2	1	0	7	**L5**	
red-tailed hawk	*Buteo jamaicensis*	RTHA			x	CO	0	2	2	2	1	1	1	0	9	**L5**	
red-winged blackbird	*Agelaius phoeniceus*	RWBL	x	PO	x	CO	0	3	1	1	1	1	0	0	7	**L5**	
song sparrow	*Melospiza melodia*	SOSP	x	PO	x	PR	0	3	1	1	1	2	0	0	8	**L5**	
warbling vireo	*Vireo gilvus*	WAVI	x	PO	x	PR	0	1	2	1	1	2	1	0	8	**L5**	
yellow warbler	*Setophaga petechia*	YEWA			x	PR	0	3	2	1	1	2	0	0	9	**L5**	
European starling	*Sturnus vulgaris*	EUST			x	CO	0	4								**L+**	
house finch	*Haemorhous mexicanus*	HOFI			x	PR	0	1								**L+**	
house sparrow	*Passer domesticus*	HOSP			x	PR	0	4								**L+**	
rock pigeon	*Columba livia*	ROPI			x	PO	0	4								**L+**	
Herpetofauna																	
western chorus frog	*Pseudacris triseriata*	MICF	1	PR			3	3	2	2	4	5	3	1	23	**L2**	OHS 1994
northern leopard frog	*Lithobates pipiens*	LEFR			1	PR	0	3	2	1	4	5	2	1	18	**L3**	
American toad	*Anaxyrus americanus*	AMTO			x	PR	0	3	2	1	4	4	0	0	14	**L4**	
green frog	*Lithobates clamitans*	GRFR			cc1	PR	0	2	2	1	3	4	1	0	13	**L4**	
Incidental Species: species that are reported on as incidental to the TRCA protocol.																	
Mammals																	
hoary bat	*Lasiurus cinereus*	HOBA				PO	5	2	2	1	1	3	1	0	15	**L3**	
northern short-tailed shrew	*Blarina brevicauda*	NSTS			1	PR	2	2	2	1	2	4	2	0	15	**L3**	
red bat	*Lasiurus borealis*	REBA				PO	5	2	2	1	1	3	2	0	16	**L3**	
beaver	*Castor canadensis*	BEAV			1	PR	0	2	2	2	3	3	1	0	13	**L4**	
big brown bat	*Eptesicus fuscus*	BBBA				PO	4	2	2	1	1	2	1	0	13	**L4**	
eastern chipmunk	*Tamias striatus*	EACH			1	PR	0	2	1	2	3	3	1	0	12	**L4**	
eastern cottontail	*Sylvilagus floridanus*	EACO			4	PR	0	2	1	1	3	2	1	0	10	**L4**	2017
muskrat	*Ondatra zibethicus*	MUSK			1	PR	0	2	2	1	3	3	1	0	12	**L4**	iNat(2019)
red squirrel	*Tamiasciurus hudsonicus*	RESQ			1	PR	0	2	1	1	3	2	1	0	10	**L4**	
Virginia opossum	*Didelphis virginiana*	VIOP			1	PR	3	2	2	1	3	1	1	0	13	**L4**	iNat(2019)
white-tailed deer	*Odocoileus virginianus*	WTDE			1	PR	0	2	2	3	2	1	2	0	12	**L4**	
woodchuck	*Marmota monax*	WOOD			1	PR	1	2	3	1	3	0	0	0	10	**L4**	iNat

Appendix 3: Fauna List with Ranks and Scores for Humber Arboretum.

Common Name	Scientific Name	Code	pre-2011	max status	2020	max status	LO	PTn	PTt	AS	PIS	StD	HD	+	TS	L-Rank	comments
deer mouse	*Peromyscus maniculatus*	DEMO			?	PR	2	2	1	1	2	1	0	0	9	**L5**	
grey squirrel	*Sciurus carolinensis*	GRSQ	x	PR	x	PR	0	2	1	1	3	0	0	0	7	**L5**	
meadow vole	*Microtus pennsylvanicus*	MEVO			2	PR	0	2	1	1	2	2	1	0	9	**L5**	
raccoon	*Procyon lotor*	RACC			x	CO	0	2	1	1	3	0	1	0	8	**L5**	
striped skunk	*Mephitis mephitis*	STSK			x	PR	1	2	2	1	3	0	0	0	9	**L5**	
domestic cat	*Felis catus*	DOCA			x	PR	2									**L+**	
Herpetofauna																	
common snapping turtle	*Chelydra serpentina*	SNTU			1	PR	0	3	1	1	5	5	2	2	19	**L3**	iNat(2019)
midland painted turtle	*Chrysemys picta*	MPTU			1	PR	0	2	1	1	5	4	1	1	15	**L3**	iNat
Dekay's brownsnake	*Storeria dekayi*	BRSN			1	PR	2	2	2	1	3	4	0	0	14	**L4**	
eastern gartersnake	*Thamnophis sirtalis sirtalis*	EAGA			2	PR	0	2	1	1	3	3	0	0	10	**L4**	
red-eared slider	*Trachemys scripta elegans*	SLID			1	PO	3									**L+**	
Invertebrates																	
"chimney" crayfish	*Fallicambarus fodiens*	CHCR			2	PR	1	3	2	1	4	5	2	1	19	**L3**	

LEGEND

LO = local occurrence
PTn = National population trend
PTt = TRCA population trend
AS = area sensitivity
PIS = Patch Isolation Sensitivity
STD = sensitivity to development
HD = habitat dependence
+ = additional points
TS = total score
L-rank = TRCA Rank, March, 2019

breeding status
PO = Possible
PR = Probable
CO = Confirmed

L1 = Species of Regional Conservation Concern, regionally scarce due to either accidental occurrence or extreme sensitivity to human impacts
L2 = Species of Regional Conservation Concern, somewhat more abundant and generally slightly less sensitive than L1 species
L3 = Species of Regional Conservation Concern, generally less sensitive and more abundant than L1 and L2 ranked species
L4 = Species of Urban Concern; occur throughout the region but could show declines if urban impacts are not mitiagted effectively
L5 = species that are considered secure throughout the region
L+ = introduced species, not native to the Toronto region
LX = extirpated species; species not recorded in the region in the past 10 years
LV = sporadic breeder ("Vagrant"); species not recorded in the region in the past 10 years