

Carruthers Creek Watershed Plan Terrestrial Biological Inventory and Assessment

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Prepared for: Region of Durham



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Foreword

The Region of Durham recognises watershed plans as an effective tool to inform the management of Durham's water resources, natural heritage, and natural hazards, such as flooding. In 2015, the Region retained the Toronto and Region Conservation Authority (TRCA) to update the watershed plan for Carruthers Creek.

This four year study will build upon the goals, objectives, and management recommendations established in the 2003 *Watershed Plan for Duffins Creek and Carruthers Creek*, thereby ensuring a continuum of management efforts to achieve the desired ecological and sustainability objectives for the watershed.

The following report is one of a series of technical reports that were prepared at the end of the first phase of the watershed plan development process to characterize the existing conditions of the watershed. Information contained in these reports will provide the knowledge base necessary to develop management recommendations during Phase 2. The reports were subject to an independent peer review process. The final integrated watershed plan will be completed by the end of Phase 2.

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1.0 Introduction

1.1 Carruthers Creek Watershed Plan Study Area

Carruthers Creek is a relatively small watershed with a drainage area of approximately 3,748 hectares (9,261 acres), ranging from two to three kilometres in width, and only 18 kilometres in length (see map: Carruthers Creek Watershed Plan Study Area Land Use 2015, below). It is the easternmost watershed in TRCA's jurisdiction and is located entirely in the Region of Durham. At the request of the Region of Durham, a small section of lands in East Duffins Creek subwatershed, which are immediately adjacent to Carruthers Creek watershed and outside of the provincial Greenbelt, were included in the study area.

The watershed occurs within the South Slope and Glacial Lake Iroquois physiographic regions, south of the Oak Ridges Moraine. Topographically, most of Carruthers Creek watershed is flat to slightly rolling. The exceptions are low hills associated with the Lake Iroquois Shoreline, notably the Kinsale Raised Shoreline immediately west of Audley Road and south of Highway 7, and the main valley feature of Carruthers Creek which forms a distinct but shallow ravine from Taunton Road south to Highway 401.

Carruthers Creek's headwaters form to the south of the Oak Ridges Moraine in the City of Pickering. Both the east and west branches of the creek originate north of Concession 8; the confluence is immediately north of Taunton Road and the creek enters Lake Ontario in the Town of Ajax. Carruthers Creek contains a total of 61 kilometres of stream channels. Historically, portions of the watershed would have supported cold water fish populations including Brook trout, Atlantic salmon, Slimy sculpin, and Mottled sculpin. Instream barriers to fish movement in the watershed adversely impact the aquatic system by limiting access to feeding and spawning areas, increasing water temperature, and affecting sediment transport. In addition, some instream structures increase water velocities to the point where fish passage is prevented. Instream structures that act as barriers to fish passage include dams, weirs, road and rail crossings, and some culverts.

Carruthers Creek watershed lies in the Great Lakes-St. Lawrence floristic region, which is comprised of mixed coniferous-deciduous forest. There are two provincial Areas of Natural and Scientific Interest (ANSI), as designated by the Ontario Ministry of Natural Resources and Forestry, in the watershed: the Kinsale Raised Shoreline Earth Science ANSI, designated for its distinct geological character as a well preserved part of the ancient Lake Iroquois Shoreline; and Shoal Point Marsh Life Science ANSI, which is included in the coastal Carruthers Creek Wetland Complex Provincially Significant Wetland. Two smaller wetlands are evaluated as Locally Significant: the Rossland Road Wetland Complex and the Salem Road Wetland Complex. The Carruthers Creek Wetland Complex is divided into two Environmentally Significant Areas: the coastal Carruthers Marsh and the Carruthers Creek Forest, a few hundred metres inland.

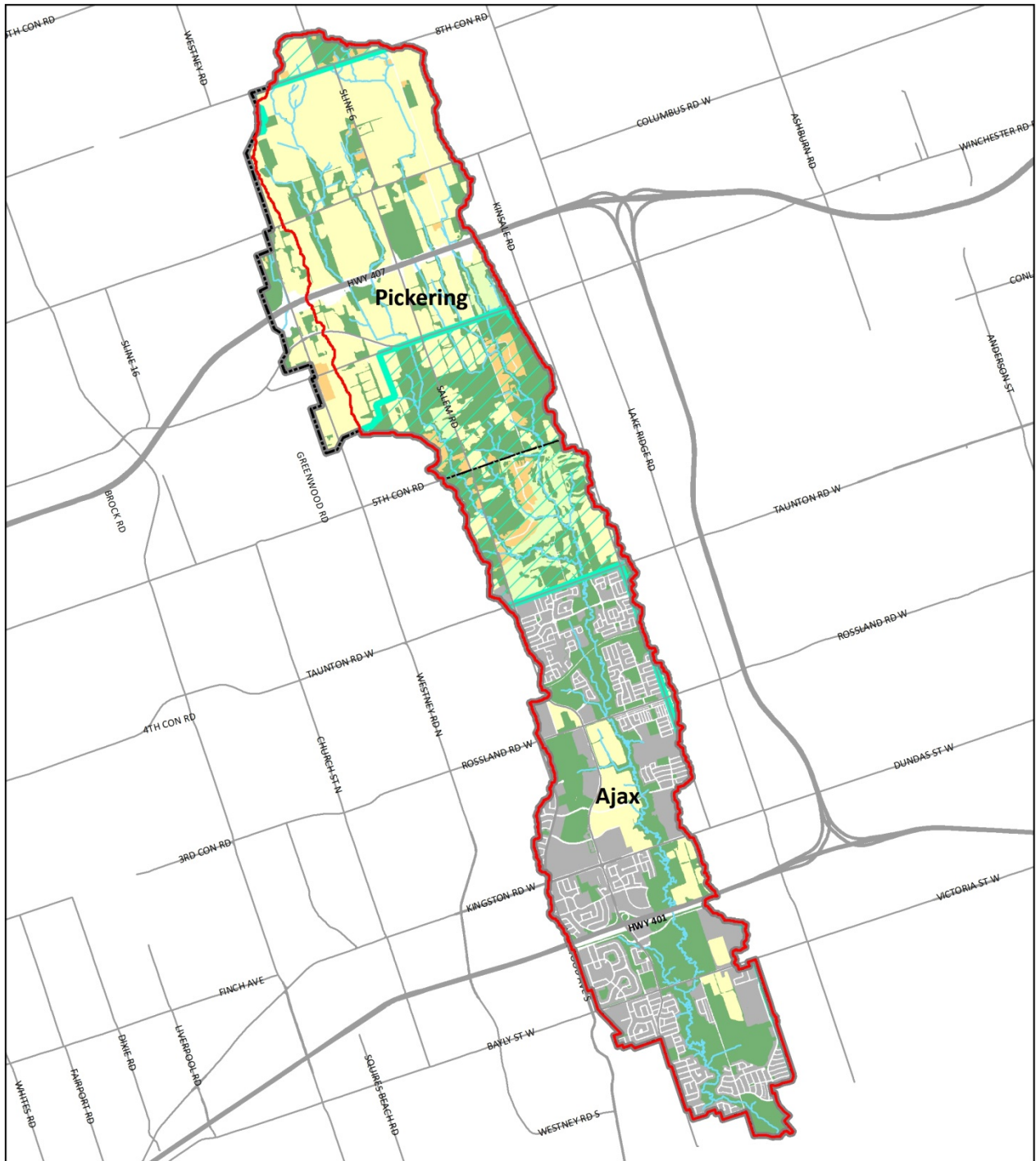
Long-term precipitation and air temperature patterns in the watershed are summarised from data collected by Environment and Climate Change Canada at the nearby Oshawa Water Pollution Control Plant station. In 2015, precipitation volumes of 985 mm exceeded the 30 year (1981-2010) normal of 892 mm, however the 2016 volumes were significantly lower at approximately 614 mm. For three of the last nine years, the total volume of precipitation exceeded the 30 year normal. Lower than normal precipitation volumes were reported in the years 2013, 2015, and 2016.










Stream flow records for the watershed are related to climate patterns. Preliminary water quantity data suggest that 2015 was a wet year in terms of stream flow and 2016 was significantly drier. Although stream flow has only been measured in the watershed for a relatively short period of record, a wide range of climatic conditions has been observed.

Carruthers Creek watershed is mainly rural north of Highway 7. From Highway 7 south to Taunton Road, the majority of lands are in the Protected Countryside of the provincial Greenbelt, however there is a noticeable loss of the integrity of the natural heritage system due to clearing of vegetation and filling. Low to medium density suburban development predominates from Taunton Road south to the lakeshore. Lands currently mapped as rural in the urban areas of Ajax are expected to be developed as employment lands to meet future demands. The older parts of the built urban area have little to no stormwater controls, while the newer parts include standard stormwater quality and quantity ponds accompanied by low impact development (LID) technologies. There is also a flood vulnerable area in the Pickering Beach neighbourhood of Ajax.

As expected, there are differences in agricultural land use in the upper reaches versus mid-reaches of the watershed which may be attributed to land tenure, drainage and soil properties, or a combination of factors. Horticulture dominates the east branch, whereas the west branch is predominantly cash crops and at least one livestock operation, although horticulture is also present. In the urban areas of Ajax, some lands slated for development are still cultivated with cash crops as an interim use.

Overall, the land use in this small watershed is in transition, therefore the characterization provided by the field work in Phase 1 of the watershed plan is an excellent benchmark for future study and decision-making. Regular monitoring during and following this watershed planning process continuously improves our understanding and will help to guide ongoing decision-making to protect, restore, and enhance Carruthers Creek watershed.



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|  <p>Date: July 2017 Created by: T.R.C.A. Information Services/Information Technologies Disclaimer: The Data used to create this map was compiled from a variety sources and dates. The T.R.C.A. takes no responsibility for errors or omissions in the data and retains the right to make changes and corrections at anytime without notice. For further information about the data on this map, please contact the T.R.C.A. GIS Department. (416) 661-6600.</p> | <p style="text-align: center;">Carruthers Creek Watershed Plan Study Area Land Use 2015</p> <p style="text-align: center;">0 0.5 1 2 3 4 KM</p> | <ul style="list-style-type: none">  Carruthers Watershed Plan Study Area  Watershed Boundary  Greenbelt Boundary  Natural Areas  Golf Course  Agricultural/Rural  Rural Estate  Urban |
|--|--|---|

1.2 Carruthers Creek Watershed Natural Heritage Inventory

From a natural heritage perspective the watershed is noteworthy for the riverine and lacustrine wetlands in the lower reaches; otherwise the main natural heritage interest is the relatively extensive patch of forest cover in the central reaches of the watershed, and from a fauna perspective, the extensive open country habitat associated with the predominantly agricultural north end.

Since 2001 smaller, site-focussed fauna and flora inventories were conducted at several locations throughout the watershed. In 2015, TRCA was requested to conduct an in-depth ecological inventory of the entire Carruthers Creek watershed. To this end, staff biologists visited a total of 970 hectares of natural cover, which amounts to 92% of the watershed's entire natural cover. Much of this field work revisited sites which had been visited previously, but in several cases the 2015/2016 inventory visited sites for which no previous data were available. Private landowners were approached for permission to access their properties, and in many cases this was granted; however, where permission was not granted there are gaps in the total coverage. Nevertheless, combining the current inventory data with the older site-based surveys, data from a large enough proportion of natural cover were available to enable a reliable understanding of the flora and fauna populations across the watershed.

Inventories of the Carruthers Creek watershed (and small portion of the Duffins watershed) were conducted at the levels of habitat patch (landscape analysis), vegetation community, and species (flora and fauna). The landscape evaluation is used to determine the quantity and quality distribution of natural cover across the watershed. Vegetation community and species data were collected according to the Terrestrial Natural Heritage Program Data Collection Methodology. Vegetation community designations are based on a slightly modified protocol of the Ecological Land Classification (ELC) and determined to the level of vegetation type. Flora and fauna regional species of conservation concern were mapped as point data with approximate number of individuals seen. A list of all other species observed was documented for the watershed.

Overall, the watershed can be divided in two sections: the urbanised southern section (south of Taunton Road) is largely devoid of more sensitive fauna species, other than in the extensive forest patch north of Carruthers Marsh. The northern section contains the most extensive forest in the watershed, which also acts as an important east-west corridor of natural cover between Duffins Creek watershed to the west, and Lynde Creek watershed to the east (Map 3). North of this significant green corridor (running along the old Lake Iroquois Shoreline), the landscape is primarily agricultural but interspersed with meadow and riparian habitats which, given the absence of urban matrix, provide nesting opportunities for many significant open country species including three meadow bird Species at Risk.

The results for habitat patch quality at the landscape level in the north section is on average "fair"; the southern section is conspicuously two-tiered with the area between Taunton Road and Highway 401 scoring on average as "poor", but then reverting to "fair" as the watershed

approaches the lake shore. This variation in the level of habitat quality between the north and south of the Study Area is well reflected in the variation in the occurrence of fauna Species of Concern across the Study Area.

The field data collection results obtained from the TRCA inventories found 173 different ELC vegetation community types including 47 different natural forest communities, 22 plantations, 23 successional communities, 51 wetlands, 13 aquatic communities, 14 dynamic communities (e.g., savannah, beaches, bluffs), and 3 meadow types. Of the 173 vegetation communities, 49 are of regional conservation concern. A total of 935 species of vascular plants were recorded including 845 naturally-occurring species. Of all the naturally-occurring plants, 484 are native (57%) and 361 are non-native (43%). The other 90 species are believed to have been planted during various restoration activities however, there were no signs that they are naturally regenerating. There are 153 flora species of regional conservation concern (L1 to L3). Four of these have not been recorded anywhere else in the TRCA jurisdiction; an additional 8 species have only been recorded at one or two other sites in the jurisdiction. While sensitive vegetation communities and flora can be found throughout the watershed, floristic richness is concentrated along the Lake Iroquois shoreline area north of Taunton Road and in the large wetland complex at the lower end of the watershed.

The fauna inventories documented a total of 133 possible breeding vertebrate fauna species over the past decade. This total is composed of 106 breeding birds, 18 mammals, and 9 herpetofauna documented primarily during formal TRCA inventories, but also including input from TRCA's Marsh Monitoring Project stations in Carruthers Marsh, a long-term monitoring station in the nearby Carruthers Marsh woodlands, and incidental records from staff.

Comparison between the most recent extensive fauna inventory (2015/16) and earlier inventories conducted over a decade ago is complicated by the inconsistency in specific site boundaries, but in one case – the natural cover between Highway 401 and Bayly Street - such a comparison is readily made. This comparison indicates that local faunal biodiversity has been largely maintained; the potential (repeat visits in subsequent years would be needed to confirm) loss of one particularly sensitive forest songbird species has been compensated by an increase in the population of a similarly ranked forest-edge species. However, comparisons made elsewhere in this lower urbanized section of the watershed suggest that, despite an increase in the number of generally less sensitive species, several other highly sensitive forest species have been lost entirely. These latter species are still represented in the northern rural section of the watershed (north of Taunton Road).

The additional field work conducted during the 2015/16 field season provided the information necessary to summarize the current terrestrial conditions in the Carruthers watershed as outlined in this report. This information will be used to inform scenario development and developing final recommendations for the watershed plan.

Carruthers Creek provides a continuous corridor of natural habitat from the Oak Ridges Moraine in the north to Lake Ontario in the south (Map 1).

The watershed is noteworthy for its riverine and lacustrine wetlands in the lower reaches. Additionally, major natural habitats include areas of mixed and deciduous forest, especially in the north-central portion of the watershed. A few fens and seepage wetlands occur in this area. There are also extensive areas of meadow and successional habitat across the watershed. A small coastal beach/bar/lagoon at the mouth is home to several important natural heritage features. In addition to its ecological features, Carruthers Creek is an important local place for recreation and enjoyment of the natural environment.

In 2015 and 2016, TRCA undertook terrestrial biological inventories of Carruthers Creek watershed in preparation for a watershed plan. Carruthers Creek was combined with Duffins Creek in the earlier 2003 watershed plan (TRCA 2003), which followed a State of the Watershed Report (TRCA 2002). However, TRCA's collection of ground-truthed field data for vegetation communities, flora and fauna species only begun around that time (see Section 1.1 below), therefore, these studies did not have the benefit of such data.

Areas of the watershed which had never been surveyed or had outdated data were targeted for inventory for this update. In the past, a number of terrestrial biological inventories were conducted in different sections of the watershed, many in relation to specific land use issues. These served to document and highlight the current conditions and "state of" the natural system, and were used to inform ongoing management strategies for the protection of biodiversity amid intensive urbanisation and other land use changes. Some of these historic data have been combined with the new data collected in 2015/2016 in order to summarise and characterise the baseline terrestrial natural heritage conditions for the watershed.

1.3 History of Surveys

Carruthers Creek is smaller and generally less well-known than most TRCA watersheds. Its most well-known feature, the Carruthers Wetland Complex was identified in 1982 and delineated by the province in 1998 (MTRCA 1982, OMNR 1998).

In-depth biological inventories began in 2001 when TRCA surveyed the coastal marsh and lagoon for vegetation communities, flora species, and breeding birds. In 2002, an area in the northern part of the watershed, south of Highway 7, was surveyed and in 2003, the Ajax Warbler Swamp north of the coastal marsh was included with surveys of the lower valley which extends north to Kingston Road (Map 6a). The east and north basins of Ajax Warbler Swamp fall outside Carruthers Creek watershed, and are under Central Lake Ontario Conservation Authority jurisdiction. The results of the 2001 and 2003 surveys were summarised in TRCA (2004).

In 2005 and 2007, TRCA surveyed two areas in the mid- to upper reaches which overlap substantially with Carruthers Creek watershed, while in 2009, an extensive area of the headwaters was covered. A report was prepared for the lands surveyed in 2005 (TRCA 2006). Names and locations of survey areas are found in Section 3.2 and on Maps 6a and 6b. Older data, from 2005 and earlier, are becoming outdated, particularly for fauna.

In 2015 and 2016, approximately 760 hectares of natural cover were surveyed throughout the watershed, including large areas never before surveyed. Many areas in the lower part of the watershed originally surveyed in 2001 and 2003 were also re-surveyed in greater detail. This report incorporates all TRCA data collected from 2001 to 2016 (Map 6c).

All surveys and reports undertaken by the TRCA, including those of Carruthers Creek watershed, are done with a view to TRCA's jurisdiction-wide approach under the Terrestrial Natural Heritage Program. This program expands on earlier single-site approaches such as the designation of Environmentally Significant Areas (ESA), and treats all natural cover as a unified natural system.

1.4 TRCA Terrestrial Natural Heritage Program

In the late 1990s, TRCA initiated the Terrestrial Natural Heritage Program to address the loss of terrestrial biodiversity in the jurisdiction's nine watersheds. This work is based on two landscape-level indicators: the quality distribution of natural cover, and the quantity of natural cover. The aim of the program is to create a conservation strategy that both protects elements of the natural system (vegetation communities, flora and fauna species) *before* they become rare, and promotes greater ecological function of the natural system as a whole. This preventive approach is needed because by the time a community or species has become rare, irreversible damage has often already occurred. A healthy natural system capable of supporting regional biodiversity is the goal of the Terrestrial Natural Heritage Systems Strategy (TNHSS), to be achieved by setting short- and long-term (100 years) targets for the two landscape indicators in order to provide direction in planning at all scales (TRCA 2007a, TRCA 2007b).

The Carruthers Creek watershed plan of 2003 relied on early methodology for defining a natural heritage system. Since that time, through the official TNHSS, Carruthers Creek watershed has been updated following the final methods adopted.

A key component of the TNHSS is a target system which identifies a land base where natural cover should be restored. Although the objectives of the TNHSS are based on making positive changes at all scales, the evaluation models were developed at the landscape scale by combining digital land cover mapping and field collected data. Field collected data also provide ground level information in the application of the landscape models at the site scale. The two indicators and their set targets are explained in Section 3.1. It is important to understand that habitat quality and distribution are interdependent. For example, neither well-distributed poor-quality natural cover nor poorly-distributed good-quality natural cover achieve the desired condition of sustainable biodiversity and social benefits across the watershed.

2.0 Study Area Description

Carruthers Creek watershed extends about 20 kilometres from the historic hamlet of Mount Zion at Concession 8 and Salem Road (Ontario Abandoned Places, 2015) down to Lake Ontario (Map 1). This large area (3748 ha) is divided into sections north and south of Taunton Road for the purposes of this report (Maps 2a and 2b). The two sections are almost the same size, and Taunton Road also marks the northern boundary of intensive urbanisation. These sections are referred to as Carruthers Creek watershed North and South, respectively. The watershed is in the Great Lakes-St. Lawrence floristic region, comprised of mixed coniferous-deciduous forest.

The study area crosses three physiographic regions: the South Slope (of the Oak Ridges Moraine) covered with a layer of silty clay till occupies the northern third of the watershed down to south of Highway 7 (Sharpe 1980). The Lake Iroquois Sand Plain and associated shoreline occupies the mid-reaches of the watershed where there is more forest cover. Farther south, the Ajax-Whitby Clay Plain covers most of the watershed south of Taunton Road to the lake (Chapman and Putnam 1984). The Ajax-Whitby Clay Plain is associated with the deeper water deposits of Lake Iroquois. These lacustrine clays are often imperfectly to poorly drained and include, for example, Smithfield Clay Loam which predominates south of Highway 401 (Olding *et. al.* 1957). Amid this broad picture, lenses of differing soil textures can be found throughout the watershed. Soil samples taken during field work confirm the general trend of fine sands to the south grading to silts and clays northward, with exceptions.

Topographically, most of Carruthers Creek watershed is flat to slightly rolling. The exceptions are the low hills associated with the Lake Iroquois shoreline, notably the Kinsale Raised Shoreline west of Audley Road, south of Highway 7, which is an Earth Science Area of Natural and Scientific Interest (ANSI). The main valley feature of Carruthers Creek itself also forms a distinct but shallow ravine from Taunton Road south to Highway 401.

Portions of Carruthers Creek watershed have been recognised as ecologically rich, and some are designated as ANSIs, ESAs, and Provincially Significant Wetlands (PSWs) (Map 3). There are two provincial ANSIs: the Kinsale Raised Shoreline (designated for its distinct geological character as a well preserved part of the Iroquois Shoreline), and Shoal Point Marsh, which encompasses the coastal Carruthers Creek Wetland Complex, itself a PSW. There are also two smaller evaluated (non-Provincial) wetlands: Rossland Road Wetland Complex and Salem Road Wetland Complex. The Carruthers Creek Wetland Complex falls across two ESAs, the coastal Carruthers Marsh and the Carruthers Creek Forest, a few hundred metres inland (MTRCA 1982).

Table 1: ANSIs, PSWs and ESAs in Carruthers Creek watershed

| Designation | Name of Parcel | Approx. Size (ha) |
|----------------------------|---|-------------------|
| ANSI | Kinsale Raised Shoreline (western portion only) | 73 |
| | Shoal Point Marsh (western two-thirds) | 111 |
| PSW - evaluated | Carruthers Creek Wetland Complex (including Carruthers Marsh and Ajax Warbler Swamp west basin) | 147 |
| other wetlands - evaluated | Rosland Road Wetland Complex | 14 |
| | Salem Road Wetland Complex | 35 |
| ESA | Carruthers Marsh (ESA #112) | 42 |
| | Carruthers Creek Forest (ESA #113) | 52 |

Pre-European settlement (*i.e.*, prior to 1830) conditions in the watershed were probably largely continuous forest and wetland cover with occasional windfall areas, and likely natural burn areas. There was probably some First Nations agriculture in the preceding centuries. After permanent European settlement, deforestation proceeded quickly and forest cover reached the lowest point of about 6% around 1921 in Pickering Township (Varga *et al.* 1991).

Intensive activity continued in Carruthers Creek watershed throughout the 20th century, including agriculture, aggregate extraction, recreational development, and service and transportation corridors. Moreover, as of the 1990s, the surrounding lands have been converting from countryside to urban land uses. Forest cover in Carruthers Creek watershed, based on 2013 aerial photo interpretation, is approximately 13%.

3.0 Inventory Methodology

Biological inventories of Carruthers Creek watershed were conducted at the levels of habitat patch (landscape analysis), vegetation community, and species (flora and fauna) according to TRCA methodologies for landscape evaluation (TRCA 2007c) and field data collection (TRCA 2007d) which are based on a slightly modified version of the Ontario Ministry of Natural Resources and Forestry (OMNRF) Ecological Land Classification (ELC) (Lee *et al.* 1998). Habitat patch mapping was excerpted from the regional 2013 (most recent available) mapping of broadly defined patch categories (forest, wetland, meadow, successional, and beach/bluff) and digitised using ArcView GIS software. All data collected are incorporated into corporate databases and ArcView GIS files.

A key component of the field data evaluation is scoring and ranking vegetation communities and flora and fauna species to generate local “L” ranks (L1 to L5). This process was undertaken from 1996 to 2000 and ranks are reviewed regularly based on the annual terrestrial biological inventories conducted across all nine watersheds (TRCA 2016a). Vegetation community scores

and ranks are based on two criteria: *local occurrence* and the number of *geophysical requirements* or factors on which they depend. Flora species are scored using four criteria: *local occurrence*, *population trend*, *habitat dependence*, and *sensitivity to impacts associated with development*. Fauna species scores have seven criteria: *local occurrence*, *local population trend*, *continent-wide population trend*, *habitat dependence*, *sensitivity to development*, *area-sensitivity*, and *patch isolation sensitivity*. With the use of this ranking system, communities or species of *regional concern*, ranked L1 to L3, now replace the idea of *rare* communities or species. *Rarity (local occurrence)* is still considered but is now one of many criteria that make up the L-ranks, making it possible to recognise communities or species of regional concern before they become rare.

In addition to the L1 to L3 ranked species, a large number of currently common or secure species at the regional level are considered of concern in the urban context. These are the species identified with an L-rank of L4. Although L4 species are widespread and frequently occur in relatively intact urban sites, they are vulnerable to long-term decline.

3.1 Landscape Analysis

The quality, distribution and quantity of natural cover in any watershed are important determinants of species distribution, vegetation community health, and the provision of “ecosystem services” (e.g., air and water quality, recreation, aesthetics) in that region.

3.1.1 Base Mapping

The first step in evaluating a natural system or an individual *habitat patch* is to interpret and map land cover using aerial photographs. The basic unit for evaluation at all scales is the habitat patch in the region, which are then combined and evaluated as a system at any scale. A *habitat patch* is a continuous piece of habitat, as determined from aerial photo interpretation. TRCA maps habitat according to five broad categories: *forest*, *wetland*, *meadow*, *successional*, and *beach/bluff*. At the regional level, TRCA’s jurisdiction is comprised of thousands of habitat patches. Mapping of habitat patches in broad categories through remote sensing is used to evaluate quality, distribution, and quantity of natural cover. It should not be confused with the more detailed mapping of vegetation communities obtained through field surveys which is used to ground-truth the evaluation (see Section 3.2).

3.1.2 Quality Distribution of Natural Cover

The quality of each habitat patch is evaluated according to three criteria: *size* (the number of hectares occupied by the patch), *shape* (edge-to-area ratio), and *matrix influence* (measure of the positive and negative impacts from surrounding land use) (TRCA 2007c). A total score for each patch is obtained through a weighted average of the scores for the three criteria. The total score is used as a measure of the “quality” of a habitat patch and is translated into a local rank (L-rank)

ranging from L1 to L5 based on the range of possible total scores from 3 to 15 points. Of the L-ranks, L1 represents the highest quality habitat and L5 the poorest.

Species presence or absence correlates to habitat patch quality (size, shape, and matrix influence) (Kilgour 2003). The quality target is based on attaining a quality of habitat patch throughout the natural system that would support a broad range of biodiversity in the very long-term, and more specifically, support the region's fauna Species of Conservation Concern (Table 2).

Table 2: Habitat patch quality, rank and species response

| Patch Quality | 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 |

In addition to the three criteria which make up the total habitat patch score, another important measure to consider in assessing habitat patch quality is forest interior, *i.e.*, the amount of forest habitat that is greater than 100 metres from the edge of the forest patch, using 100 metre increments. A recognised distance for deep interior conditions occurs at 200 metres from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

3.1.3 Quantity

The *quantity target* is the amount of natural cover that needs to exist in the landscape in order to accommodate and achieve the quality distribution targets described above. The two targets are therefore linked to each other: it will be impossible to achieve the required distribution of natural heritage quality without the appropriate quantity of natural cover. The proportion of the watershed which needs to be maintained as natural cover in order to achieve the desired quality has been identified as 30% (TRCA 2007a).

3.2 Vegetation Community and Flora and Fauna Species

Field surveys by TRCA occurred from 2001 to 2016 (Table 3; Maps 6a and 6b, see also Section 1.1). Vegetation community and flora and fauna surveys were done during the appropriate times of year to capture breeding status in the case of amphibians and birds, and during the optimal growing period of the various plant species and communities. Larger surveys were divided into 'blocks' divided by major roads and lists prepared for each block (Map 6d). The 2001 flora data

for Carruthers Marsh now lies outside the 15-year threshold used by TRCA to designate “current” records. Thus, these occurrences are not included in the current flora list for Carruthers Creek watershed (Appendix 2). However, they are recent enough, and the site is relatively unchanged as of 2015, that they are discussed in the report.

Table 3: TRCA Surveys in Carruthers Creek watershed, 2001-2016

| Year Surveyed | TRCA Site Name / Location | ELC Area (ha)* | Vegetation and Flora species | Frogs and Nocturnal Spring Birds | Breeding Songbirds |
|---------------|--------------------------------------|----------------|------------------------------|----------------------------------|--------------------|
| 2001 | Carruthers Marsh | 24 | yes | no | yes |
| 2002 | 02-M (5 th Conc. & Salem) | 36 | yes | yes | yes |
| 2003 | Carruthers Creek South | 200 | yes | yes | yes |
| 2005 | Berrywood Farms | 35 | yes | yes | yes |
| 2006 | Deer Creek Golf Club | 195 | no | no | yes |
| 2007 | Kinsale Expansion Area | 70 | yes | yes | yes |
| 2007 | Barclay Estates | 20 | no | yes | no |
| 2009 | Carruthers ‘vanilla lands’ | 79 | yes | yes | yes |
| 2015 | Carruthers Creek watershed Plan | 664 | yes | yes | yes |
| 2016 | Carruthers Creek watershed Plan | 100 | yes | yes | yes |

***Please note: Because many of the areas surveyed before 2005 were re-surveyed in 2015/2016, the total of these amounts is greater than the actual ELC coverage of the watershed in Table 4.**

Vegetation communities and flora species were surveyed concurrently where possible. Vegetation community designations were based on the ELC and determined to the level of vegetation type. Community boundaries (referred to as polygons) were outlined onto printouts of 2014 digital ortho-rectified photographs (ortho-photos) to a scale of 1:2000 and then digitised in ArcView. Flora regional species of concern (species ranked L1 to L3) were mapped as point data with approximate number of individuals seen. South of Taunton Road, where there is now an urban matrix, L4 species were mapped as well. A list of all other species observed was documented for the site. When necessary, flora specimens or photos were sent for identification verification to the appropriate authorities.

From 2001 to 2016 fauna data were collected by TRCA on surveys typically conducted in early spring (April), late spring, and summer (May, June, July). The spring surveys searched primarily for frog species of regional concern but also incidentally recorded the presence of any early spring nocturnal bird species (owls and American woodcocks). Surveys from late May to July were concerned primarily with mapping breeding bird species of regional concern. As per the TRCA data collection protocol, breeding bird surveys are carried out by visiting all parts of a site at least twice during the breeding season (late May to mid-July) to determine the breeding status of each mapped point. The methodology for identifying confirmed and possible breeding birds follows Cadman *et al.* (2007). All initial visits were completed by the end of the third week of June. The field-season is organized so that by late June only repeat visits are being conducted. Any site visit made in the first half of June is subsequently validated by a second visit later in the season.

The fauna inventories conducted in 2015 and 2016 mapped fauna of regional and urban concern (species ranked L1 to L4) as point data; inventories farther north in the watershed, conducted prior to 2015, primarily mapped fauna of regional concern (L1 to L3), only mapping L4 species in locations considered to be urban or near-urban at the time of the inventories. In the case of breeding birds, each mapped point represents a possible breeding bird territory. It should also be noted that over the course of so many years the local rankings of some species have changed as new information regarding their local occurrence influences their total scores within the process.

4.0 Results and Discussion

Information pertaining to Carruthers Creek watershed was collected through both remote sensing and ground-truthing surveys. This information contains three levels of detail: habitat patch (Section 4.2 and 4.3), vegetation community (Section 4.4), and flora and fauna species (Sections 4.5 and 4.6). This Section provides the information collected and its analysis in the context of the TNHS Strategy (TRCA 2007a).

4.1 TRCA Jurisdiction Context

Based on 2013 orthophotography, 25% of the land area in the TRCA jurisdiction consists of natural cover. Of the non-natural cover (*i.e.*, the remaining 75%), 48% is urban and 27% is rural/agricultural. Historically, the jurisdiction would have consisted of up to 95% forest cover. Currently, approximately 17% is covered by forest and wetland.

At the regional level, analysis of habitat patches shows that the present average patch quality for the entire TRCA jurisdiction is “fair” (L3). Thus the existing natural system stands below the quality target for the region (L2, “good”) which requires 30% forest and wetland cover. Furthermore the existing natural cover has a very unbalanced distribution, with large patches of forest and wetland cover restricted largely to the northern half of the TRCA jurisdiction, especially on the Oak Ridges Moraine (ORM) (Map 4). The distribution of fauna species of concern is similarly distributed with a bias to the northern part of the jurisdiction; fauna species of regional concern are generally absent from the urban matrix (see Map 5). The regional picture, being the result of a long history of land use changes, confirms that *all* site-based decisions contribute to the condition of a region.

4.2 Quantity of Natural Cover in Carruthers Creek watershed

Carruthers Creek watershed is approximately 3748 hectares, with 27% natural cover as estimated by remote sensing, including 523 hectares as forest (13%) and 335 hectares as meadow (9%).

4.3 Habitat Patch Findings for Carruthers Creek watershed

The following details the study area according to the natural system indicator *quality distribution* used in designing the Terrestrial Natural Heritage System Strategy. The results for quality distribution are reported below under the headings of habitat patch size and shape, matrix influence, and total score. Analysis was based on 2013 orthophotos.

4.3.1 Habitat Patch Size and Shape

The difference between the northern and southern halves of Carruthers Creek watershed is well-reflected in the distribution of natural cover. South of Taunton Road, natural cover is almost exclusively restricted to the riparian corridor of Carruthers Creek, with almost no east to west distribution. On the other hand, north of Taunton Road the natural cover, although still relatively sparse, is spread throughout the landscape, including the significant east-west distribution north of Deer Creek Golf Course (Map 3). The difference is particularly pronounced if the occurrence of habitat patches larger than 5 hectares is investigated. In the southern reaches of the watershed, there are very few such habitat patches, in fact the small number of patches – all in the riparian corridor – are generally larger than 10 hectares. Urbanisation has effectively displaced all but the larger habitat patches, those in the creek valley. North of Taunton Road, there are many more 5 hectare remnants scattered across the largely agricultural landscape, the concentration of larger patches (>10 hectares) being restricted to the east-west corridor north of Deer Creek Golf Course.

Only two habitat patches in the northern half of the watershed score as either “good” or “excellent” (Map 7a). One of these two patches is the extensive forest of the Kinsale Raised Shoreline ANSI, the other--which scored as “excellent”--is actually smaller but, as a wetland habitat, the area threshold limit is lower than for forest habitats. For wetland communities to score excellent they need to be greater than 10 hectares in size whereas forests, to only be scored as good, need to be greater than 50 hectares. The remaining habitat fragments in the northern half of the watershed vary considerably in size, ranging from “very poor” to “fair” (forest communities ranging in size from 0.5 to less than 10 hectares and wetlands up to 3 hectares). To the south of Taunton Road (Map 7b) there is a lower degree of variation in patch sizes, most of which score as “fair”; the only habitat patch scoring higher is again identified as a wetland (part of Ajax Warbler Swamp).

Forest interior--requiring a combination of good size and shape attributes--is a very scarce commodity in both the northern and southern halves of the watershed, a reflection of the linear configuration (poor shape) of much of the forest in the southern half, and the fragmentation in the agricultural landscape of the northern half. The only extensive patch of interior forest in the north is located in the Kinsale Raised Shoreline ANSI; to the south there is again only one patch located in the Shoal Point Marsh ANSI (Maps 8a and 8b).

4.3.2 Habitat Patch Matrix Influence

As should be expected across a study area that is so obviously split between the rural (north of Taunton Road) and the urban (to the south), there is a stark contrast between the matrix influence scores in the two halves. To the north, in the largely agricultural landscape, almost all the habitat patches score as “good” or L2; to the south, the urban landscape imposes an extensively “poor” matrix influence score (Maps 9a-10b). Habitat patches in the extreme south (Ajax Warbler Swamp, Carruthers Marsh ESA) have been given “fair” and “good” matrix influence scores but this is entirely due to the proximity of the lakeshore. TRCA measures matrix influence at the landscape level by assigning set values of positive, neutral, and negative, to the type of landscape use

occurring within 2 kilometres of the subject site. Lake Ontario is assigned a positive matrix influence value. It is important to understand and consider the matrix influence that occurs at the site and patch level. Such influences include those transferred to an otherwise remote natural habitat patch from a distant urban or suburban development, for example via a trail system.

4.3.3 Habitat Patch Total Score

Habitat patch total score is calculated through the combination of scores that each habitat patch receives for size, shape, and matrix influence. Therefore patches such as the majority of patches north of Taunton Road which score a combination of “good” (L2) for matrix influence and “poor” (L4) for patch size, achieve an overall “fair” (L3) patch score (Map 11a). From Taunton Road south to Highway 401, the “poor” matrix influence scores combine with the largely “fair” patch sizes to produce a “poor” total score (Map 11b). South of Highway 401, the more extensive patches combined with the “positive” matrix influence of Lake Ontario raise this total score to “fair”.

4.4 Vegetation Community Findings for Carruthers Creek Watershed

4.4.1 Vegetation Community Representation

The majority of the natural cover in Carruthers Creek watershed has been inventoried by TRCA since 2002 (Maps 6a and 6b). Total ELC coverage is 970 hectares, while the remote-sensed estimate of total watershed natural cover is 1050 hectares. This comparison must be interpreted with caution however, since the remote-sensed figure may miss small patches of natural cover which would be captured by ground surveys. A total of 173 different ELC vegetation community types are described for the site (listed in Appendix 1, summarised in Table 4) which represents 44% of the 392 vegetation types recorded for the entire TRCA jurisdiction. There are 47 different natural forest communities, 22 plantations, 23 successional communities, 51 wetlands, 13 aquatic communities, 14 dynamic communities (e.g., beaches, bluffs, barrens), and 3 meadow types. This is moderately high community diversity, with wetlands notably well-represented. Such a pattern reflects the relatively flat topography and imperfect to poor drainage of the watershed’s soils. Upland community diversity is highest in the vicinity of the Lake Iroquois Shoreline, roughly between Taunton Road and Highway 7.

Table 4: Summary of vegetation communities, Carruthers Creek watershed

| | Total Area (ha)* | | | # Of Different Vegetation ELC Types |
|--------------------------------|------------------|-------|--------------|-------------------------------------|
| | north | south | total | |
| All surveyed vegetation | 548.3 | 421.3 | 969.6 | 173 |
| Forest (natural) | 152.2 | 71.7 | 223.9 | 47 |
| coniferous | 22.6 | 4.9 | 27.5 | 5 |
| mixed | 46.3 | 6.7 | 53.1 | 15 |
| deciduous | 83.3 | 60.1 | 143.4 | 27 |
| sugar maple | 59.1 | 10.3 | 69.3 | 12 |
| oak-hardwood | 4.7 | 0.3 | 5.0 | 3 |
| lowland / young | 19.5 | 49.6 | 69.0 | 11 |
| Plantation | 37.9 | 25.8 | 63.7 | 22 |
| Successional | 139.8 | 80.0 | 192.5 | 23 |
| Wetland | 90.3 | 137.3 | 227.7 | 51 |
| conifer / mixed swamp | 10.3 | 13.4 | 23.6 | 6 |
| deciduous swamp | 23.2 | 55.2 | 78.3 | 9 |
| thicket swamp | 13.0 | 9.9 | 23.0 | 4 |
| fen | 1.1 | 0.2 | 1.3 | 4 |
| meadow-marsh | 24.5 | 9.2 | 33.7 | 17 |
| cattail shallow marsh | 6.6 | 37.6 | 44.2 | 3 |
| other shallow marsh | 3.5 | 5.0 | 8.5 | 8 |
| common reed marsh | 8.2 | 6.8 | 15.0 | 3 |
| Aquatic - vegetated | 12.1 | 27.9 | 40.0 | 11 |
| Aquatic - unvegetated | 0.6 | 1.7 | 2.3 | 2 |
| Dynamic | 1.6 | 2.8 | 4.4 | 12 |
| beach / bar / bluff | 0.04 | 0.6 | 0.6 | 6 |
| barren / savannah | 1.6 | 1.1 | 2.6 | 7 |
| Meadow | 113.7 | 74.1 | 187.7 | 3 |

*Please note: due to rounding of decimals, totals may differ by 0.1 hectares from the sum of north and south

A little more than one quarter (224 hectares or 28%) of the habitat surveyed is natural forest. Forest cover is much higher in the north-central part of the watershed, in particular along the Lake Iroquois Shoreline between 5th Concession and Highway 7. This drops off drastically to the south and in the far northern part of the watershed where soils are more conducive to agriculture. Mature and mid-aged forest covers the Lake Iroquois Shoreline, including the Kinsale Raised

Shoreline ANSI which forms a distinct hill feature along the eastern border of the watershed. Mature woodlots are widely scattered through the remainder of the watershed and along the ravines formed by Carruthers Creek and its tributaries.

Ravine slopes with a northern or eastern aspect and some tablelands on sandier soils in the vicinity of the Lake Iroquois Shoreline are cooler and often fairly moist. Forests here have a larger coniferous component, with white cedar (*Thuja occidentalis*) and sometimes eastern hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*). Associated communities with significant cover include Fresh-Moist White Cedar Coniferous Forest (FOC4-1), Fresh-Moist White Cedar–White Pine Coniferous Forest (FOC4-A), Fresh-Moist White Cedar–Sugar Maple Mixed Forest (FOM7-1), and Fresh-Moist Hemlock–Sugar Maple Mixed Forest (FOM6-1). There are 20 different coniferous and mixed forest types in all, covering 81 hectares.

The warmer south-facing slopes and fertile tableland woodlots have deciduous forest cover. There are 12 sugar maple (*Acer saccharum* ssp. *saccharum*) forest types with various hardwood co-dominants covering 69 hectares or 7.2% of the total natural cover. Sugar maple forest is one of the major communities in southern Ontario, so this value shows it somewhat underrepresented in the Carruthers watershed. (By way of contrast, TRCA surveys in the Rouge National Urban Park showed 13.3% of its total natural cover as sugar maple forest. Fresh-Moist Sugar Maple–Hardwood Deciduous Forest (FOD6-5) is the single largest type, at 22.9 hectares. A few of the mature forest communities are dominated by red oak (*Quercus rubra*) or beech (*Fagus grandifolia*).

Younger forest types with shade-intolerant trees cover 69 hectares (7.1% of the natural cover). These types make up most of the forest cover in the area south of Taunton Road. Much of this is bottomland forest which is dominated by stands of red ash (*Fraxinus pennsylvanica*), crack willow (*Salix x fragilis*), poplars (*Populus* spp), hawthorn (*Crataegus* spp), and Manitoba maple (*Acer negundo*). The corresponding ELC vegetation types are Fresh-Moist Ash Deciduous Forest (FOD7-2), Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3), Fresh-Moist Poplar Deciduous Forest (FOD8-1), Fresh-Moist Hawthorn–Apple Deciduous Forest (FOD7-E), and Fresh-Moist Manitoba Maple Deciduous Forest (FOD7-a).

Plantations cover 64 hectares (6.6% of the natural cover). They are roughly evenly divided between north and south of Taunton Road but are quite different in character. South of Taunton Road, most of the plantation is composed of young plantings around stormwater ponds and in recently dedicated parkland in relatively new subdivisions. These are Mixed Restoration Plantation (CUP2-A) with some Deciduous Restoration Plantation (CUP1-A) and Coniferous Restoration Plantation (CUP3-A). These sites are dominated by native trees such as white pine, white spruce (*Picea glauca*), silver maple (*Acer saccharinum*), and basswood (*Tilia americana*). They are generally less than 10 years old and do not have canopy closure. North of Taunton Road, there is more coniferous plantation, often a blend of native and non-native conifers such as Norway spruce (*Picea abies*). These are associated with old farm yards, fencerows, golf course landscape plantings, and most notably a property west of Westney Road (Duffins Creek watershed) which

was a nursery business in the 1970s (block 'O' in the 2016 TRCA survey). The most common plantation type is Mixed Conifer Coniferous Plantation (CUP3-H).

Successional semi-woody habitat covers 193 hectares (19.9% of the surveyed land), scattered across the tablelands, bottomlands, and ravines between patches of forest. They result mostly from natural regeneration of abandoned agricultural land. Abundant types (*i.e.*, covering more than 20 hectares) include Exotic Successional Woodland (CUW1-b), Native Deciduous Successional Woodland (CUW1-A3), Hawthorn Successional Woodland (CUW1-D), and Buckthorn Deciduous Thicket (CUW1-b). Dominant tree species include ash, poplar, and willow. Communities where hawthorns or apple trees (*Malus pumila*) are prevalent (*e.g.*, CUW1-D, CUS1-1) are interesting cases and notably prominent in the mid- to lower parts of the watershed, particularly between Rossland Road and Kingston Road (block 'J' in the 2015 TRCA survey: Map 6c). If hawthorn–apple communities with enough canopy closure to be considered 'forest' (FOD4-D, FOD7-E) are included, such vegetation types cover 44.1 hectares (Figure 1), and indicate that cow pasture was one of the previous land uses (Marks 2001).



Figure 1: Fresh-Moist Hawthorn–Apple Forest (FOD7-E): note ground layer of starry false Solomon's seal (*Maianthemum stellatum*) (photo TRCA 2015)

Wetlands and aquatic communities are a major component of Carruthers Creek watershed and comprise almost all of the designated natural features in Table 1. Wetlands occupy 228 hectares, while vegetated aquatic communities occupy 40 hectares. Together they account for more than 25% of the total natural cover. Two-thirds of the wetlands are in the southern part of the watershed, particularly in the Carruthers Creek Wetland Complex, close to Lake Ontario (blocks 'L' and 'M' in the 2015 TRCA survey, map 6c). However, there are significant amounts of wetlands across watershed, 51 wetland communities are recorded, including the Salem Road Wetland Complex north of Taunton Road.

Treed swamp occupies 102 hectares, with largest concentration in the Carruthers Creek Wetland Complex, however there is also a large patch in the Rossland Road Wetland Complex south of Rossland Road and west of Salem Road (block 'I' in the 2015 TRCA survey). Red Ash Mineral Deciduous Swamp (SWD2-2) is by far the most prominent treed swamp type at 58 hectares, mostly in the Carruthers Creek Wetland Complex. The high prevalence of red ash (*Fraxinus pennsylvanica*) makes these communities vulnerable to drastic alteration with the arrival of emerald ash borer (EAB) which is killing ash trees at a tremendous rate.

Coniferous and mixed swamp covers 24 hectares in total, associated with the presence of groundwater and scattered across the watershed, with a slight association with the Lake Iroquois Shoreline. Most of this is White Cedar–Hardwood Mineral Mixed Swamp (SWM1-1) and White Cedar–Hardwood Organic Mixed Swamp (SWM4-1), the latter of which is found in the Rossland Road Wetland Complex. There are smaller amounts of White Cedar Mineral Coniferous Swamp (SWC1-1), White Cedar–Conifer Mineral Coniferous Swamp (SWC1-2), White Cedar Organic Coniferous Swamp (SWC3-1), and Birch–Conifer Organic Mixed Swamp (SWM6-1).

Thicket swamp occupies 23 hectares, approximately equally divided between the northern and southern halves of the watershed, largely Willow Mineral Thicket Swamp (SWT2-2) and Red-osier Mineral Thicket Swamp (SWT2-5). There is a small amount of Red-osier Organic Thicket Swamp (SWT3-5) in the north and Nannyberry Mineral Thicket Swamp (SWT2-10) in the south near Carruthers Marsh.

There are 55 hectares of shallow marsh and 40 hectares of meadow marsh in the watershed. Significant concentrations of shallow marsh occur in the coastal Carruthers Marsh and slightly inland at Ajax Warbler Swamp. Meadow marsh is more widely distributed northwards, along swales, and the margins of stormwater and golf course ponds.

Cattail (*Typha*) marshes are the most abundant marsh types, with 44 hectares recorded. There is a large patch of Broad-leaved Cattail Organic Shallow Marsh (MAS3-1A) at Ajax Warbler Swamp, which covers 18 hectares. This community was originally a Poplar Organic Deciduous Swamp (SWD7-1) when first surveyed in 2003 (TRCA 2004). However, beaver arrived in 2010 and dammed it (Leadbeater 2015). It was flooded until 2013 when the beaver vacated the premises and the pond drained. Overflow from a stormwater pond which blew out also contributed to the flooding. This part of Ajax Warbler Swamp could not be surveyed in detail in 2015 due to treacherous, mucky soil conditions. But it seemed to be dominated by a mix of tickseeds (*Bidens*

spp.), broad-leaved cattail (*Typhalatifolia*), and rice cut-grass (*Leersia oryzoides*) (Figure 2), almost all trees were dead. Narrow-Leaved Cattail Mineral Shallow Marsh (MAS2-1b) is also abundant (17 ha) dominated mostly by hybrid cattail (*Typha x glauca*) followed by species such as narrow-leaved cattail (*Typhaangustifolia*), reed canary grass and jewelweed (*Impatiens capensis*). It is the predominant type in the coastal Carruthers Marsh, and is scattered throughout the watershed in pond edges, along riverbanks, and in disturbed seeps. Common Reed Mineral Meadow Marsh (MAM2-a) and Reed Canary Grass Mineral Meadow Marsh (MAM2-2) occupy 13 and 15 hectares respectively.

It is evident that invasive species such as reed canary grass, the non-native cattail hybrid, and common reed (*Phragmites australis* ssp. *australis*) play a prominent role in the watershed's marshes. Forb Mineral Meadow Marsh (MAM2-10) occupies 15 hectares, common species associated with this community include panicled and swamp asters (*Symphotrichum lanceolatum* var. *lanceolatum* and *S. puniceum*) and spotted Joe-Pye weed (*Eupatorium maculatum*). Other marsh types occupy only small amounts of land, including Forb Mineral Shallow Marsh (MAS2-9), Bluejoint Mineral Meadow Marsh (MAM2-1), Narrow-leaved Sedge Mineral Meadow Marsh (MAM2-5), Broad-leaved Sedge Organic Meadow Marsh (MAM3-6), and Bur-reed Mineral Shallow Marsh (MAS2-7).



Figure 2: Ajax Warbler Swamp, now a cattail marsh after a period of flooding (photo TRCA 2015)

Some of the most interesting wetlands in Carruthers Creek watershed are the seepage fens which have a very high concentration of flora species of conservation concern. They are very small, with a total of 1.3 hectares recorded. There are four types: Mineral Fen Meadow Marsh (MAM5-1), Willow Shrub Mineral Fen (FES2-A), White Cedar Treed Mineral Fen (FET2-A), and White Cedar–Scots Pine Mineral Treed Fen (FET2-B). Almost all fen habitat is found along the Lake Iroquois Shoreline between 5th Concession and Highway 7 (Block ‘G’ in the 2015 survey). There is also a tiny polygon of Mineral Fen Meadow Marsh close to Lake Ontario on the west side of the creek, and fen-like conditions occur around an old aggregate pit near Salem Road north of Rosland Road (Block ‘H’ in the 2015 survey) (Map 6c).

Organic wetlands occupy 34 hectares of the total 228 hectares of wetland. There are 13 types, spanning a range of swamps and marshes (Appendix 2). The paucity of organic soils reflects the fact that most of the wetlands in the watershed are lacustrine (lake connected) or riverine (stream connected), and hence subject to energy and erosion. Almost all of the organic soils are

associated with the Ajax Warbler Swamp and the Rossland Road Wetland, which appear to be more isolated from major flows and are likely kettle depressions.

Aquatic communities cover 42 hectares. Aquatic communities with submergent vegetation account for 40 hectares. The Carruthers Marsh coastal lagoon has a fringe of Pondweed Submerged Shallow Aquatic (SAS1-1) with small patches of Water Lily–Bullhead Lily Mixed Shallow Aquatic (SAM1-A). In addition, numerous constructed ponds occur throughout the watershed from Lake Ontario to the headwaters, and most are vegetated, including ponds at Deer Creek Golf Course north of Taunton Road, and many stormwater ponds south of Taunton Road in recent residential subdivisions. The prevalence of aquatic macrophytes in the stormwater ponds may be due to groundwater inputs that maintain water quality and cooler temperatures (Leadbeater 2015).

Dynamic communities (*i.e.*, those subject to fire, erosion, and other dynamic processes) account for only 4 hectares of the surveyed watershed and include a beach complex at the mouth of Carruthers Creek which extends outside the watershed study area along the lakeshore, to the west. Within the watershed study area, the beach includes 3 communities covering 0.5 hectares, including Sea Rocket Open Sand Beach (BBO1-1). Due to the low topography and sluggish character of Carruthers Creek, there are no riparian bar communities and almost no bluffs.

There are seven different vegetation communities associated with barrens and woodlands in Carruthers Creek watershed mostly associated with the Lake Iroquois Shoreline, these are very small fragments totalling 3 hectares. They range from Red Oak Non-tallgrass Woodland (CUW1-2) to Forb Sand Barren (SBO1-A). Some of these communities would have been historically burned, though probably not for many decades, while many of the barrens seem to result from old aggregate pits. There are also some Fresh-Moist Tallgrass Prairie Plantings (TPO2-A) around stormwater ponds. True fully-developed tallgrass habitats are absent from Carruthers Creek, however some associated species of concern occur sporadically.

Meadow areas, covering 188 hectares of surveyed land, are distributed across the watershed. Recently planted fields considered meadows in the original OMNRF ELC are currently classified as pioneer plantations in TRCA's modification of the ELC protocol and not included in this calculation. Native Forb Meadow (CUM1-A) is the most prevalent, covering 99 hectares, dominated by species such as goldenrods (*Solidago* spp.), asters (*Symphyotrichum* spp.), and common milkweed (*Asclepias syriaca*). Exotic Cool-season Grass Meadow occupies 58 hectares. Exotic forb meadow (CUM1-c), dominated by invasive species such as dog-strangling vine (*Cynanchum rossicum*), covers 31 hectares.

Non-native species are prominent in the successional, meadow, and plantation areas, extending into the less mature forest types, and therefore affecting much of the natural cover in the watershed. Only the mature forests and a few wetlands, particularly fens, are relatively free of invasive non-native species.

4.4.2 Vegetation Communities of Concern

The vegetation communities in TRCA's jurisdiction are scored and given a local rank from L1 to L5 based on the two criteria mentioned in Section 3.0: abundance and geo-physical requirements. Communities with a rank of L1 to L3 are considered of regional conservation concern in the jurisdiction, while L4 communities are considered of concern in the urban portion of the jurisdiction. Community ranks do not take into account the intactness or quality of individual examples of communities, thus, a common type of vegetation community may be of interest at a particular site because of its age, intact native ground layer, or other considerations aside from rank.

There are 49 different vegetation community types of regional conservation concern in Carruthers Creek watershed, though they are often quite small and scattered (Maps 12a and 12b). They are well-distributed across the watershed, accounting for about 6% of the natural cover total area. Another 28% of the natural cover across the watershed is made up of L4 communities. Interestingly, the northern portion of the watershed has more exotic-dominated communities (Ranked L+), while the more urbanised south has more L5 communities. This anomaly may be due to the prevalence of native hawthorns in the successional areas farther south, and the dominance of European cool-season grasses in meadow areas in the actively agricultural matrix north of Highway 7. It does not necessarily signify that the northern half of the watershed has a more severe invasive exotic problem.

The highest-ranking communities (L2) fall into several categories, with the coastal (beach), sand barren, and fens being the most prominent. L3 communities include 10 forests, 3 semi-open woodlands or barrens, 3 beach or bluff, 19 wetlands, and 2 aquatic.

The beach communities occupy a very small area at the mouth of Carruthers Creek. They include the sand spits that separate the Carruthers Marsh lagoon from Lake Ontario, where there are three communities: Sea Rocket Open Sand Beach (BBO1-1), Willow Shrub Beach (BBS1-2A), and Treed Beach (BBT1-A). The beach community extends west out of the watershed, where there is a successful dune planting. True dunes are absent from the lagoon-spit complex, which is a mostly treed beach subject to flooding.

Sand barrens occur along Lake Iroquois shoreline deposits between Highway 7 and Rossland Road. They are found where disturbance, often from old aggregate pits and in one case from an abandoned railway line, has caused removal of the topsoil and erosion. A good example is found north of Rossland Road (Figure 3).



Figure 3: Treed Sand Barren (SBT1) at old gravel pit (photo: TRCA 2015)

An interesting dynamic community is the Red Oak Non-tallgrass Woodland (CUW1-2), which occurs in two small patches adjacent to lower Carruthers Creek and Carruthers Marsh. These areas are surrounded by wetlands and lowland forest, have the typical silty and clayey soils of the Ajax-Whitby Clay Plain, and yet are dry and well-drained because they are on a slight elevation above the surrounding landscape. Although they do not have the specific tallgrass species such as big bluestem (*Andropogon gerardii*), they do have certain oak woodland indicator species in the shrub and ground layer, and likely had fires in the distant past (see section 4.5.4). The two sites are adjacent to navigable water, sheltered, and dry, and may have been attractive locations for First Nations camps. This community was named “Dry Red Oak Cultural Woodland” in the original OMNRF ELC but the name provided in TRCA’s modification of the protocol better describes its character and significance since it has a more native than post-agricultural character.

The forest communities of regional concern are mostly associated with sandy loams on the Lake Iroquois Shoreline. These include Dry-Fresh White Pine–Oak Mixed Forest (FOM2-1), Dry-Fresh Oak–Red Maple Deciduous Forest (FOD2-1), Fresh-Moist Paper Birch Mixed Forest (FOM8-2),

and Fresh-Moist Sugar Maple–Yellow Birch Deciduous Forest (FOD6-3). In 2015, an unusual forest association was discovered for the first time in TRCA: Fresh-Moist Beech–Hardwood Deciduous Forest (FOD9-D). This was situated on moist sandy clay in the north end of the watershed near 7th Concession. Vernal pools were observed, and the main tree species were beech (*Fagus grandifolia*) and ironwood (*Ostrya virginiana*).

Wetlands with high conservation ranks (L2 to L3) include the seepage fens, mainly along the Lake Iroquois shoreline, as well as several marshes and swamps with organic soils (Appendix 2). There is a large patch of Broad-leaved Cattail Organic Shallow Marsh at Ajax Warbler Swamp and several small areas of organic swamp and marsh in the headwaters. The Rossland Road Wetland Complex has a fairly large patch of White Cedar–Hardwood Organic Mixed Swamp (SWM4-1) (rank L4). Small areas of higher sensitivity wetland communities such as Bluejoint Mineral Meadow Marsh (MAM2-1) and Broad-leaved Sedge Mineral Shallow Marsh (MAS2-4) occur along the lower reaches and in the coastal Carruthers Marsh. Nineteen of the 51 wetland types have a rank of L2 to L3. These wetlands have a high sensitivity to hydrological changes, nutrient and sediment loading, which tends to alter them toward invasive-dominated types such as Reed Canary Grass Mineral Marsh (MAM2-2) or Hybrid Cattail Mineral Shallow Marsh (MAS2-1b). Coastal wetlands are highly sensitive to lake level fluctuations, eutrophication, and sediment loads in addition to disturbance by carp (*Cyprinus carpio*). The Hybrid Cattail Marsh is now the dominant community in the Carruthers Marsh, along with extensive areas of open water.

Bladderwort Mixed Shallow Aquatic (SAM1-6) has a rank of L2 and was found at Deer Creek Golf Club, while Pondweed Mixed Shallow Aquatic (SAM1-4) occurred in several ponds. There are also 8 vegetated aquatic communities which are moderately resilient (having a rank of L4) but nonetheless sensitive to inputs of sediments and nutrients which can increase turbidity. It remains to be seen how long these vegetated aquatic communities can persist in stormwater ponds.

4.5 Flora Species Findings for Carruthers Creek Watershed

4.5.1 Flora Species Representation

Carruthers Creek watershed had a total of 935 species of vascular plants recorded from 2002-2016 (Appendix 2 and summarised in Table 4). These include 845 naturally-occurring species and 90 planted species. Excluding plantings, this represents approximately 45% of all vascular plants known to have occurred in TRCA jurisdiction. Of all the naturally occurring species, 484 are native (57%) and 361 are non-native (43%).

Given the size of the watershed, this is very high plant species richness. It is comparable to the data collected by TRCA in the Rouge National Urban Park, which had 971 species. The high floristic diversity of the watershed is largely related to the mix of mature and younger forests, sporadic sand barrens, and especially the range of wetlands. The combination of Lake Iroquois Shoreline and coastal clay plain/wetland habitats helps to increase the number of flora species.

Table 5: Summary of flora species, Carruthers Creek watershed (North and South)

| Count of Species | North | South | Total |
|---|-------|-------|------------|
| Total species | 803 | 740 | 935 |
| Naturally-occurring species | 738 | 681 | 845 |
| Planted only species | 65 | 59 | 90 |
| Native species (excluding plantings) | 433 | 395 | 484 |
| Non-native species (excluding plantings) | 305 | 286 | 361 |
| Number of L1 - L3 species (excluding plantings) | 115 | 91 | 153 |
| Number of L4 species (excluding plantings) | 144 | 132 | 155 |

4.5.2 Flora Species of Concern

Of the 845 naturally occurring flora species recorded, there are 153 (18%) vascular plant species of regional conservation concern (rank L1 to L3). This places Carruthers Creek watershed in the upper mid-range of TRCA sites for sensitive flora. By comparison, the TRCA data from Rouge National Urban Park, one of our most concentrated sites of similar size for sensitive flora, has 233 species of regional conservation concern. An additional 155 species are ranked L4 and these have intermediate sensitivity (see description of ranks in Section 3.0). Flora of concern are well-distributed between the northern and southern halves of the watershed (Table 4) with “hot spots” associated with the Lake Iroquois Shoreline, Carruthers Marsh, Ajax Warbler Swamp, and a few woodlots in the headwaters north of Highway 7 (Maps 13a and 13b). The ranks are based on sensitivity to human disturbance associated with development, habitat dependence, as well as rarity (TRCA 2010). In most cases, the species are not currently rare but are at risk of long-term decline due to the other criteria. The following discussion of sensitive flora and their conservation biology follows that of the criteria used to assess L-rank, starting with rarity and decline. The other criteria of habitat dependence and sensitivity to development help to explain species sensitivity and can be used to plan recovery from, or prevention of, declines.

4.5.3 Rare Flora and Population Trends

Loss of native biodiversity is a large concern for the entire TRCA jurisdiction (TRCA 2007a). In addition, Carruthers Creek watershed marks the eastern border of TRCA jurisdiction and forms a link between Lake Ontario, the provincial Greenbelt, Duffins Creek watershed to the west and Lynde Creek watershed to the east. Given the habitat fragmentation of the lands in TRCA’s jurisdiction, it is a challenge to maintain viable populations of sensitive plant species, particularly populations that are capable of weathering unfavourable periods and dispersing across the landscape. Even large blocks of greenspace such as the nearby Rouge River valley, with its large preserved landscapes, has lost many sensitive species in the past few decades (TRCA 2016b).

4.5.3.1 Current Conditions

There are 30 plants ranked L1 to L3 which score 4 or 5 for local occurrence (Appendix 2) and are regionally rare (found in 6 or fewer of the forty-four 10x10 kilometre grid squares that cover TRCA jurisdiction). In fact, there are 4 species in Carruthers Creek watershed believed to occur nowhere else in the TRCA jurisdiction (Table 6).

Table 6: Identified TRCA flora species believed to be found only in Carruthers Creek watershed

| Scientific Name | Common Name | L Rank |
|--------------------------------|----------------------------|--------|
| <i>Sagittaria rigida</i> | sessile-fruited arrow-head | L2* |
| <i>Eleocharis quinqueflora</i> | few-flowered spike-rush | L2‡ |
| <i>Rosa palustris</i> | swamp rose | L2 |
| <i>Equisetum x litorale</i> | shore horsetail | L3 |

*Originally assigned a rank of 'LX', extirpated, until rediscovered in 2015

‡Observed in 2001 (prior to 15-year record of current occurrences)

All four species are associated with wetlands, the first two specifically with coastal wetlands. Their local rarity is due to the disruption of wetlands, especially coastal wetlands, by urbanization shoreline stabilization, and water level regulation. The sessile-fruited arrow-head was thought to be extirpated from TRCA jurisdiction until it was found at Carruthers Marsh in 2015 (Figure 4). The last sighting for this species was at Grenadier Pond in High Park in 1949 (Varga 2008a). It was also historically recorded at Toronto Island in 1913 (Faull 1913, Varga 2008b). Few-flowered spike rush had been observed on Toronto Island as recently as 1978 (Varga 2008b). It was then seen at Carruthers Marsh in 2001. However, this is a cryptic species, which appears on exposed shorelines at times of low water. It is reasonably likely to still occur at Carruthers Marsh and may exist at other coastal wetlands.



Figure 4: Sessile-fruited arrow-head (*Sagittaria rigida*) Carruthers Marsh (photo TRCA 2015)

Swamp rose was found at Ajax Warbler Swamp in 2015, and this record seems to be the last naturally-occurring population in TRCA jurisdiction, at least some plants escaped the beaver flooding event (Figure 5). It had been seen at an undisturbed offline oxbow marsh in the Rouge Marshes in 1988 but could not be found there in 2009. It has also been seen at Creditview Wetland in the Credit Valley Conservation Authority jurisdiction (Varga 1999). Swamp rose, however, is planted in several restoration projects across the TRCA jurisdiction (e.g., Nordheimer Ravine).

Shore horsetail is a rare hybrid between two much more common horsetail species: field horsetail (*Equisetum arvense*) (L5) and water horsetail (*E. fluviatile*) (L3). It was found in a seepage marsh in the headwaters of Carruthers Creek in 2009.

Eight other species are known from only one or two other locations in TRCA jurisdiction. One of these, conspecta hawthorn (*Crataegus coccinioides*) was identified from a fall specimen and photo by a hawthorn taxonomist (Talent, 2017). This identification, however, cannot be certain without a spring specimen collection. Conspecta hawthorn, like the sessile-fruited arrow-head, is only known in TRCA from a historic record in the City of Toronto of indeterminate date (Varga *et al.* 2001). However, it is the sort of plant that can easily be overlooked and underreported.



Figure 5: Swamp rose (*Rosa palustris*), Ajax Warbler Swamp (photo: TRCA 2015)

There is one federally and provincially designated flora Species at Risk in Carruthers Creek watershed: butternut (*Juglans cinerea*), which is considered endangered (COSEWIC 2014). Butternut trees are being severely attacked across the host range by the pathogen, butternut canker (*Sirococcus clavigignenti-juglandacearum*). The canker is an invasive alien species threatening the long-term viability of butternut. Butternut is still fairly common in TRCA jurisdiction, but almost all surveyed trees show signs of the canker.

Regionally rare species are found in a variety of habitats reflecting the varied conditions (see Section 4.5.4). While wetland species are most prominent, rare upland species also occur. For example: slippery elm (*Ulmus rubra*) and purple-tinged sedge (*Carex woodii*) were in woodlots; while swamp dewberry (*Rubus hispidus*) and perennial evening-primrose (*Oenothera perennis*) were in moist, sandy field edge habitats.

4.5.3.2 Population Trends

There is considerable evidence that sensitive flora have been declining in supposedly protected habitats in TRCA jurisdiction (TRCA 2016a), as well as in protected areas in other urban areas such as Boston (Primack *et al.* 2009). For example, in Rouge National Urban Park south of Steeles Avenue, 39 of 272 L1-L3 flora species apparently disappeared between 1973 and 2014, a decline of 14% (TRCA 2016b).

There are insufficient data for Carruthers Creek watershed to track changes in flora, although it is likely that the area is subject to the same trends as other urban and near-urban natural areas. However, one species of orchid, small purple-fringed orchis (*Platanthera psycodes*), has almost certainly vanished from the watershed (and TRCA jurisdiction) in the last 25 years (Leadbeater 2015). It was last seen at Ajax Warbler Swamp in the early 1990s but probably eliminated during the flooding episode of 2010-2013 if not earlier. The first TRCA surveys were in the early 2000s, and several of the species seen then were not observed in 2015-2016. These species could have been overlooked or were in areas that were not re-surveyed (e.g., ground-cedar, *Diphasiastrum digitatum*). Spotted St. John's-wort (*Hypericum punctatum*) may have disappeared, since it was in oak woodland near Carruthers Marsh that was thoroughly surveyed in both 2001 and 2014. This species has a definite paucity of recent records in TRCA jurisdiction.

Floristic declines observed in urban and near-urban nature reserves appear to have complex origins, involving factors such as climate change, invasive species, atmospheric deposition, and subtle changes in land-use which alters the habitat (Primack *et al.* 2009).

4.5.4 Flora Species Habitat Dependence

All 153 flora species of concern found in Carruthers Creek watershed can be considered habitat specialists, scoring 3 or more out of a possible 5 points for *habitat dependence* (Maps 14a and 14b). (Some habitat specialists may not be of regional conservation concern if the other criteria used in the ranking indicate that they are abundant and are resilient to urban disturbances). Habitat specialists are those which are found in 7 or fewer vegetation cohorts (a "cohort" is grouping of similar vegetation types: for example, all sugar maple forest vegetation types form one cohort) (TRCA 2010). Specialist species will not readily recover or colonize new areas when these habitats are lost or altered. This is particularly a concern when the habitats themselves are scarce, as is the case with beach, sand barren or seepage fen. There are many different types of habitat in the watershed from coastal beach to upland oak forest. The largest groupings of habitat specialists are in wetlands (which include marsh, especially coastal marsh; seepage fens; treed or thicket swamps; and vegetated aquatic habitats). Wetlands account for almost 75 of the species of concern. The greatest numbers of specialists are in marsh and swamp (about 30 species each) with the highest densities of species records in the seepage fen communities, which are small and densely packed (Maps 14a and 14b). About 11 species are seepage fen specialists, though there is overlap with other communities. Some examples include twig-rush (*Cladium mariscoides*), in a fen-like thicket swamp in the Rossland Road Wetland Complex, and shining ladies'-tresses (*Spiranthes lucida*), in an old aggregate pit (Figure 6).



Figure 6: Shining ladies'-tresses (*Spiranthes lucida*), in seepage fen (photo TRCA 2015)

Marsh species are most prominent in Carruthers Marsh, with a few inland representatives. The most noteworthy find is the sessile-fruited arrow-head. Other examples of marsh specialists include dotted smartweed (*Persicaria punctata*), marsh water starwort (*Callitriche palustris*), and water sedge (*Carex aquatilis*).

There are 30-35 species which can be considered swamp specialists. Along with swamp rose, examples include richweed (*Collinsonia canadensis*), royal fern (*Osmunda regalis*), and fringed sedge (*Carex crinita*). The treed swamps tend to be fern and sedge rich.

Aquatic species found only in the coastal lagoon include horned pondweed (*Zannichellia palustris*) and bullhead lily (*Nuphar variegata*). Constructed ponds at Deer Creek Golf Club and even some stormwater ponds with a small catchment area and light contaminant loads have such unexpected macrophytes as floating-leaved pondweed (*Potamogeton natans*) and northern water-milfoil (*Myriophyllum sibiricum*).

The sand barren areas along the Lake Iroquois Shoreline include about 10 species of concern such as slender panic grass (*Dichanthelium linearifolium*), red-seeded sedge (*Carex tonsa* var. *rugosperma*), and tower mustard (*Turritis glabra*). There are also around 10 species which seem to occur on moist open sandy areas, almost an ecotone between sand barren, seepage fen and meadow. The low fertility combined with some moisture and open ground supports species like fringed and bottle gentian (*Gentianopsis crinita* and *Gentiana andrewsii*), narrow-leaved mountain-mint (*Pycnanthemum tenuifolium*), Canada St. John's-wort (*Hypericum majus*), and straw-coloured umbrella-sedge (*Cyperus strigosus*). Such moist open sand was also where TRCA biologists found the swamp dewberry; the only other extant location in TRCA is in a kettle wetland at Ken Park in Brampton, near Heart Lake.

A few plants are restricted to the beach at the mouth of Carruthers Creek. Two beach species actually fall within the watershed study area: sea-rocket (*Cakile edentula*) and smaller evening-primrose (*Oenothera parviflora*). Other beach species occur west of the study area boundary.

The remnant patches of oak woodland near Carruthers Marsh also have dry, semi-open conditions (although in this case not very sandy). This is where populations of running serviceberry (*Amelanchier spicata*), spotted St. John's-wort, and Pennsylvania sedge (*Carex pennsylvanica*) are found. There is a slight chance that the serviceberry was planted, as other planted trees and shrubs are in the vicinity, but the serviceberry was surrounded by native species and this particular serviceberry is not commonly cultivated.

At least 40 flora species of concern are forest plants, even though forest cover in the watershed is not particularly high. Male fern (*Dryopteris filix-mas*) was found on a dry deciduous slope, while silvery glade fern (*Deparia acrostichoides*) was in a moist cedar forest. One sugar maple woodlot on the north side of Highway 401 (block 'K' in the 2015 survey) has a particularly rich assemblage of spring ephemerals such as wild leek (*Allium tricoccum*), squirrel-corn (*Dicentra canadensis*), and narrow-leaved spring-beauty (*Claytonia virginica*). The saprophyte Indian pipe (*Monotropa uniflora*) was particularly abundant along the Lake Iroquois Shoreline. Surveys in 2015-2016

included forest patches which extend outside the study area boundary to the west, in Duffins Creek watershed and east in the Lynde Creek watershed. These patches had several ephemeral and other forest species such as wild blue phlox (*Phlox divaricata*), prickly-ash (*Zanthoxylum americanum*) and leatherwood (*Dirca palustris*).

The successional habitats are rich in hawthorns. Three of these are ranked L3: conspecta, glabrate fireberry and Fuller's hawthorns (*Crataegus coccinioides*, *C. chrysoarpa* var. *phoenica* and *C. coccinea* var. *fulleriana*).

Carruthers Creek watershed is in the Great Lakes–St. Lawrence life zone. Nonetheless, there are a couple of Carolinian species: moonseed (*Menispermum canadense*) and southern blue flag (*Iris virginica* var. *shrevei*). On the other hand, balsam fir (*Abies balsamea*) and bluebead lily (*Clintonia borealis*) are both northern species near the southern edge of their natural range. Some of the white spruce (*Picea glauca*) found in seepage areas on the Lake Iroquois shoreline may be natural populations.

4.5.5 Flora Species Sensitivity to Development

Carruthers Creek watershed is subject to increasing levels of impact due to the surrounding urban land uses, especially south of Taunton Road, and its proximity to a large pool of park users. Much of the urban development is very new, built in the past 15 years. These impacts on flora deserve a closer look. All but one of the watershed's 153 flora species of concern are sensitive to development, being vulnerable to at least one kind of disturbance associated with land use changes (Maps 9a and 9b). TRCA has identified 7 impacts affecting flora in the jurisdiction, most of which are deleterious to native flora but a couple of which can benefit some species. The score for sensitivity to development ranges from 1 to 5 (TRCA 2010). Sensitive species score 3 or more, so declines are most likely from multiple factors. These urban stressors are as follows, starting with the most direct physical impacts of people on plants moving to more indirect environmental changes that affect them):

1. Trampling of vegetation
2. Collection of plants for food or ornamental use
3. Increased populations of certain herbivorous animals
4. Loss of natural disturbance regimes or dynamic process such as fire
5. Changes in hydrology
6. Contamination or changes in chemistry due to surface or atmospheric deposition
7. Invasive species (treated in-depth in following section: 4.5.6)

The heavy human traffic in urban parks, especially from ad-hoc trails, results in disturbances caused by trampling and sometimes picking and seed movement. Trampling can slowly wipe out populations of species of concern or enable invasive species to replace more sensitive species which are often less tolerant of compacted soils and repeated trampling. Off-leash dogs, particularly near the waterfront, increase trampling impacts.

Trampling is particularly a problem on the popular beach at the mouth of Carruthers Creek. It can be a serious problem in attractive, mature forest communities, although so far most of these are on private land in the undeveloped north part of the watershed or in employment areas where there is less use of outdoor spaces. Invasive non-native species can be introduced to areas through visitors' footwear and pets. Forest species such as male fern and silvery glade fern (which in this watershed occur in low numbers, near residential subdivisions) are vulnerable to trampling.

The problem is exacerbated in some places, notably the forest and swamp of the Carruthers Forest ESA (block 'M' in 2015), by adjacent residents who expand their backyards into the park, encroach on it with yard waste dumping, trails, and landscaping. On a property near Highway 407 and Westney Road, which was a horticultural business in the 1970s, new introduced species escaped from gardens, such as chocolate-vine (*Akebia quinata*), fern-leaved yarrow (*Achillea filipendulina*), but some of the escapes are well-known invasives such as periwinkle (*Vinca minor*).

A related situation is the collection of plants for transplanting into gardens, edible, or herbal use. The showy Michigan lily (*Lilium michiganense*), and orchids such as smaller yellow lady's slipper (*Cypripedium parviflorum* var. *makasin*) could be subject to collection for gardens. Even less sensitive species such as wild leek (*Allium tricoccum*) (L4) and ostrich fern (*Matteucia struthiopteris*) (L5) can be at risk from wild edibles collectors.

Increased populations of herbivores such as white-tailed deer (*Odocoileus virginianus*) have significant impacts in the watershed. Evidence of deer browse, such as stunted plants or a very thin covering of forest floor plants, was observed in places throughout the watershed. Although deer are active in almost all natural cover patches, the heaviest pressure seems to be in the south end at Ajax Warbler Swamp and nearby forests. Large areas were almost completely denuded (Figure 7).



Figure 7: Extreme deer browse at Ajax Warbler Swamp (photo TRCA 2015)

Palatable species such as bottle gentian, trilliums (*Trillium grandiflorum* and *T. erectum*), and saplings of hemlock (*Tsuga canadensis*) can be heavily affected. Along with deer, smaller herbivores such as grey squirrel (*Sciurus carolinensis*) can affect tree regeneration, although coyotes (*Canis latrans*) help to control populations of smaller mammals and possibly deer fawns.

Some open or semi-open communities require natural disturbance regimes to maintain conditions for certain plants. The best example is the need for fire by species found in dry oak forest openings such as Pennsylvania sedge and running serviceberry. The sand barren species (e.g., perennial evening-primrose: *Oenothera perennis* and hay sedge: *Carex siccata*) in the watershed seem to rely on other forms of disturbance such as excavation and erosion to maintain their open habitat. Similarly, beach species such as sea rocket require active erosion and deposition of lake sands.

Species associated with seepage swamps or cool mixed and coniferous forests on north facing slopes, such as yellow birch, dwarf enchanter's nightshade (*Circaea alpina*), and drooping sedge (*Carex prasina*), are vulnerable to hydrological changes. Such changes can occur from habitat fragmentation, opening small patches to drying winds and sun, as with the highly agricultural areas at the north end of the watershed, and the new industrial development around the main basin of the Rossland Road Wetland Complex (block 'I'). Diversion of water or stream flow regime changes often result from nearby development. Upstream development can add large amounts of sediment to watercourses, and hardened surfaces increase runoff. The cumulative effect of this is changing the landscape of the watershed. Along with beaver activity, development is certainly a significant contributing factor to the alteration of Ajax Warbler Swamp and the likely loss of some of its flora species. Unlike the beaver, the stormwater input is still an active presence.

Contamination by surface or atmospheric deposition can alter plant communities. Urban and agricultural runoff involve nutrient and salt inputs which can affect wetlands and bottomland, notably the coastal Carruthers Marsh and Ajax Warbler Swamp. One source of nutrient input that would affect the entire area as opposed to local point sources is atmospheric nitrate deposition from air pollution, which can affect the hardiness and survivability of native plants adapted to natural conditions of relatively low nitrogen availability (Brys *et al.* 2005, Sauer 1998). The plants found in some of the open areas, such as perennial evening-primrose, hay sedge, and fringed gentian, require low-nutrient soils (*i.e.*, well-leached fine sands). On a more intense but local level, soil disturbance is associated with increased nutrient loading which is natural in floodplain situations but not in upland woodland communities. In general, the increased fertility caused by deposition from air pollution and stormwater runoff favours rapidly-growing invasive exotics and weedy native species at the expense of conservative or sensitive species.

An accentuated source of soil disturbance is the practice of dumping "clean fill" on rural or near urban lands. This occurs in several places along the Lake Iroquois Shoreline section of the watershed (block 'G'), which has unique sandy soils and hydrological features. In one case, it appears that a forest was cleared so that fill could be placed. The result is foreign soil, often clayey, replacing natural habitat, and which may not be suitable for the suite of species adapted to the site. The fill is considered "clean" in that it does not have chemical contaminants, but is decidedly less so when it comes to seeds and other propagules of invasive plants (Figure 8). Where fill projects occur, additional monitoring and management can be undertaken to reduce the potential spread of invasive plants.



Figure 8: Newly deposited fill near Salem Road Wetland Complex. Note the common reed already sprouting (centre) (Photo: TRCA 2015)

4.5.6 Invasive Species

Carruthers Creek watershed has significant infestations of invasive exotic plants. There are numerous exotic species, but only a handful of them become invasive threats to ecosystem integrity. Dog-strangling vine is the most serious invasive upland plant, it dominates the ground layer in a large portion of vegetation community polygons, particularly in successional habitats. Dog-strangling vine is a threat to almost any vegetation community that is not wetland or mature forest, including areas which are not otherwise disturbed. This plant is able to invade and dominate due to its prolific seed production, high seed viability, and competitive growth (TRCA 2008). At present, there are no effective control measures for large populations such as those in southern parts of the watershed, although wick application of glyphosate herbicide can be effective in small areas in order to protect specific populations of sensitive species. The City of Toronto conducts this labour-intensive activity in High Park and elsewhere with some success (TRCA 2008). The best hope to control dog-strangling vine is through a regional biological control program. The leaf-eating moth *Hypena opulenta* was released in 2014 in Ottawa, near Orillia, and caged trials at Scarborough Campus, University of Toronto (on Highland Creek) (Smith 2014). Field trials continue to monitor the efficacy of the biocontrol agent.

Garlic mustard (*Alliaria petiolata*) and dame's rocket (*Hesperis matronalis*) are locally abundant, especially in floodplain forests. These mustard species tend to out-compete native ground

vegetation, especially when combined with other disturbances such as trampling or loss of the soil litter layer. Moneywort (*Lysimachia nummularia*) and Himalayan balsam (*Impatiens glandulifera*) are emerging as invasive species with similar habits, and occur sporadically. As with dog-strangling vine, control of large populations is generally not feasible. However, biological control is promising in the medium term, and one weevil already present in southern Ontario appears to be spontaneously adapting to attack garlic mustard (Yates and Murphy 2008).

European buckthorn (*Rhamnus cathartica*) is abundant throughout the watershed, especially south of Taunton Road. It tends to out-compete native successional shrubs and small trees such as hawthorns or Canada plum (*Prunus nigra*), and takes advantage of increased light when emerald ash borer (*Agrilus plannipennis*) kills ash trees. Shrub honeysuckle (*Lonicera x bella* complex) and autumn-olive (*Elaeagnus umbellata*) are having a similar effect on a lesser scale.

Oriental bittersweet (*Celastrus orbiculatus*) is sporadically distributed across Carruthers Creek watershed. This woody vine is abundant at a few locations in east Toronto (TRCA 2012). It may have colonised from ornamental plantings at Deer Creek Golf Course and has the potential to become a major problem. Oriental bittersweet is closely related to the native American bittersweet (*Celastrus scandens*), an L3 species, but is more aggressive. The two species hybridize, and the invader's genes dominate.

Certain ornamental plants have spread from old properties or estates, most notably Giant hogweed (*Heracleum mantegazzianum*) which is found on the old horticultural nursery property on the northwest border of the study area (block 'O'). The population is in East Duffins Creek subwatershed, which is in the Carruthers Watershed Plan study area. This plant is a serious emerging invasive species, which also causes skin burns when sap contacts skin exposed to sunlight. Other horticultural species that become invasive include lily-of-the valley (*Convallaria majalis*), goutweed (*Aegopodium podagraria*), periwinkle (*Vinca minor*), and possibly chocolate-vine. These species are entering the forest ground layer near residential backyards, old farmyards, and campsites. There is a high risk that these will continue to spread and further disrupt the biodiversity of high quality habitats. Likewise, Norway maple (*Acer platanoides*) and multiflora rose (*Rosa multiflora*) originating from horticultural plantings move into native forests in the ravine and tablelands. Multiflora rose is now abundant in parts of Carruthers Creek watershed, particularly in moist riparian woodlands and successional areas.

Wetlands in Carruthers Creek watershed have their own suite of invasive species. Common reed is by far the worst, spreading into wetlands and moist areas from roadside ditches, excavations and fill dumps. About 15 hectares of the surveyed area are effectively a common reed monoculture. There are also occasional patches of eulalia (*Miscanthus sacchariflorus*). Common reed is a threat to wetland areas and many coastal wetlands and other wetland projects throughout TRCA jurisdiction. Purple loosestrife (*Lythrum salicaria*) has been reduced by beetles introduced for biological control purposes, although there are sporadic surges in population when beetle numbers are down. Hybrid cattail (*Typhectares x glauca*) has largely replaced native broad-leaved cattail (*T. latifolia*) in Carruthers Marsh and elsewhere, largely the result of disturbance and

increased nutrients. Floating-heart (*Nymphoides peltata*), an aquatic ornamental with invasive potential, is present in ponds on the old nursery property.

Invasive pests and diseases are another concern. These pathogens range from emerald ash borer (*Agrilus plannipennis*) to Dutch elm disease (*Ophiostoma* spp). Emerald ash borer is likely to have a huge impact, rivalling that of dog-strangling vine. Red ash (*Fraxinus pennsylvanica*) is the most abundant tree in large parts of the watershed, especially in the south. For example, Fresh-Moist Ash Deciduous Forest (FOD7-2) and Red Ash Mineral Deciduous Swamp (SWD2-2) together occupy 75 hectares (Figure 9). These habitats will be heavily altered. The drastic canopy opening will release many of the invasive species already present in and nearby these sites. In particular, deciduous swamps now dominated by red ash are likely to degrade into open areas dominated by reed canary grass, common reed, and buckthorn.



Figure 9: Fresh-Moist Ash Deciduous Forest (FOD7-2) at Carruthers Creek, likely to become scarce soon due to attack by emerald ash borer (photo: TRCA 2015)

Butternut canker is the sole reason for butternut being identified as an endangered species, this threat overwhelms the fact that butternut is otherwise a resilient habitat generalist.

4.5.7 Plantings

Carruthers Creek watershed has numerous plantings. Twenty-two native species occur only as plantings; of these, 11 seem to be established and regenerating. The types of plantings, however, differ considerably. There are two main types of planting observed: a) traditional reforestation plantings consisting largely of a few species of mainly coniferous trees, and b) more recent ecological restoration type plantings which include a wide range of prairie and wetland species, as well as some trees and shrubs.

Traditional reforestation plantings can be found throughout the watershed, but are concentrated north of Taunton Road and associated more with the rural landscape. They mostly were planted prior to 1990 and are comprised of conifers such as Scots pine (*Pinus sylvestris*), white pine, white spruce, and Norway spruce. A few deciduous trees such as Carolina poplar (*Populus x canadensis*) and black locust (*Robinia pseudacacia*) may be intermingled. Although less diverse than the more recent restoration plantings, the conifer plantations cover a larger area and have more complete forest-like canopy closure. Some of the plantations at the old nursery property (block 'O') have a high proportion of exotic ornamental species such as Austrian pine (*Pinus nigra*) and lilac (*Syringa* spp).

Restoration plantings are more recent (post-2000). They occur mostly around stormwater ponds and park areas in the new urban development south of Taunton Road, although some are found at Deer Creek Golf Club, north of Taunton Road. Tree and shrub cover (mostly a few common native species) is relatively sparse, partly because the plantings are young and partly because they are widely-spaced with gaps. However, upland areas of these plantings often have a high component of tallgrass prairie species both native to TRCA jurisdiction and not native here but native to southwestern Ontario. Species native to TRCA jurisdiction include Indian grass (*Sorghastrum nutans*), little bluestem (*Schizachyrium scoparium*), and ox-eye (*Heliopsis helianthoides*). Species native to southwestern Ontario include grey-headed coneflower (*Ratibida pinnata*) and compass-plant (*Silphium laciniatum*) (Figure 10). The prairie plantings are on silts and clays, which are not typical site conditions for this suite of species. They are surprisingly vigorous, but their long-term viability is not yet known.



Figure 10: Compass-plant in prairie planting (ELC community TPO2-A) near Carruthers Creek (photo: TRCA 2015)

The ponds have largely common wetland species planted, with a few odd finds such as sallow sedge (*Carex lurida*) found in two restoration plantings. This plant is very rare in TRCA jurisdiction and known naturally only from a couple of unverified locations on the Oak Ridges Moraine.

Finally, there is some coastal restoration work immediately outside the Carruthers Creek Watershed Plan study area, but contiguous with its coastal communities. West of Carruthers Creek are some new wetland and sand dune plantings which contain beach grass (*Ammophila breviligulata*). Nearby is a shellbark hickory (*Carya laciniosa*) that was planted in a former residential yard. Immediately east of Carruthers Creek is a successfully established planted population of pickerel-weed (*Pontederia cordata*).

The appropriateness of such plantings depends on the situation. Red pine is probably not appropriate for restoring natural historic communities in much of the watershed, since it requires well leached acidic sand (though there is some regeneration on part of the Lake Iroquois

shoreline). Likewise, compass-plant and shellbark hickory are not native to this watershed, they make a handsome contribution to plantings near stormwater ponds and public use areas but would not be a good choice for a high fidelity restoration. High-fidelity restorations would use species native to the TRCA jurisdiction that are adapted to the specific site conditions. Most of these would be common species ranked L4 or L5.

The success of plantings is sometimes threatened by the rapid growth of invasive species such as common reed, dog-strangling vine, and garlic mustard. Due attention should be paid to seed source, habitat conditions, and site preparation and maintenance to ensure success.

4.6 Fauna Species Findings for Carruthers Creek Watershed

4.6.1 Fauna Species Representation

TRCA fauna surveys conducted throughout Carruthers Creek watershed over the past decade (Table 3, Section 3.2) documented a total of 133 possible breeding vertebrate fauna species. This total is comprised of 106 breeding birds, 18 mammals, and 9 herpetofauna documented during formal TRCA surveys and augmented by verified incidental observations. An additional 8 species have been recorded only as historical records, dating back to the late 1980s, consisting of 7 bird species and a single report (1988) of western chorus frog (*Pseudacris triseriata*). The current 10 year period total of 133 species is comparable with the 155 species reported from Rouge Park (2005 to 2014) which covers 5810 hectares, considerably more than the 3748 hectares in Carruthers Creek watershed. Refer to Appendix 3 for a list of the fauna species in Carruthers Creek watershed and their corresponding L-ranks.

The TRCA protocol for fauna inventories imposes a 10 year threshold for all data, whereby any data points mapped prior to the previous 10 years are archived and not considered current observations. This threshold is imposed because of the rapid rate of development on the landscape in the jurisdiction and the expectation that fauna distribution will change fairly rapidly in response to such landscape changes. Table 7 lists the 7 species reported from the watershed before (and including) 2005, but not after. Although several of these species losses appear to be significant, it is important to consider the numbers involved and the local context.

The only species in this short-list which can properly be considered extirpated from Carruthers Creek watershed is western chorus frog, for which the TRCA records show no occurrence since 1988. These records were mapped in Carruthers Marsh, an area which has been monitored for frogs annually since 2007, therefore it can be stated with confidence that the species appears to no longer occur in the watershed. The restricted mobility of this species implies that the two archival reports (1988) are unlikely to refer to individuals which occurred as vagrants. Rather, these records refer to relic populations as they were about to disappear. The decline and disappearance of this Species at Risk from the watershed is in keeping with similar declines throughout the species' Great Lakes-St. Lawrence range. The other absent species are perhaps

more properly considered as “status unknown”. The location of the two golden-winged warbler (*Vermivora chrysoptera*) territories has not been visited since 2005 (*i.e.*, it was not inventoried in 2015/2016). The loss of the three Nashville warbler (*Leiothlypis ruficapilla*) territories from Block G is perhaps due to filling of gaps as the forest matures (both of these warbler species prefer successional or edge-habitat), and it should also be noted that in 2015 a new territory was mapped to the east of the habitat block in Block G. Several of the other missing species were previously represented by single sightings and therefore it is likely that these species were not well-established in the watershed.

Table 7: List of the seven fauna species not reported in Carruthers Creek watershed since 2006

| Species Common Name | Scientific Name | L-rank | Count pre 2006 |
|------------------------|--------------------------------|--------|----------------|
| green-winged teal | <i>Anas crecca</i> | L2 | 1 |
| sora | <i>Porzana carolina</i> | L3 | 1 |
| northern mockingbird | <i>Mimus polyglottos</i> | L5 | 1 |
| golden-winged warbler | <i>Vermivora chrysoptera</i> | L2 | 2 |
| Nashville warbler | <i>Leiothlypis ruficapilla</i> | L3 | 3 |
| white-throated sparrow | <i>Zonotrichia albicollis</i> | L3 | 2 |
| western chorus frog | <i>Pseudacris triseriata</i> | L2 | 2 |

More important than the loss of species previously represented in the watershed by only 1 or 2 territories, are the larger decreases shown by species still managing to persist in the watershed. One of these species, blue-winged warbler (*Vermivora cyanoptera*), registered a loss of 6 territories, and only through the mapping of a single territory in Block E in 2007 does the species maintain a foothold in the study area. Further scrutiny of the regional database reveals that although 6 territories were lost from the mid- to upper reaches of the watershed, there were 3 males on territory in 2015 and 2016 (including a Brewster’s warbler—the blue-winged dominant hybrid of the two species, blue-winged warbler and golden-winged warbler, *Vermivora chrysoptera*) beyond the eastern edge of the watershed study area, on the west side of Audley Road, and therefore not included in this watershed inventory. The loss of the 6 territories in the survey area is perhaps in part due to these birds moving beyond the study area boundary, and in part due to the maturing and infill of forest gaps.

The other apparently substantial decline in the study area was shown by northern waterthrush (*Parkesia noveboracensis*). The two territories in Block G (3 territories if the territory east of the study area boundary is considered) have been reduced to 1 territory, and in the lower reaches of the watershed, the forest block to the west of Shoal Point Road, south of Bayly Street East, no longer supports the 2 archival territories. Unfortunately, staff conducting the 2015/2016 inventory were not permitted access to the swamp forest to the east of Shoal Point Road where prior to 2005 there was a concentration of 5 northern waterthrush territories. However, data provided by

an environmental consultant (Leadbeater 2015) indicates that there were no northern waterthrushes at this location from 2012 to 2014. Although the heronry at this location has persisted, the small population of waterthrushes appears to have abandoned the site, no doubt in part due to the surrounding development, but perhaps also due to flooding of the eastern section of the forest block as a result of recent beaver activity combined with a reported surface water flow issue caused by a failed stormwater pond (the latter has apparently subsequently been fixed).

4.6.2 Fauna Species of Concern

Fauna species, like vegetation communities and flora species, are considered of regional concern if they rank L1 to L3 based on their scores for the seven criteria mentioned in Section 3.2. Since a large proportion of the study area is situated in what are now urban and urbanising zones, this report also considers fauna species ranked as L4, *i.e.*, those species that are of concern in urban landscapes. This is a proactive, preventive approach, identifying where conservation efforts are needed before a species becomes rare.

Fauna surveys and TRCA staff observations over the past decade in Carruthers Creek watershed reported 74 bird species of either regional or urban concern (L1 to L4), including 33 ranked as L3 and 5 ranked as L2 species. In addition, there were nine L1 to L4 ranked herpetofauna and thirteen L1 to L4 ranked mammal species, bringing the total to 96 fauna species of either regional or urban concern (Table 8). Locations of these breeding fauna are depicted on Maps 15a and 15b.

Table 8: Summary of fauna species, Carruthers Creek watershed, 2006 – 2016

| Fauna | # Species | L1–L3: Species of Regional Concern | # L4: Species of Urban Concern | Total # L1-L4: Species of Regional or Urban Concern |
|--------------|------------|------------------------------------|--------------------------------|---|
| birds | 106 | 38 | 36 | 74 |
| herps | 9 | 6 | 3 | 9 |
| mammals | 18 | 4 | 9 | 13 |
| Total | 133 | 48 | 48 | 96 |

Local occurrence is one of seven scoring criteria for fauna species and is based on TRCA data and information from the Natural Heritage Information Centre (NHIC) of the Ontario Ministry of Natural Resources and Forestry (NHIC 2008). Using local occurrence as a measure of regional rarity, any species reported as a probable or confirmed breeder in fewer than 10 of the forty-four 10x10 kilometre grid squares in TRCA jurisdiction is considered regionally rare (*i.e.*, scores three to five points for this criterion) (TRCA 2010). In Carruthers Creek watershed over the past decade a total of 12 native breeding vertebrate fauna species which are considered regionally rare have been reported, including 2 species (ermine, *Mustella ermine* and star-nosed mole, *Condylura*

cristata) reported from fewer than five of the forty-four 10x10 kilometre grid squares which make up the region.



Figure 11: A small colony of great blue herons has managed to persist alongside the urban development at “Ajax Warbler Swamp” (photo: TRCA 2012)

As is the case with flora, most regionally rare fauna species have other associated factors which explain their vulnerability and must be taken into account in conservation strategies. The 12 “rarities” reported by TRCA from Carruthers Creek watershed over the past decade consist of a diverse set of species which are regionally scarce for a variety of reasons. The 8 bird species include 4 wetland dependent species (great blue heron, *Ardea herodias*; osprey, *Pandion haliaetus*; marsh wren, *Cistothorus palustris*; gadwall, *Anas strepera*) and 2 meadow dependent species (grasshopper sparrow, *Ammodramus savannarum*; and northern harrier, *Circus cyaneus*). Gadwall is a species present in the coastal marshes associated with each of the main regional rivers including Carruthers Marsh, however Carruthers Creek is the only watershed in which this L4 ranked duck has been reported as a potential nesting species much farther upstream. In the 2015 inventory, gadwall were reported from 2 sites north of Kingston Road East (more than 4.5

kilometres inland). The great blue heron record refers to the small but relatively long standing heronry in what is locally known as “Ajax Warbler Swamp”, *i.e.*, the swamp forest on the east side of Shoal Point Road, south of Bayly Street East (Figure 11). Marsh wren is a species that, at least in the Toronto region, appears to be associated with fairly extensive stands of *Typhoctares*, and therefore it is surprising to find that the species, although reported from Carruthers Marsh in 5 of the years since 2008, was not recorded there in 2015. The osprey record constitutes a good news story: this record refers to a pair that has been nesting on an artificial nest platform provided on farmland at the northern end of the study area. The farmer informed TRCA staff that in 2014 a fledgling, having become entangled in baling twine used in the nest structure, was rescued and released; the ospreys have returned to nest in subsequent years (including 2016).



Figure 12: Rare within the region, a single grasshopper sparrow territory was located in the agricultural upper reaches of the watershed (photo: TRCA 2014)

The two meadow dependent species are represented by one and two mapped points each, but both species must be considered in the context of landscape. Although there are only two mapped records for northern harrier in Carruthers Creek watershed, these records fit into a series of reports from across the middle reaches of the neighbouring East and West Duffins Creek sub-watersheds, and Lynde Creek watershed to the east of TRCA jurisdiction. This species is very much an open-country specialist and breeding pairs will range over large expanses of open habitat such as is available across the extensive agricultural land in this part of the region. In this

respect, the landscape features in Carruthers Creek watershed have considerable impact on the neighbouring watersheds, and vice versa. Although TRCA's 2013 habitat mapping does not show very much meadow habitat in the middle and upper reaches of the watershed, many meadow species are equally successful in lower intensity agricultural situations (which are not indicated in the habitat mapping exercise), sometimes using only small portions of fields where farming practice has allowed appropriate conditions to persist. Such circumstances would also favour species such as grasshopper sparrow (Figure 12).

The four non-avian species on the list of "rarities" must be considered in the context of the inventory method. TRCA's fauna inventory was designed as a fairly rapid assessment, targeting all vocal species – primarily songbirds and frogs. Any other taxa are recorded somewhat incidentally, either by the fauna biologists or TRCA botanists. For this reason, the four "rare" mammal species: hairy-tailed mole, star-nosed mole, meadow jumping-mouse (*Zapus hudsonius*), and ermine (*Mustella erminea*) are considered very much underreported and therefore, the designation of these species as "rare" is somewhat tentative.

Only one of the species which scores as regionally rare is listed as a Species at Risk at the Provincial level through the Committee on the Status of Species at Risk in Ontario (COSSARO): grasshopper sparrow (*Ammodramus savannarum*) is listed as Special Concern. The overall Carruthers Creek watershed species list includes a further seven species which are also listed as provincial species at risk. Four of these species (bank swallow, *Riparia riparia*; barn swallow, *Hirundo rustica*; bobolink, *Dolichonyx oryzivorus*; and eastern meadowlark, *Sturnella magna*) are afforded Threatened status at the provincial level.

Sensitivity to development is another criterion used to determine the L-rank of fauna species. A large number of impacts which result from local land use, both urban and agricultural, can affect the local fauna. These impacts, considered separately from the issue of actual habitat loss, can be divided into two distinct categories. The first category involves changes that arise from local urbanisation which directly affect the breeding habitat of the species in question. These changes alter the composition and structure of the vegetation communities; for example, clearing and manicuring of habitat such as removal of dead wood and clearance of shrub understory. The second category of impacts involves changes that directly affect individuals of the species in question. Examples include increased predation from an increase in the local population of predator species which thrive alongside human developments (e.g., blue jays, *Cyanocitta cristata*; American crows, *Corvus brachyrhynchos*; squirrels, raccoons, *Procyon lotor*, and domestic cats); parasitism (from facilitating the access of brown-headed cowbirds, *Molothrus ater*, a species which prefers more 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 nests); and, sensitivity to pesticides.

As with flora sensitivity to development, TRCA has identified 14 impacts affecting fauna in the jurisdiction, most of which are deleterious to native fauna but a couple of which can benefit some species. The score for sensitivity to development ranges from 0 to 5 (TRCA 2010). These urban stressors are as follows:

1. Clearing (loss of understorey, snags, fallen logs)
2. Removal of wood (logging, fuelwood collection)
3. Soil compaction (from trampling or vehicles)
4. Drainage alteration
5. Dumping
6. Exotic species invasion
7. Increased predation, parasitism, or competition
8. Flushing (i.e. repeated direct disturbance of the individual)
9. Removal (hunting, collecting)
10. Persecution
11. Sensitivity to pesticides (and bio-accumulation)
12. Others
13. Provision of additional food source (a potential positive impact)
14. Nesting/denning location, including provision of sites for winter shelter (a potential positive impact).

Fauna species are considered to have a high sensitivity to development if they score three or more points (out of a possible five) for this criterion. In the Carruthers Creek watershed study area, 72 of the species ranked L1 to L4 receive this score and are therefore considered sensitive to one or more of the impacts associated with development (Maps 10a and 10b). This is a relatively high proportion of sensitive species (75%) given that much of the study area falls in the urban and urbanising landscape.

A species list can only tell us so much about the natural system of an area; it is important to consider not only species richness but also the representation and abundance of those species. For example, the presence of the 2 ground-nesting warbler species—ovenbird (*Seiurus aurocapilla*) and black-and-white warbler (*Mniotilta varia*)—is initially indicative of healthy and relatively undisturbed forest features, however, these 2 species are represented by 13 and 2 territories respectively, despite a total forest cover of 512 hectares. In contrast, black-and-white warbler is represented by 10 territories in the 270 hectares of forest in and adjacent to the northern section of the nearby Greenwood Conservation Area, and ovenbird is represented by 15 territories at Claremont Conservation Area at 150 hectares. Both species are found only in the relatively well forested middle reaches of Carruthers Creek watershed. Open country sensitive species (likewise ground-nesters) such as bobolink and vesper sparrow (*Pooecetes gramineus*) are much better represented with 38 and 23 territories respectively, almost all of these territories are located in the agricultural landscape to the north of 6th Concession Road. In fact this stretch of the Carruthers Creek watershed accommodates the highest regional concentration of territories for both of these species.

The absence of ovenbirds and other similarly sensitive ground-nesting forest birds from forest habitat throughout much of the watershed, is in part a reflection of the generally negative matrix influence imposed by the urban and urbanising landscape. It is worth noting that almost all of the territories held by sensitive forest species of regional concern (ranked L1 to L3) are located in the narrow corridor of forest habitat that crosses the watershed east to west, between the 5th and 6th

Concession Roads. In addition to the ovenbirds and black-and-white warblers, this area also holds the vast majority of the wood thrush (*Hylocichla mustelina*) territories and almost all of the veery (*Catharus fuscescens*) territories (Figure 13). None of these species hold territories south of 5th Concession Road (except for a single wood thrush and a couple of veery, to the west of the golf course), at least not in the past decade. Prior to 2006, there were 5 wood thrush and 3 veery territories held in the vicinity of Bayly Street East, in the southern reaches of the watershed. Small numbers of wood thrush also manage to persist in the smaller forest fragments in the agricultural landscape to the north of the 6th Concession Road.



Figure 13: Veery, a low-nesting thrush species, has shown considerable decline in the watershed over the past decade (photo: TRCA 2014)

However, it should be noted that a few sensitive species have in fact managed to maintain viable populations in some of the forest features even in the southern reaches of the watershed. American redstart (*Setophaga ruticilla*), for example, is thriving in much of the riparian forest along Carruthers Creek from the lakeshore as far north as 5th Concession Road (48 of the watershed's total of 70 territories). This forest edge and successional forest species nests in the sub-canopy, generally above 3 metres from the ground, and therefore is better equipped than ground nesting species to withstand the impact of increased ground borne disturbance and predation. In addition

to this L3 ranked species, three L4 ranked forest species (blue-grey gnatcatcher, *Poliophtila caerulea*; red-eyed vireo, *Vireo olivaceus*; and eastern wood-pewee, *Contopus virens*) and one L4 ranked forest-edge species (rose-breasted grosbeak, *Pheucticus ludovicianus*) are also maintaining healthy populations in these remnant forest habitats throughout the lower urbanised reaches of the watershed.

All nine of the herpetofauna species which occur in the watershed score as highly sensitive to development, therefore it may be somewhat surprising to discover that small numbers of grey treefrog (*Hyla versicolor*) and wood frog (*Lithobates sylvatica*) persist in the urbanised lower reaches. Wood frogs still maintain reasonable choruses south of Highway 401, while grey treefrogs were discovered at two urbanised locations north and south of Rossland Road West. It is important to understand that herpetofauna species are far less mobile than birds and therefore populations are unable to simply abandon a declining habitat feature as occurs with isolated songbird populations. Both wood frog and grey treefrog are effectively extirpated from the nearby City of Toronto. It seems likely that the same will occur in the urbanised landscape of the lower Carruthers, although forest patches in the extreme southern extent of the watershed are still extensive enough to contain all of the various habitat features that such frog species require and thus wood frogs are able to persist south of Bayly Street.

A major impact from urbanisation is the increase in the population of subsidised predators, animals such as domestic and feral cats, raccoons, opossums (*Didelphis virginiana*), and blue jays (*Cyanocitta cristata*), whose populations are not in tune with natural cycles in prey populations because in lean times their numbers are maintained by the provision of food from backyard feeders, garbage, and pet owners. Thus predator pressure never subsides enough to allow prey species numbers to recover. This completely artificial dynamic affects all small animals, birds, herpetofauna, and mammals, but especially small mammals. This in turn reduces the prey availability for non-subsidised predators such as eastern screech-owls (*Megascops otus*) and hawks, although this latter consideration is compensated by the fact that many native predators appear to be thriving as an indirect result of human sourced food subsidies (e.g., the remarkable increase in the population of Cooper's hawk (*Accipiter cooperii*) as a result of constantly high populations of mourning doves (*Zenaida macroura*), Eurasian starlings (*Sturnus vulgaris*), grey squirrels (*Sciurus carolinensis*) and blue jays). All in all, the food subsidies are creating a completely new (and unnatural) dynamic in the ecosystem. Some species certainly benefit, but many are declining. The impact of free ranging feral and domestic cats on bird and small mammal populations in North America has been recently posited as "likely the single greatest source of anthropogenic mortality for US birds and mammals" (Loss *et al.* 2013).

Dogs, and particularly off-leash dogs, are a huge issue for any habitat that is being managed for the natural system. Although dogs do not have as large an impact in terms of animals killed as do cats, it has been shown that their mere presence in a natural setting deters many species from even attempting to breed. A study in Australia reported that dog-walking (on-leash) 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).

It is important to understand that negative matrix influences are not solely associated with the close proximity of urban and suburban development, many negative influences can be transferred deep within an otherwise intact natural matrix by extensive trail networks used by large numbers of people originating from quite distant urban and suburban centres. Extensive public use of a natural habitat can have substantial negative impact through the cumulative effects of hiking, dog-walking and cycling on the site. Various studies have shown that many bird species react negatively to human intrusion, even the mere presence of people, to the extent that nest abandonment and decreased nest attentiveness lead to reduced reproduction and survival. One example of such a study showed that abundance was 48% lower for hermit thrushes (*Catharus guttatus*, a ground-nesting/foraging species) in intruded sites than in the control sites (Gutzwiller and Anderson 1999).

Area sensitivity is a scoring criterion which can be closely related to the issue of a species' need for isolation. Fauna species are scored for area sensitivity based on their requirement for a certain minimum size of preferred habitat. Species which require large tracts of habitat (>100 hectares in total) score the maximum five points, while species that either show no minimum habitat requirement or require <1 hectares in total, score one point. Species scoring three points or more require ≥ 5 hectares in total are deemed area sensitive species. Researchers have shown that for some species of birds, area sensitivity is a rather fluid factor, dependent and varying inversely with the overall percentage forest cover in the landscape surrounding the site where those species are found (Rosenburg *et al.* 1999).

A total of 41 of the 96 fauna species of either regional or urban concern are considered area sensitive, with 10 species (all birds) requiring at least 20 hectares of continuous habitat (an area sensitive score of 4 points or more). The remaining 31 species have a habitat area requirement of at least 5 hectares (a score of 3 points).

Forest patches greater than 20 hectares are few and far between in Carruthers Creek watershed, with 3 main parcels:

- the patch south of Bayly Street, west of Shoal Point Road (this parcel should really include "Ajax Warbler Swamp" but this area, not inventoried in 2015, registers as swamp in the TRCA's habitat layer)
- the patch between Taunton Road and Rossland Road West
- the relatively extensive forest between the 5th and 6th Concession Roads

Accordingly, there are very few high scoring area sensitive species mapped outside of these three parcels, the majority of such were mapped between 5th and 6th Concession Roads (Map 7a). Despite the size of the southern parcel (south of Bayly Street) there was only one area sensitive bird species mapped in this area and this was the L4 ranked Cooper's hawk (*Accipiter cooperii*) (Map 7b). This reflects the importance of matrix influence which in this case appears to have trumped the positive patch size attribute of this forest feature. The same is true of the middle

parcel (between Taunton Road and Rossland) although the 2015 inventory mapped pine warbler (*Setophaga pinus*), Cooper's hawk, and hooded merganser (*Lophodytes cucullatus*). Only in the northernmost and most rural extensive forest patch do we encounter other L2 and L3 ranked area sensitive forest species scoring greater than 4 points such as scarlet tanager (*Piranga olivacea*), ovenbird, and black-and-white warbler.

Species' patch-size constraints are due to a variety of factors including foraging requirements and the need for isolation in a habitat block during nesting. In the latter case, regardless of the provision of a habitat patch of sufficient size, if that patch is seriously and frequently disturbed by human intrusion, such species will be liable to abandon the site. Such a variety of habitat needs are more likely satisfied in a larger extent of natural cover. Cooper's hawk is an area sensitive species which has shown considerable adaptation to the urban landscape in recent years, to the extent that the species is now found in many urban ravines. It is no surprise, then, to find Cooper's hawk widely distributed throughout the watershed, since even the smaller forest patches combine to provide ample nesting opportunities.

Three frog species score 3 points for area sensitivity and are anticipated to require in excess of 5 hectares of continuous habitat. These species' area requirements are driven by their need for a specific combination of habitat elements in order to complete their annual life cycles. Wood frog, spring peeper (*Pseudacris crucifer*), and grey treefrog all migrate from seasonal breeding wetlands to upland foraging and overwintering habitats (Figure 14). The larger the area of a patch of natural habitat, the higher the likelihood of such habitat types being present within the patch. It is interesting to note that neither grey tree-frog nor spring peeper have been recorded in recent times in the watershed to the south of Highway 401, despite the availability of ample wetland and forest habitat. As far as spring peeper is concerned, this is in keeping with the distribution of the species elsewhere in the Toronto region: there are no records of spring peeper mapped anywhere south of the Highway 401. The absence of grey treefrogs from the lower reaches of the watershed may be an oversight since the species is fairly well-represented in the nearby Rouge Marshes, and is present in the lower Duffins Creek and Frenchman's Bay.



Figure 14: Wood frogs require a relatively well-connected natural landscape, which allows safe movement between breeding wetlands and upland foraging habitat (photo: TRCA 2006)

Patch isolation sensitivity in fauna measures the overall response of fauna species to fragmentation and isolation of habitat patches. One of the two main aspects of this scoring criterion is the physical ability or the predisposition of a species to move about within the landscape and is related to the connectivity of habitat within a landscape. The second main aspect is the potential impact of roads on fauna species which are known to be mobile. Thus most bird species score fairly low for this criterion (although they prefer to forage and move along connecting corridors) whereas many herpetofauna score very high (since their life cycle requires them to move between different habitat types which may increase likelihood of roadkill).

Roads and paved trails which intersect traditional dispersal and seasonal migration routes which many herpetofauna rely upon are a major threat to populations of these species in such an urbanised landscape. Both spring peeper and grey treefrog, together with wood frogs and American toads, undergo biannual movements to and from breeding ponds. In fact almost all herp species undertake some seasonal movement across the landscape, ranging from less than 100 metres (snakes moving to and from hibernacula) to several kilometres in the case of snapping turtles (*Chelydra serpentina*) (Jochimsen 2004, Obbard 1980). Roads are an obvious hindrance to

such movements, but likewise, any paved trail invites faster bike traffic and provides seemingly ideal opportunities for basking snakes, all of which results in a higher incidence of roadkill.

From the Carruthers Creek watershed fauna list, all 9 of the herpetofauna score 3 or more points under this criterion, together with 11 of the 13 mammal species of regional or urban concern and 4 bird species. The existence of wood frog and spring peeper populations across the forested middle reaches of the watershed, and to a lesser extent across the agricultural northern reaches, is much as expected. The wood frog populations to the south of Highway 401 manage to persist despite extensive development in the surrounding landscape. This persistence is primarily due to the size of the swamp forests to the north of Bayly Street East and on either side of Shoal Point Road (including the “Ajax Warbler Swamp”). These patches are extensive enough to accommodate all elements of the life cycle requirements of this species, thereby precluding the need for these populations to migrate across any of the surrounding roads in search of either breeding wetlands or foraging upland habitat.

Fauna species which score greater than three points under the **habitat dependence** criterion are considered habitat specialists (Maps 16a and 16b). These species exhibit a combination of very specific habitat requirements that range from microhabitat (e.g., decaying logs, aquatic vegetation), particular moisture conditions, vegetation structure or spatial landscape structures, to preferences for certain community series and macrohabitat types. Twenty-one species which occur in the watershed are considered habitat specialists, with 62% of these species, including ovenbird, scarlet tanager, winter wren (*Troglodytes hiemalis*), pileated woodpecker (*Dryopcopus pileatus*) and wood frog, having a preference for forested habitat.

Several of these habitat dependent species have more specific preferences regarding the structure, age, and species composition of the forest. Winter wren, for example, prefer dark, moist, primarily mixed forests with plenty of wind throw and deadfall to provide ample nesting and foraging opportunities, such as the mixed swamp forest community south of Rossland Road East and west of Salem Road. Pileated woodpecker (Figure 15) has a requirement for ample large standing dead wood, which provides foraging and cavity excavation opportunities, which tend to be more abundant in larger and more mature forest blocks.



Figure 15: Pileated woodpeckers require plenty of large standing dead and dying trees to facilitate both foraging and nest-cavity excavation (photo: TRCA 2015)

Two of the remaining habitat dependent species, bank swallow (*Riparia riparia*) and northern rough-winged swallow (*Stelgidopteryx serripennis*), are highly dependent on very specific microhabitat conditions. Bank swallow requires bluffs or cliffs of the appropriate sandy substrate in which to excavate nest-cavities, while northern rough-winged swallow tends to use existing cavities. The latter species appears to be present in good numbers in much of the southern and central reaches of the watershed, presumably in part due to the abundance of bridges and other artificial structures in this urbanised landscape.

It should be noted that despite the inclusion of a relatively large wetland habitat at the mouth of Carruthers Creek, wetland associated species are rather poorly represented in the watershed. Only two wetland dependent species of concern were reported from the watershed in the period, and neither species was reported from the Carruthers Marsh complex during the extensive 2015 inventory. Over the past few years, only small numbers of marsh wren and the occasional Virginia rail (*Rallus limicola*) have been recorded from TRCA's Marsh Monitoring Project stations at Carruthers Marsh. In comparison to the similarly sized and equally urbanised Hydro Marsh

adjacent to Frenchman's Bay, Carruthers Marsh is faunistically rather poor. It is generally recognised that the driving force behind faunal diversity in coastal wetlands is hydrology (Keddy 2000). The water level in Lake Ontario is regulated at a relatively constant depth. Recent studies have shown that long term changes in annual water level fluctuations in the Great Lakes are important abiotic factors affecting the abundance of some marsh dependent birds in coastal marshes (Timmermans *et al.* 2008). For this reason, since the initiation of water level regulation in 1960, Lake Ontario coastal wetlands tend to be dominated by dense monotypic stands of hybrid cattail, which provide little diversity in the structure of the wetland habitat, and consequently reduced bird abundance and species diversity. This appears to be the case in the several hectares of cattail marsh at the mouth of Carruthers Creek.

Richness is essentially the presence or absence of a species at a site. However, beyond the mere presence of a single species is the idea that a natural system can be considered a healthy functioning system if there is an association of several species thriving (*i.e.*, good representation of each species, more than one territory) within that system. Each habitat type supports particular species associations. As the quality of the habitat patch improves, so will the representation and richness of flora and fauna species in that habitat. In this way representation biodiversity is an excellent measure of the health of a natural system. Currently, by far the highest representation of forest habitat dependent species in the watershed occurs in the relatively extensive forest habitat north of 5th Concession Road. Elsewhere in the watershed, numbers of forest habitat dependent species are extremely low, and where such species do occur they are always in isolation and not part of a thriving forest community (for example, the aforementioned winter wren in the forest block south of Rossland Road West). The presence of so few representatives of species dependent on forest habitat outside of the core area north of 5th Concession Road indicates that forest habitat throughout the watershed is not functioning well in terms of fauna, even the relatively extensive forest blocks to the south of Highway 401.

Another consideration in the assessment of the status and condition of forest habitat throughout the watershed is the presence or absence of red-backed salamander (*Plethodon cinereus*), a species recognised as an important component of any eastern forest ecosystem. This species thrives in mature mixed and hardwood forests where the ground layer has been left relatively intact, requiring downed woody debris and a moisture regime which enables this entirely terrestrial amphibian to complete its life cycle. Small populations of red-backed salamanders have managed to persist even in the City of Toronto, but fragmentation of forest cover (in both urban and rural landscapes) inevitably results in a gradual drying of the forest habitat. There was no specific search for this species during the inventories conducted in 2015 and 2016 although an informal and incidental search was conducted in the more extensive deciduous forest north of 5th Concession Road, simply rolling and lifting woody debris somewhat arbitrarily during the fauna survey. There are no records for red-backed salamander for the watershed and although this certainly does not mean that the species is entirely absent, it is important going forward that any future inventory work makes special efforts to properly assess the species' status.

4.6.3 Comparison of Fauna Data for the Habitat Block North of Bayly Street, East of Salem Road (in Block L), between the Years 2003 and 2015

Although this document incorporates data from several repeat visits over the past 15 years, the opportunities to make temporal comparisons within specific habitat blocks are limited. This is primarily due to differences in the extent of coverage within any one habitat block between two years. However, one location has been identified where the coverage between visits made in 2003 and 2015 is very similar, thereby facilitating a direct comparison between the two data sets (Appendix 4). The location of this 76 hectares block of mixed habitat is north of Bayly Street East, east of Salem Road, and south of Highway 401 (Map 17).

Since the initial visit in 2003, there have been some significant changes within this habitat block:

- the extension of Salem Road south from Highway 401 to Bayly Street East, on the west side of the site
- the construction of a road running along the north edge of the site, from Salem Road to the commercial depot on the east side of the site
- the development of a commercial complex in the northwest corner of the site
- the installation of two stormwater ponds in the northwest and the southwest corners

Furthermore, the once agricultural landscape to the east of the site has been developed with an extensive commercial depot, accommodating large numbers of transport trucks. Thus, the habitat block is now effectively surrounded by development of one form or another.

The comparison between the two years only considers the breeding bird species of regional and urban concern, *i.e.*, those species ranked L1 to L4. The total numbers of species within this filtered group for the two years are very similar with 22 species in 2003, and 24 in 2015. Likewise, the total abundances of these species, *i.e.*, the number of territories held within the site, are relatively close with 77 territories held in 2003 and 88 in 2015. The main differences between the two latter totals are made up by two species which showed considerable increases in population from 2003 to 2015: grey catbird (*Dumetella carolinensis*) increased from 12 to 19 territories, and American redstart increased from 7 to a surprisingly high 16 territories. However, these substantial increases hide significant declines. In 2003 there were 4 pairs of wood thrush on site; in 2015 there were none. Again, in 2003 there were 8 pairs of common yellowthroat (*Geothlypis trichas*); this number had decreased to 1 pair in 2015.

The local extirpation of wood thrush is in keeping with this species' regional and indeed global decline. Up until very recently, the decline was largely attributed to loss of overwintering habitat in Central America, but a more recent paper suggests that the larger driver is in fact loss of habitat in its breeding range in eastern North America (Rushing, 2015). The species has undergone a greater than 50% reduction in population since the mid-1960s and as such, with so many fewer

birds in the landscape, it is not surprising that the remaining individuals will be inclined to nest in larger more intact forest blocks well removed from the negative matrix influences associated with urbanisation.

Meanwhile, an even larger but fortunately positive change in a local breeding bird population was recorded for American redstart (Figure 16). The discovery in 2003 of 7 pairs of this neotropical migrant holding territories at this location was already quite surprising, given that the species was then considered a species of rural woodland edges in the Toronto region. It was completely unexpected to return to the same site in 2015 and find over double that number of territories. Of note is the observation that at least 2 of the redstart broods had been parasitized by brown-headed cowbirds. It is likely that cowbirds have played a part in the decline of wood thrushes at this site.



Figure 16: The number of American redstart territories doubled at the Bayly Street and Salem Road study block over the past decade (photo: TRCA 2015)

One more species worth singling out for special mention is blue-grey gnatcatcher. This forest canopy species has countered the decline shown by wood thrush with a significant increase from two to six pairs. Overall, it appears that the local breeding bird community is maintaining itself fairly well. Species richness and representation across the four major habitat types represented at the site (forest, forest-edge, meadow, wetland) are at much the same level in 2015 as in 2003 with the only two major species declines (wood thrush and common yellowthroat) somewhat countered by similar sized increases in two other songbird species (American redstart and blue-grey gnatcatcher). The main changes have occurred with the edge and generalist species, involving significant increases in the numbers of American redstart and grey catbird populations. The wetland guild of species has seen some decline, driven entirely by the loss of common yellowthroats across the site.

It seems likely that, despite the demise of the local wood thrush population, the recent residential development to the west of the site has little impact on the bird community, primarily because the development is separated from the forest and forest edge habitat by a new, busy road and a fairly extensive wetland. This configuration would effectively mitigate one potentially very negative matrix influence: free-ranging domestic cats, and probably serves to reduce the number of hikers and off-leash dogs visiting the site. The large commercial development on the eastern boundary of the site is not a source of free ranging domestic cats or other ground borne disturbances and, apart from the issue of noise during the construction phase, is probably having little negative impact on the current breeding bird community. However, it should be noted that, since this habitat feature is now entirely surrounded by roads and other development, opportunities for ingress and egress of non-avian fauna is likely very restricted. The site hosts a small population of wood frogs which is able to persist because all of the species' life cycle requirements are available within the habitat block. If any of these features are compromised in any way, for example, if the woodland pools dry up earlier every summer, this frog population may be at risk unless animals manage to migrate into the site from up- or downstream.

Unfortunately, broader comparisons across the watershed are not possible due to the variation in inventory boundaries. However, a very informal comparison can be made between breeding bird data from the mid-1990s supplied by Gartner Lee Consulting and the more recent TRCA inventory across a similar area south of Highway 401 (including the feature treated above). Again, the comparison shows several losses for species ranked L1 to L3 (ruffed grouse, *Bonasa umbellus*; wood thrush; veery; northern waterthrush; mourning warbler, *Geothlypis philadelphia*; among others), while several L4 ranked species have shown increases (blue-grey gnatcatcher, grey catbird, Cooper's hawk). It appears that, at the watershed level, forest species of regional conservation concern have shown considerable decline, while lower ranked species (L4), particularly those associated with disturbed edge habitat and successional forest, have shown increases. Meadow species (bobolink, vesper sparrow), with their stronghold in the agricultural landscape north of Highway 7, seem to be maintaining reasonably healthy populations.

5.0 Summary

The analysis of Carruthers Creek watershed is provided in relation to the regional targets for natural heritage in TRCA jurisdiction. To reach the regional targets for quality distribution and resultant quantity of natural cover, every watershed (or smaller site) will require its own individualized plan of action. Following is a short summary of the site features.

1. The study area contains roughly 970 hectares of surveyed natural cover, with another 100+ hectares not surveyed, much of this in close proximity to urban land uses, particularly in the southern half of the watershed. Around 90% has been surveyed for vegetation communities, flora and fauna since 2001.
2. The northern half of the watershed (north of Taunton Road) is largely agricultural but with a significant corridor of natural cover running east-west across the watershed north of the urban-rural boundary (between Taunton Road and Highway 7) (Map 3). This latter corridor maintains a connection between the more extensive forest cover of the Duffins watershed (to the west) and Lynde Creek watershed to the east (within the jurisdiction of the Central Lake Ontario Conservation Authority, CLOCA).
3. A large portion of the southern watershed belongs to the Shoal Point Marsh ANSI and Carruthers Creek Provincially-Significant Wetland Complex. There are also two evaluated non-Provincial Wetlands, one smaller ANSI, and two smaller ESAs within the watershed.
4. There were 173 vegetation community types observed, which reflects diverse coastal, forest, wetland and post-agricultural communities at the site. They comprise 44% of the total number of vegetation communities recorded in the TRCA jurisdiction. Of these, 49 are communities of conservation concern. There is a relatively high amount of wetland and communities present.
5. The study area accommodates a fairly high floristic diversity considering much of it is surrounded by an urban or suburban landscape. This is a result of the extensive wetland communities near the lakeshore and also the seepage fens and barrens on the Lake Iroquois Shoreline. A total of 845 naturally-occurring flora species were documented, including one hundred and fifty-three L1 - L3 species.
6. Over the past decade a total of 133 vertebrate fauna species have been documented as breeding species within the study area: 106 bird species, 18 mammals and 9 herpetofauna. This total compares favourably with some of the highest quality sites in the TRCA jurisdiction, but although species richness is high, representation is generally poor for many of the forest species of conservation concern.
7. Four flora species of concern occur that are recorded nowhere else in the TRCA jurisdiction; an additional nine species have only been recorded at one or two other

- sites in the jurisdiction. One endangered flora species was found: butternut, which is declining due to butternut canker.
8. Flora species of concern are associated with a range of habitats; notably coastal wetland, seepage fen, and sandy openings (including barrens). Coastal wetland species include few-flowered spike-rush and horned pondweed. Species associated with seepage include two species of ladies'-tresses orchid, two species of gentian, drooping sedge, and twig-rush. And sandy opening species include perennial evening-primrose and narrow-leaved panic-grass.
 9. Despite protection efforts native biodiversity is at risk and non-native species are abundant. Small purple-fringed orchis has apparently disappeared since the 1990s, and other plants' populations are likely declining, although there is insufficient data to verify this. There are significant infestations of invasive non-native plants, especially common reed, buckthorn, and dog-strangling vine within the Carruthers Creek watershed. Giant hogweed is an emerging threat along the Duffins / Carruthers Creek watershed border.
 10. Populations of fauna species of concern (ranked L1 to L3) in the rural northern half of the watershed appear to be maintaining reasonably well, as do populations of L4 species in much of the more urbanised southern reaches of the watershed. Losses over the past decade or so have primarily been of species of concern that once could be found in the patches of natural cover throughout what is now the urbanised and urbanising lower reaches of the watershed. Thus, for example, wood thrush and northern waterthrush appear to have disappeared from areas to the south of Highway 401.
 11. American redstart is the only L3 songbird species that is thriving in the urbanised and urbanising southern half of the watershed, with the population in one forest block (between Bayly Street and Highway 401) doubling since 2003.
 12. The great blue heron colony in the "Ajax Warbler Swamp" has shown considerable resilience over the past two decades. Despite having abandoned during the construction period in the adjacent housing development, the colony has subsequently re-established itself, although now the main threat is from changes in the local hydrology, killing the nest trees.
 13. The following five natural heritage features were identified as particularly significant within the Carruthers Creek watershed (they have concentrations of sensitive communities and species):
 - the extensive forest habitat located between Audley Road North and Salem Road, north of the 5th Concession Road,
 - the forested riparian habitat extending from the top of Carruthers Marsh to Highway 401,
 - the forested riparian habitat extending north and south from Rossland Road East,

- the heronry in Ajax Warbler Swamp, and
 - Carruthers Marsh
14. Areas of natural habitat on the shoreline of Lake Ontario, particularly situated at the mouths of rivers and creeks, are important staging areas for migrating songbirds. This is certainly the case for Carruthers Marsh and the forest blocks immediately upstream, within 2 kilometre of the lakeshore.
15. Although the southern half of the watershed is heavily urbanised, the terrestrial natural features still support a variety of functions and ecosystem services. The natural areas still provide north south connectivity of habitat for the movement of species through the watershed as well as regulating climate.

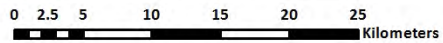
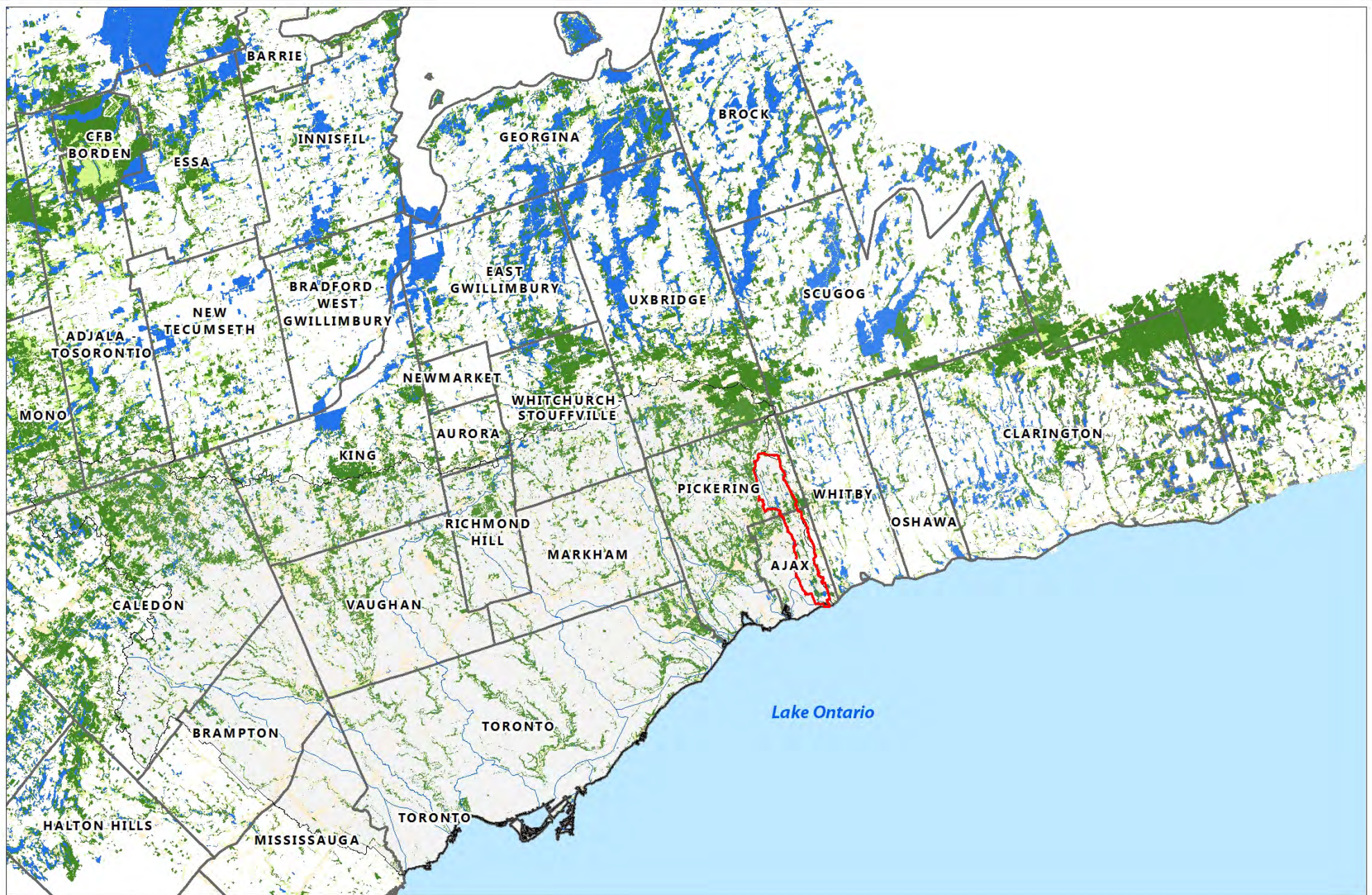
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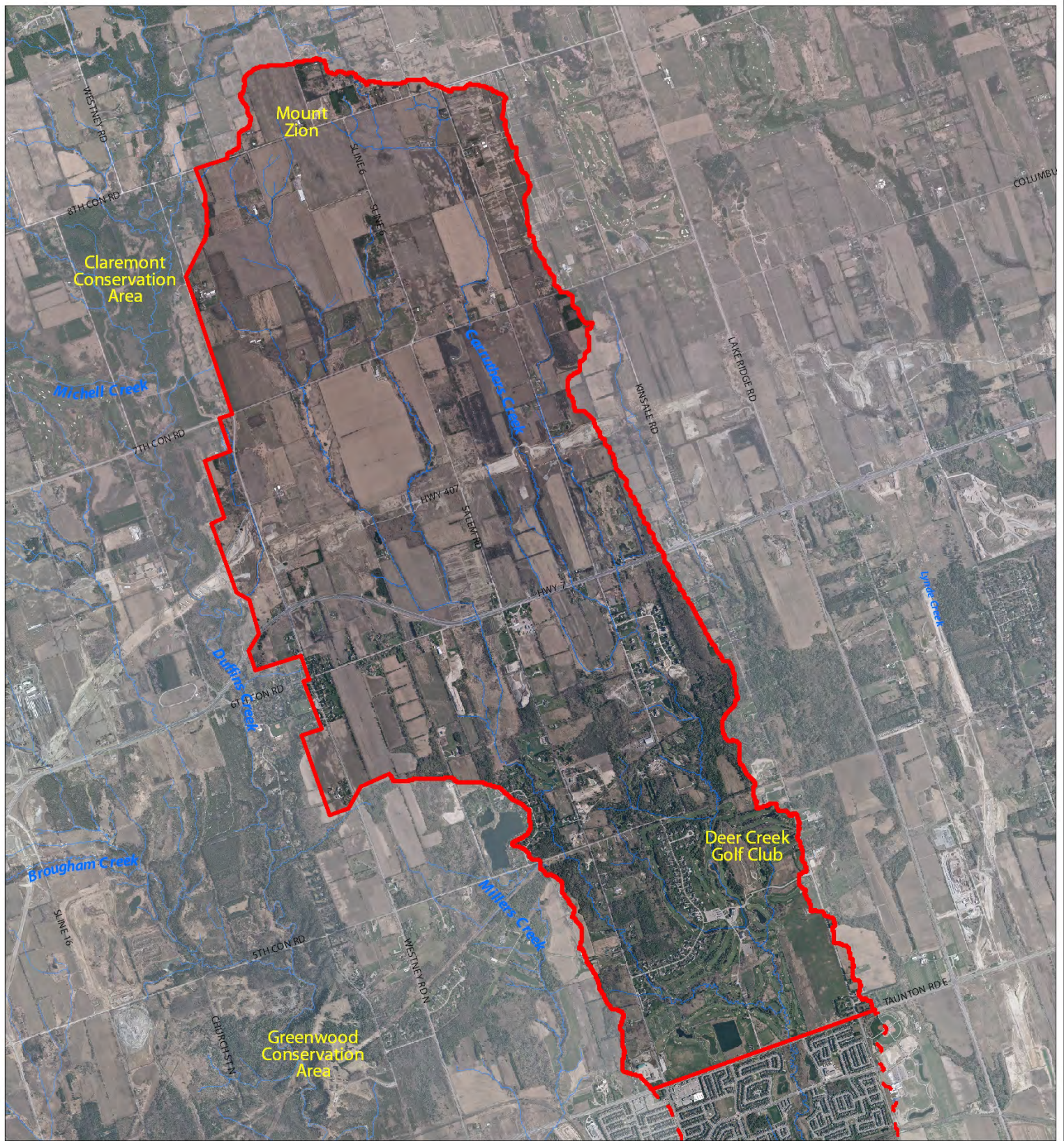


December 2016

* Landscape analysis based on 2013 Orthophotography

Map 1:
Carruthers Creek Watershed Plan Study Area,
Context of Regional Natural Cover

- | | | | |
|--|--------------|--|---------------------------------------|
| | Forest | | Carruthers Creek Watershed Study Area |
| | Successional | | TRCA Jurisdiction |
| | Meadow | | Watershed |
| | Wetland | | Municipal Boundary |
| | Beach/Bluff | | |

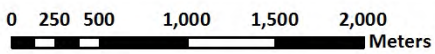


0 250 500 1,000 1,500 2,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

Map 2a:
Carruthers Creek Watershed
Plan Study Area (North)

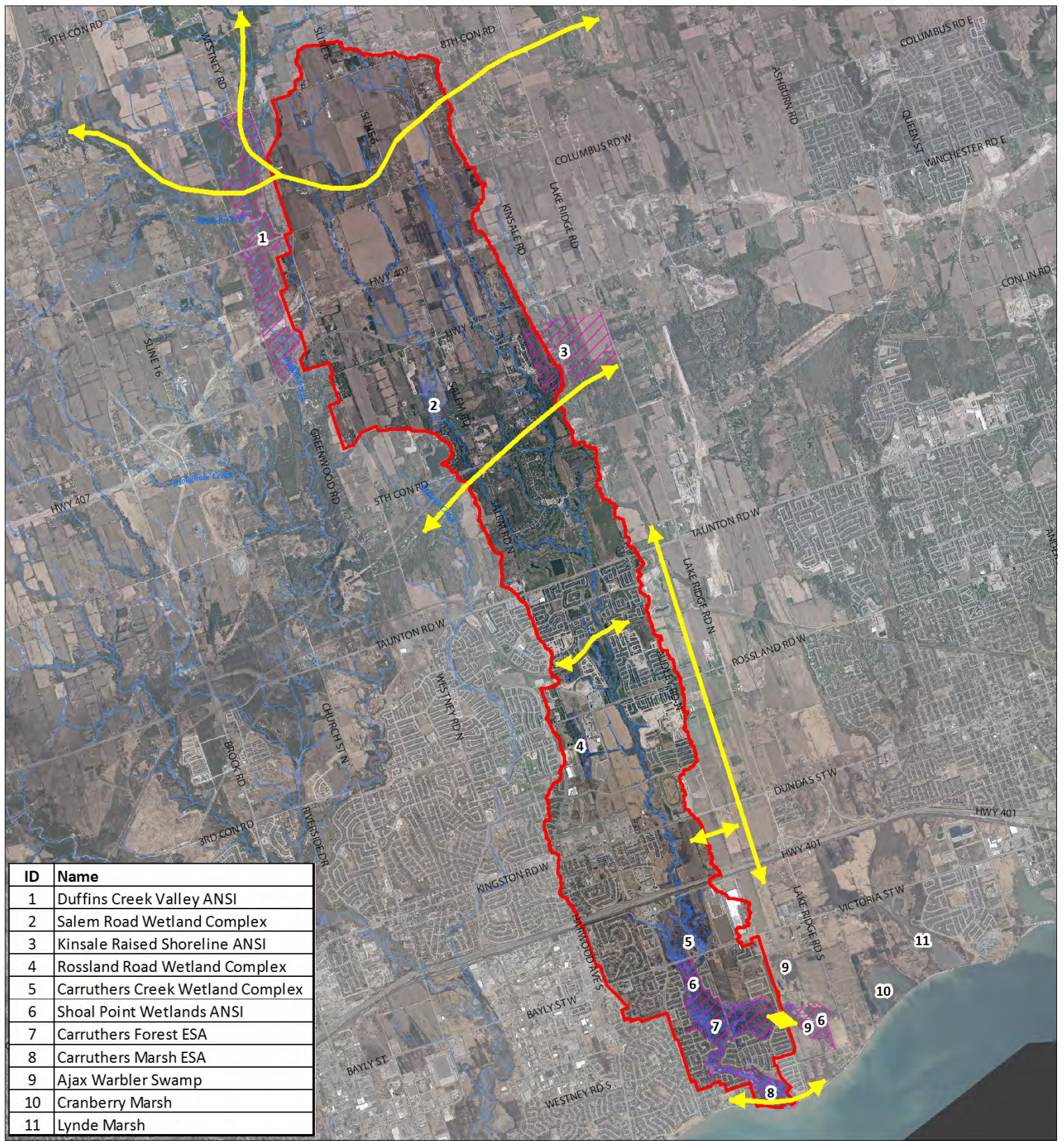
- Study Area (North)
- Study Area (South)



December 2016
 Orthophoto: Spring 2014, First Base Solutions

Map 2b:
Carruthers Creek Watershed
Plan Study Area (South)

- Study Area (South)
- Study Area (North)

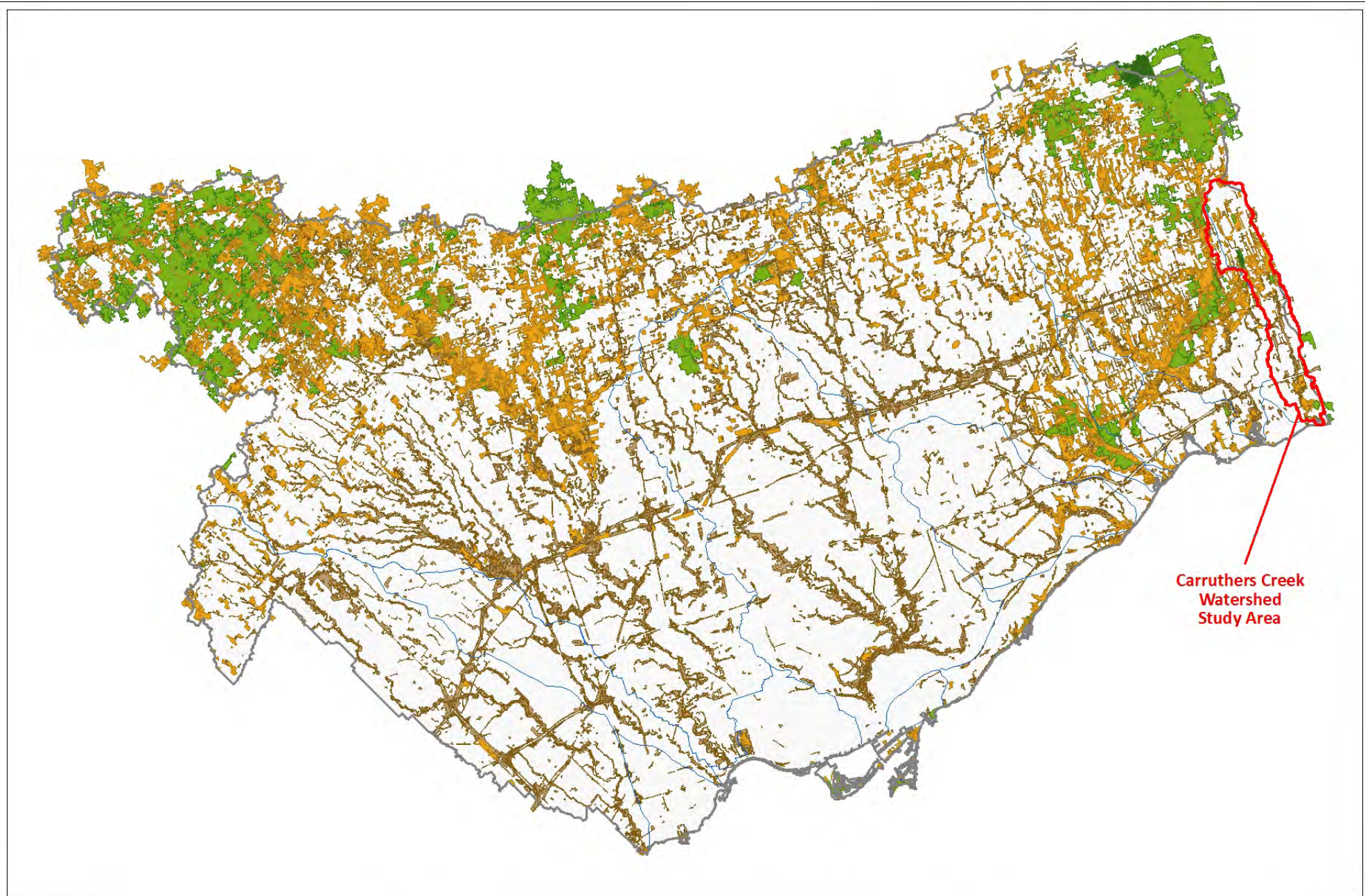


| ID | Name |
|----|----------------------------------|
| 1 | Duffins Creek Valley ANSI |
| 2 | Salem Road Wetland Complex |
| 3 | Kinsale Raised Shoreline ANSI |
| 4 | Rossland Road Wetland Complex |
| 5 | Carruthers Creek Wetland Complex |
| 6 | Shoal Point Wetlands ANSI |
| 7 | Carruthers Forest ESA |
| 8 | Carruthers Marsh ESA |
| 9 | Ajax Warbler Swamp |
| 10 | Cranberry Marsh |
| 11 | Lynde Marsh |

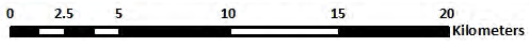
0 500 1,000 2,000 3,000 4,000 Meters
 December 2016
 Orthophoto: Spring 2014, First Base Solutions

Map 3:
Carruthers Creek Watershed
ANSIs, Potential PSWs, ESAs,
Natural Corridor Links

- Carruthers Creek Watershed Study Area
- Wetland (MNR)
- ANSI (MNR)
- Natural Corridor Connections



Carruthers Creek
Watershed
Study Area



December 2016

* Landscape analysis based on 2013 Orthophotography

Map 4:
Regional Natural System
Habitat Patch Quality

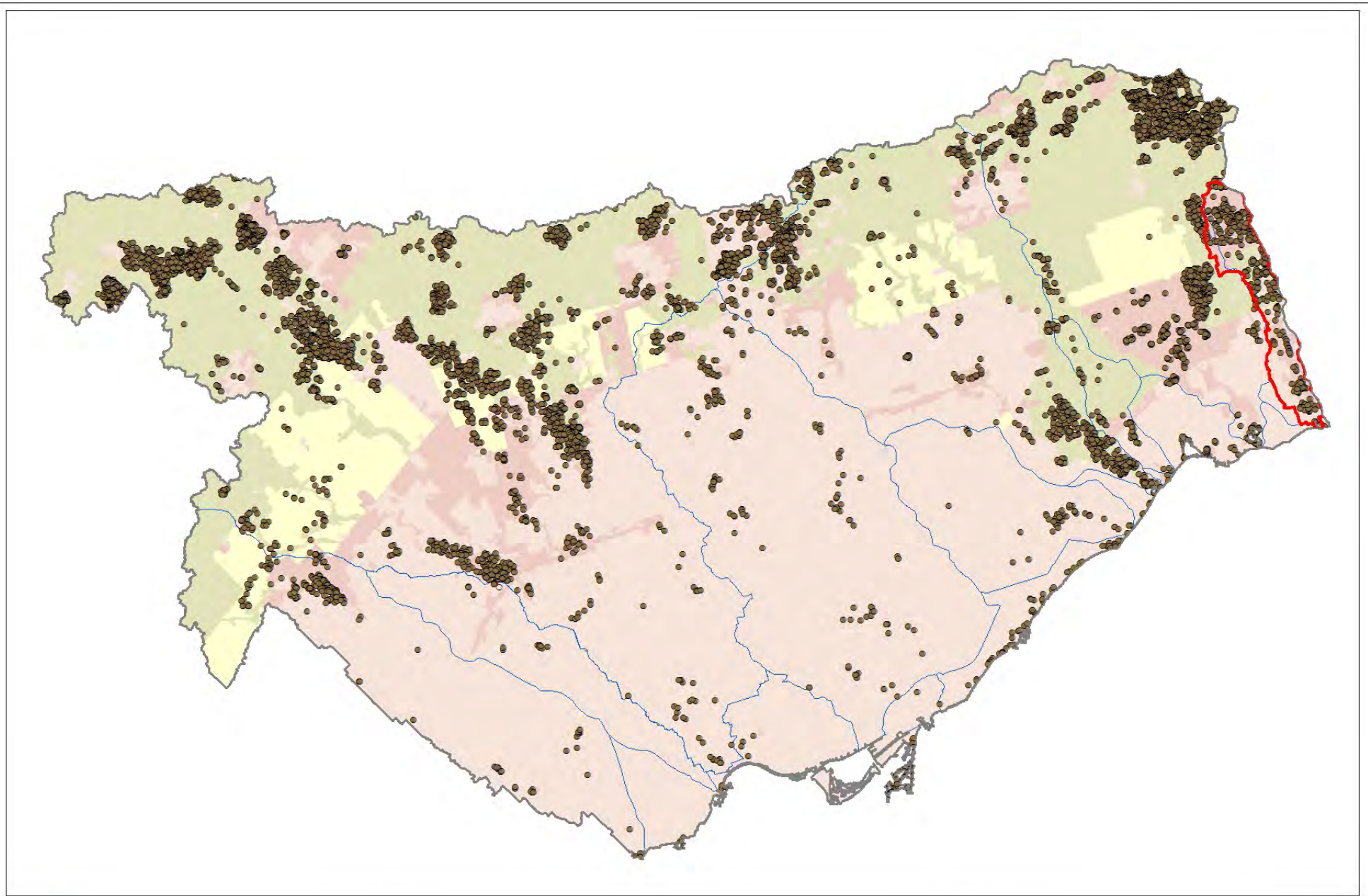
Habitat Patch Quality *


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


Carruthers Creek Watershed Study Area Boundary

TRCA Jurisdiction

Watershed












Toronto and Region Conservation
for The Living City



0 2.5 5 10 15 20 KM

December 2016

Map 5:
Distribution of Fauna
Regional Species of Concern

| | |
|--|--|
| <ul style="list-style-type: none">  Fauna Species of Concern (L1 - L3)  Carruthers Creek Watershed Study Area Boundary  TRCA Jurisdiction  Watershed | <ul style="list-style-type: none">  Agricultural & Rural Area  Built-up Area  Designated Greenfield Area  Greenbelt Area |
|--|--|



0 500 1,000 2,000 3,000 4,000
Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

Map 6a:
Areas Suveyed by
TRCA in the Study Area
(2002-2007)

- 2002 (02-M)
- 2003 (Carruthers Wetlands)
- 2005 (Berrywood)
- 2007 (Kinsale)
- Watercourse
- Carruthers Creek Watershed Study Area



0 500 1,000 2,000 3,000 4,000
Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

Map 6b:
Areas Suveyed by
TRCA in the Study Area
(2009-2016)










- 2009 (Whitebelt)
- 2015 (Carruthers Watershed Plan)
- 2016 (Carruthers Watershed Plan)
- Watercourse
- Carruthers Creek Watershed Study Area

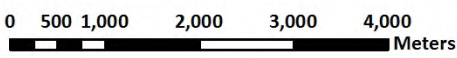
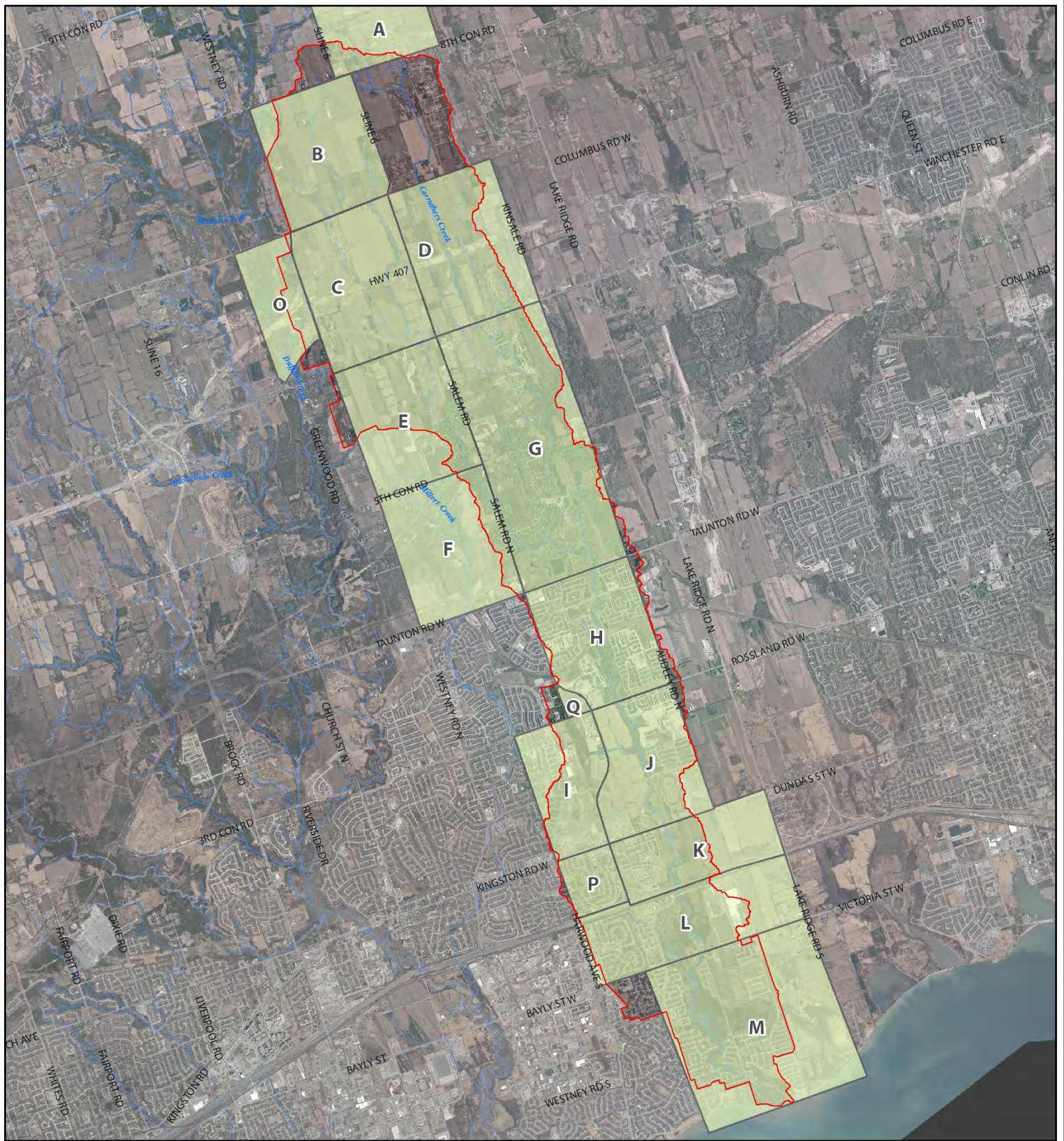


0 500 1,000 2,000 3,000 4,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

Map 6c:
Areas Suveyed by
TRCA in the Study Area
(2002-2016)

- | | | | |
|---|----------------------------------|---|---------------------------------------|
|  | 2002 (02-M) |  | Watercourse |
|  | 2003 (Carruthers Wetlands) |  | Carruthers Creek Watershed Study Area |
|  | 2005 (Berrywood) | | |
|  | 2007 (Kinsale) | | |
|  | 2009 (Whitebelt) | | |
|  | 2015 (Carruthers Watershed Plan) | | |
|  | 2016 (Carruthers Watershed Plan) | | |

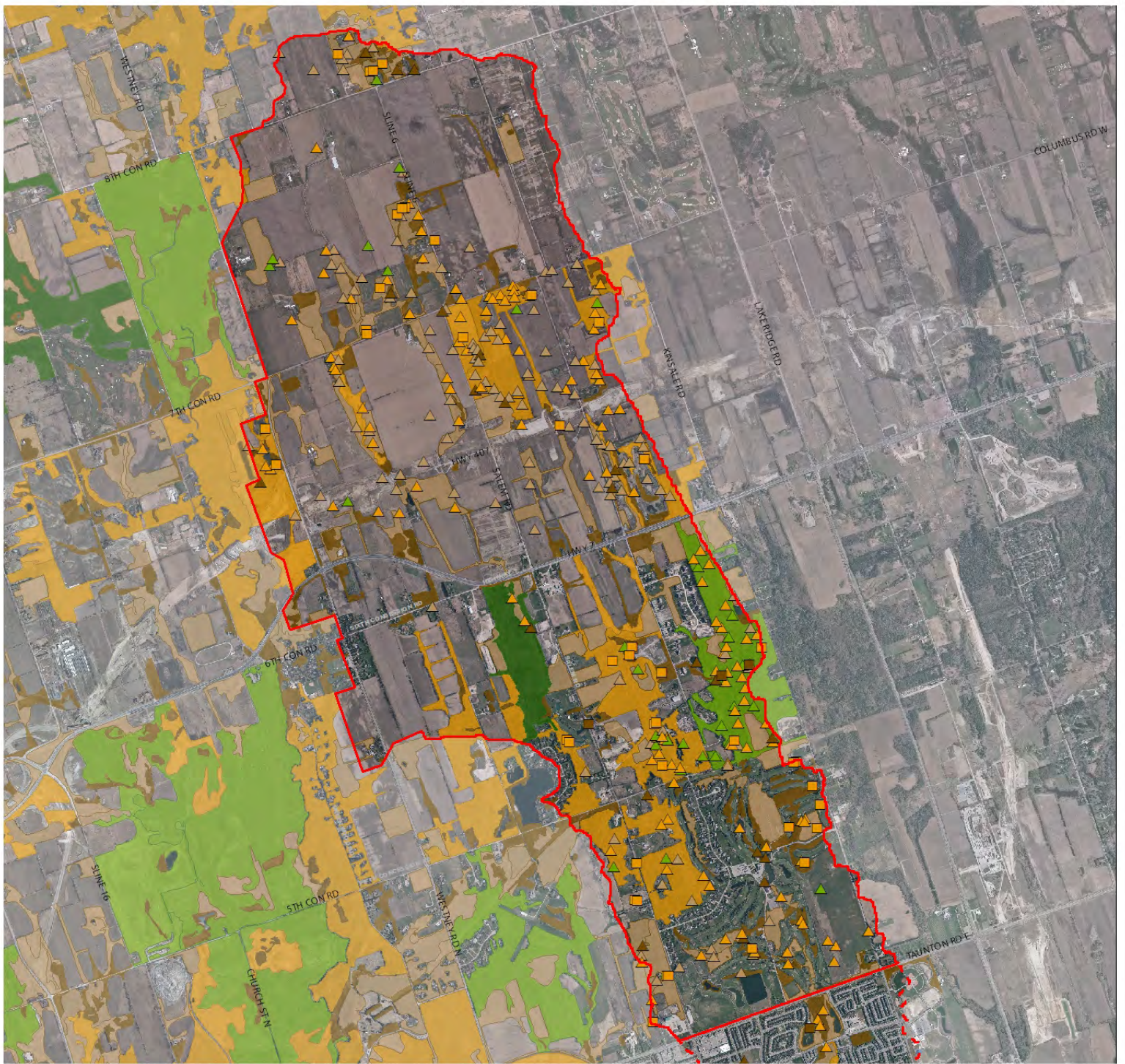


December 2016
Orthophoto: Spring 2014, First Base Solutions

Map 6d:
Areas Surveyed by
TRCA With Identified
Survey Blocks

 Carruthers Creek Watershed Study Area

 Blocks



| | | |
|--|---|--|
| <p>Fauna Area Sensitivity Scores</p> <ul style="list-style-type: none"> ▲ 5 - >100ha ▲ 4 - >20ha ▲ 3 - > 5ha ▲ 2 - > 1ha ▲ 1 - < 1ha | <ul style="list-style-type: none"> △ Fauna Species □ Frog Species | <p>Habitat Patch Size Scores *</p> <ul style="list-style-type: none"> ■ 5 - Excellent ■ 4 - Good ■ 3 - Fair ■ 2 - Poor ■ 1 - Very Poor |
| <ul style="list-style-type: none"> Carruthers Creek Watershed Study Area Boundary (North) Carruthers Creek Watershed Study Area Boundary (South) | | |

0 250 500 1,000 1,500 2,000 Meters

December 2016
 Orthophoto: Spring 2014, First Base Solutions
 * Landscape analysis based on 2013 Orthophotography

Map 7a: Habitat Patch Size Scores with Fauna Area Sensitivity Scores (North)

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



Fauna Area Sensitivity Scores

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

- △ Fauna Species
- Frog Species

- ▭ Carruthers Creek Watershed Study Area Boundary (South)
- - - Carruthers Creek Watershed Study Area Boundary (North)

Habitat Patch Size Scores *

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

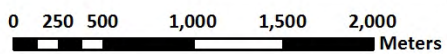
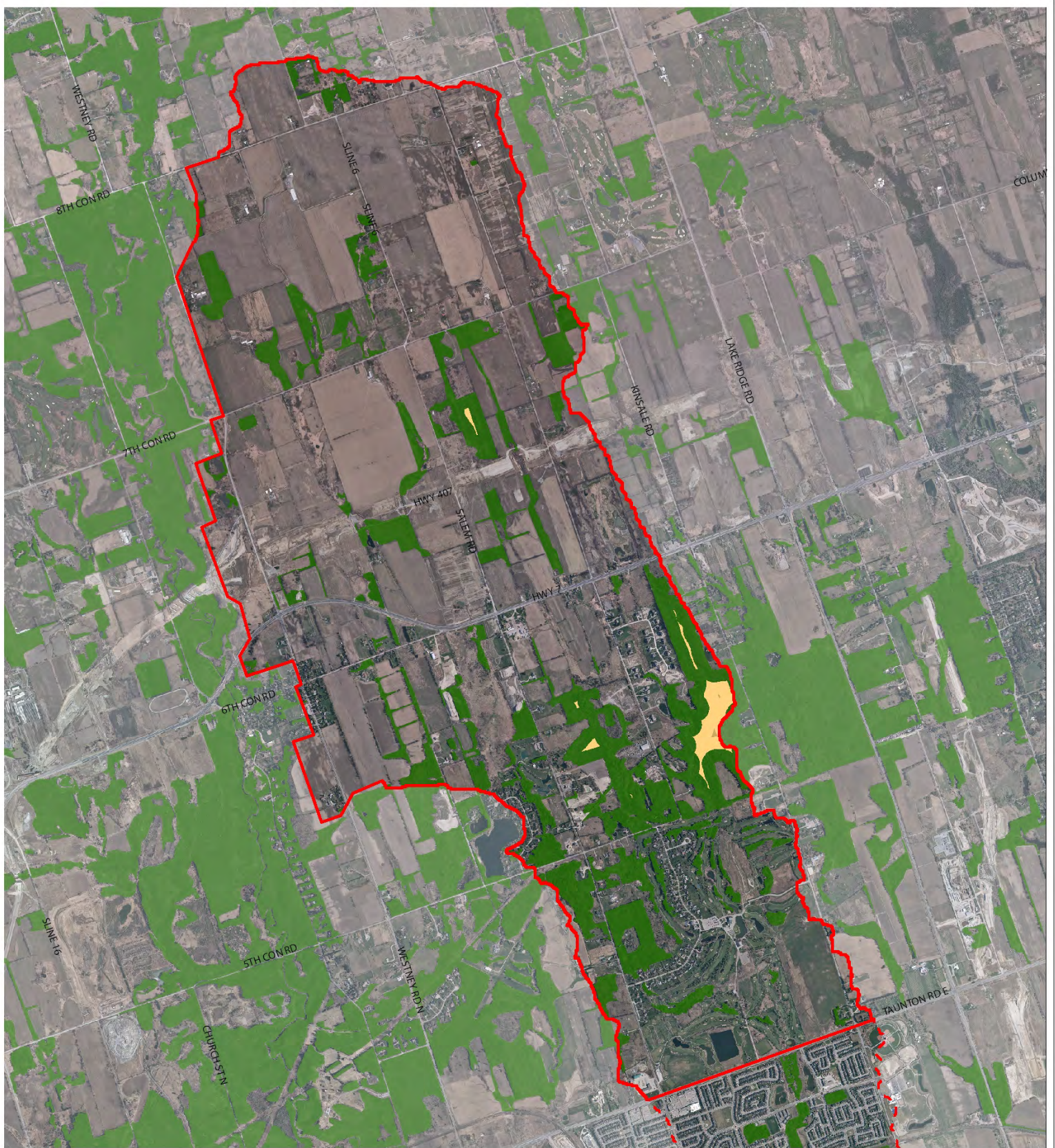


0 250 500 1,000 1,500 2,000 Meters

December 2016
 Orthophoto: Spring 2014, First Base Solutions
 * Landscape analysis based on 2013 Orthophotography





**Map 7b:
 Habitat Patch Size
 Scores with Fauna Area
 Sensitivity Scores (South)**

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



December 2016
 Orthophoto: Spring 2014, First Base Solutions

Map 8a:
Interior Forest at
Carruthers Creek Watershed
Plan Study Area
(N and S)
North





-  Study Area Boundary
-  Forest
- Forest Interior
-  100m-200m
-  200m-300m

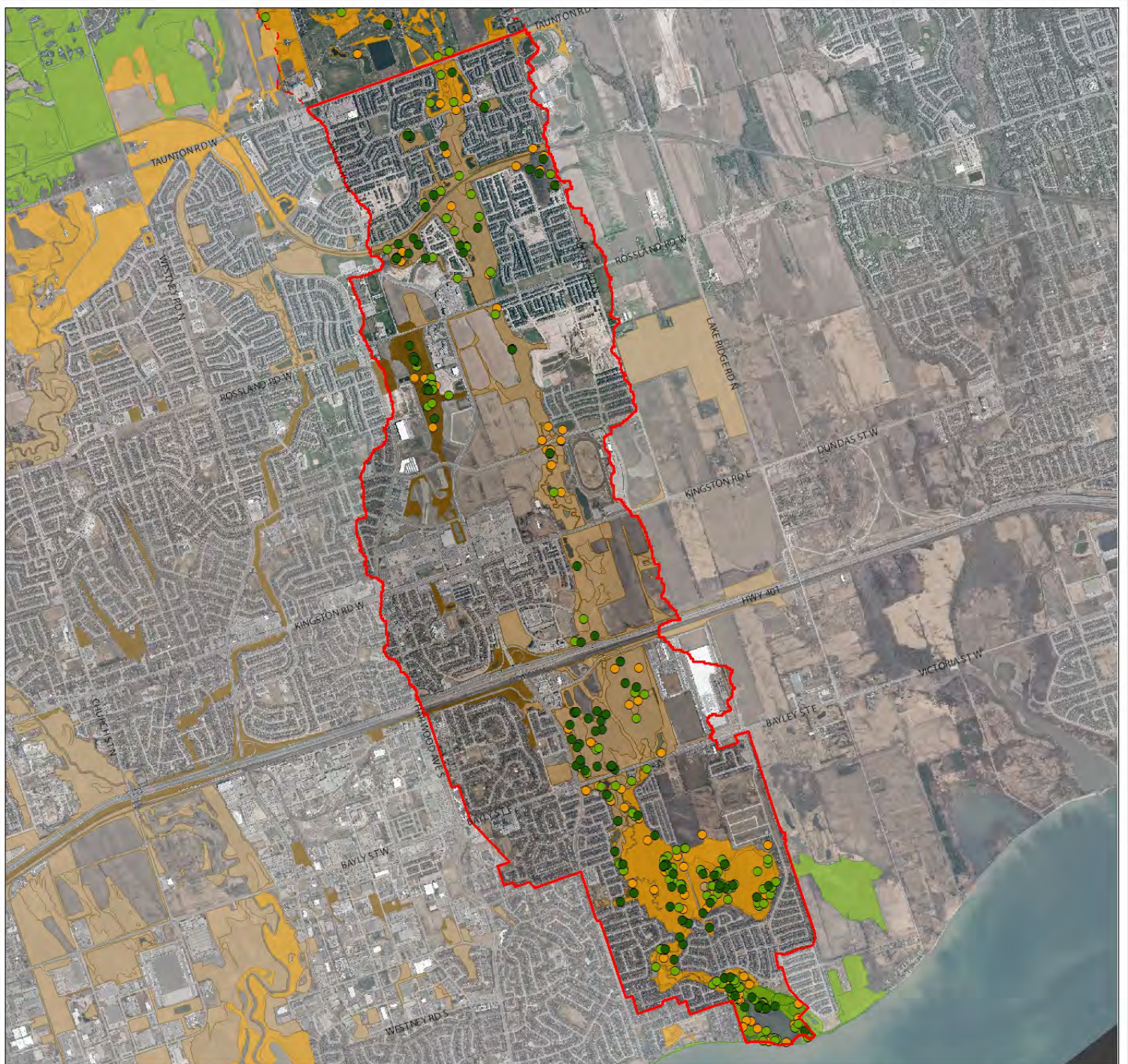


0 250 500 1,000 1,500 2,000
 Meters

December 2016
 Orthophoto: Spring 2014, First Base Solutions

Map 8b:
Interior Forest at
Carruthers Creek Watershed
Plan Study Area
(N and S)
South

-  Study Area Boundary
-  Forest
- Forest Interior
 -  100m-200m
 -  200m-300m

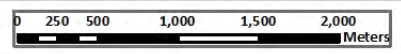


Flora Sensitivity to Development Scores

- 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
- Carruthers Creek Watershed Study Area Boundary (South)
- Carruthers Creek Watershed Study Area Boundary (North)



December 2016
 Orthophoto: Spring 2014, First Base Solutions
 * Landscape analysis based on 2013 Orthophotography

**Map 9b:
 Scores for Matrix Influence
 and Flora Sensitivity to
 Development (South)**

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
- Carruthers Creek Watershed Study Area Boundary (North)
- Carruthers Creek Watershed Study Area Boundary (South)

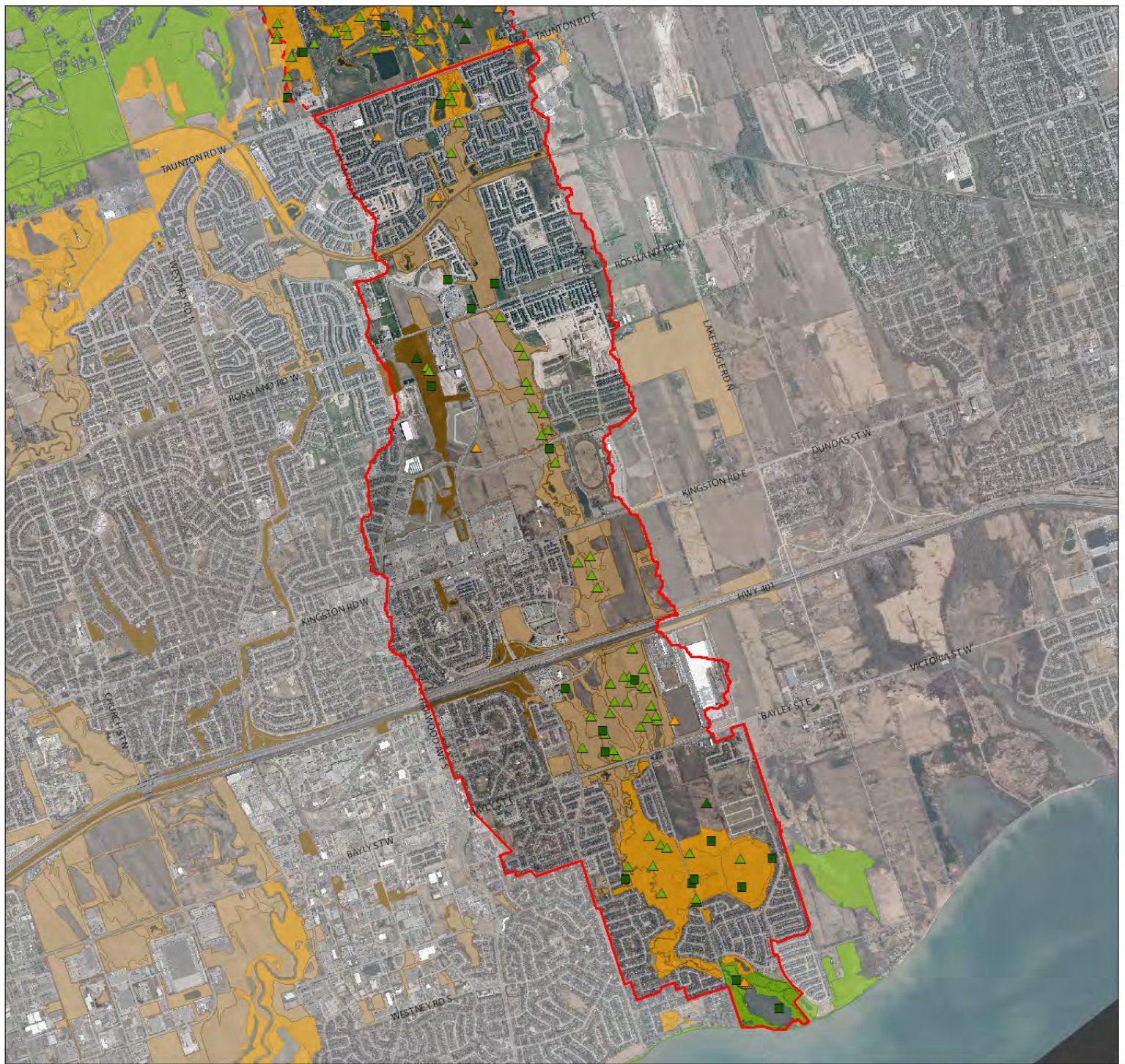


0 250 500 1,000 1,500 2,000 Meters

December 2016
 Orthophoto: Spring 2014, First Base Solutions
 * Landscape analysis based on 2013 Orthophotography

Map 10a: Scores for Matrix Influence and Fauna Sensitivity to Development (North)

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



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
- Carruthers Creek Watershed Study Area Boundary (South)
- Carruthers Creek Watershed Study Area Boundary (North)



0 250 500 1,000 1,500 2,000 Meters

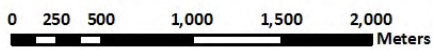
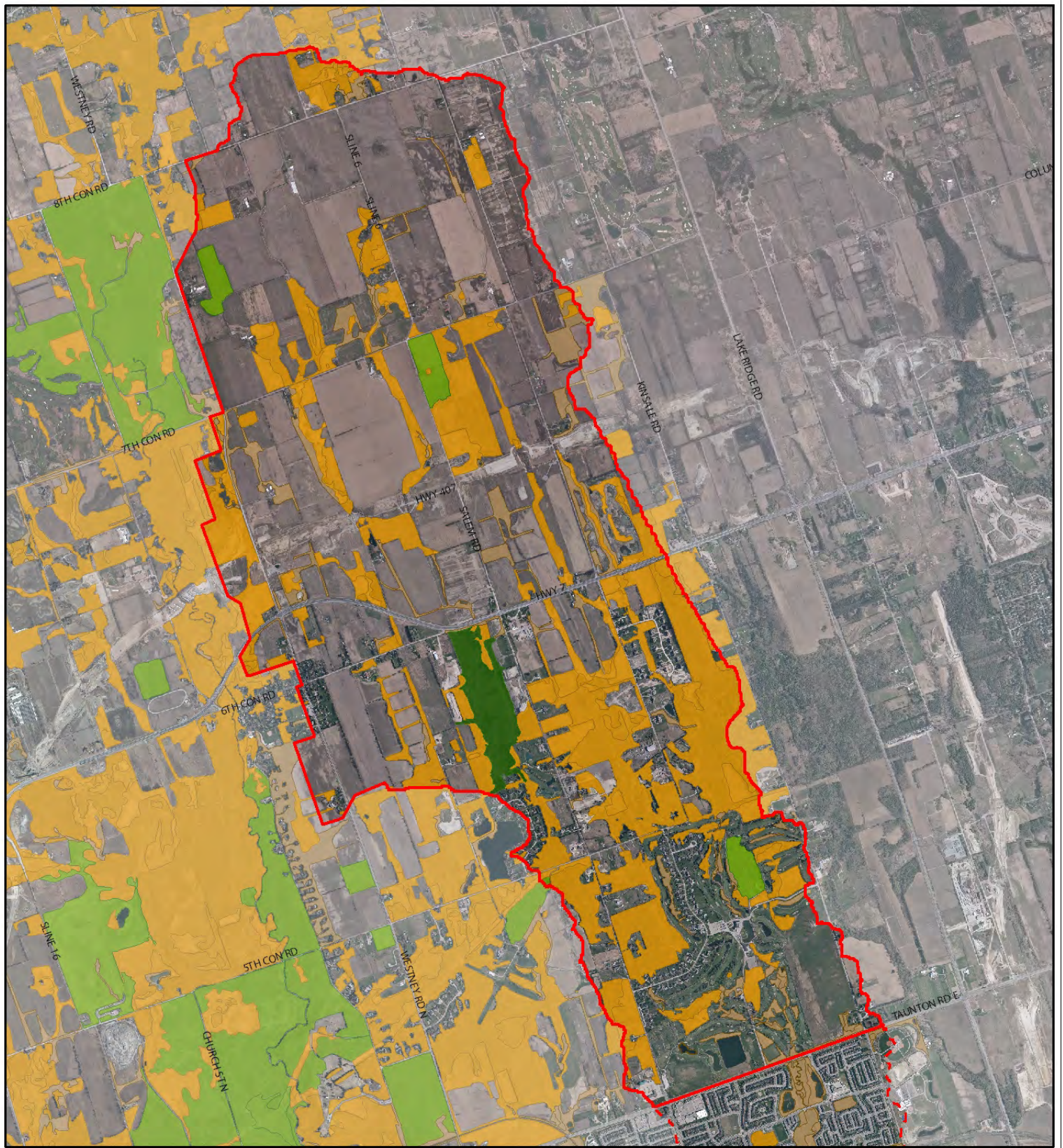
December 2016

Orthophoto: Spring 2014, First Base Solutions

* Landscape analysis based on 2013 Orthophotography

**Map 10b:
Scores for Matrix Influence
and Fauna Sensitivity to
Development (South)**

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



December 2016

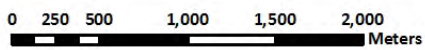
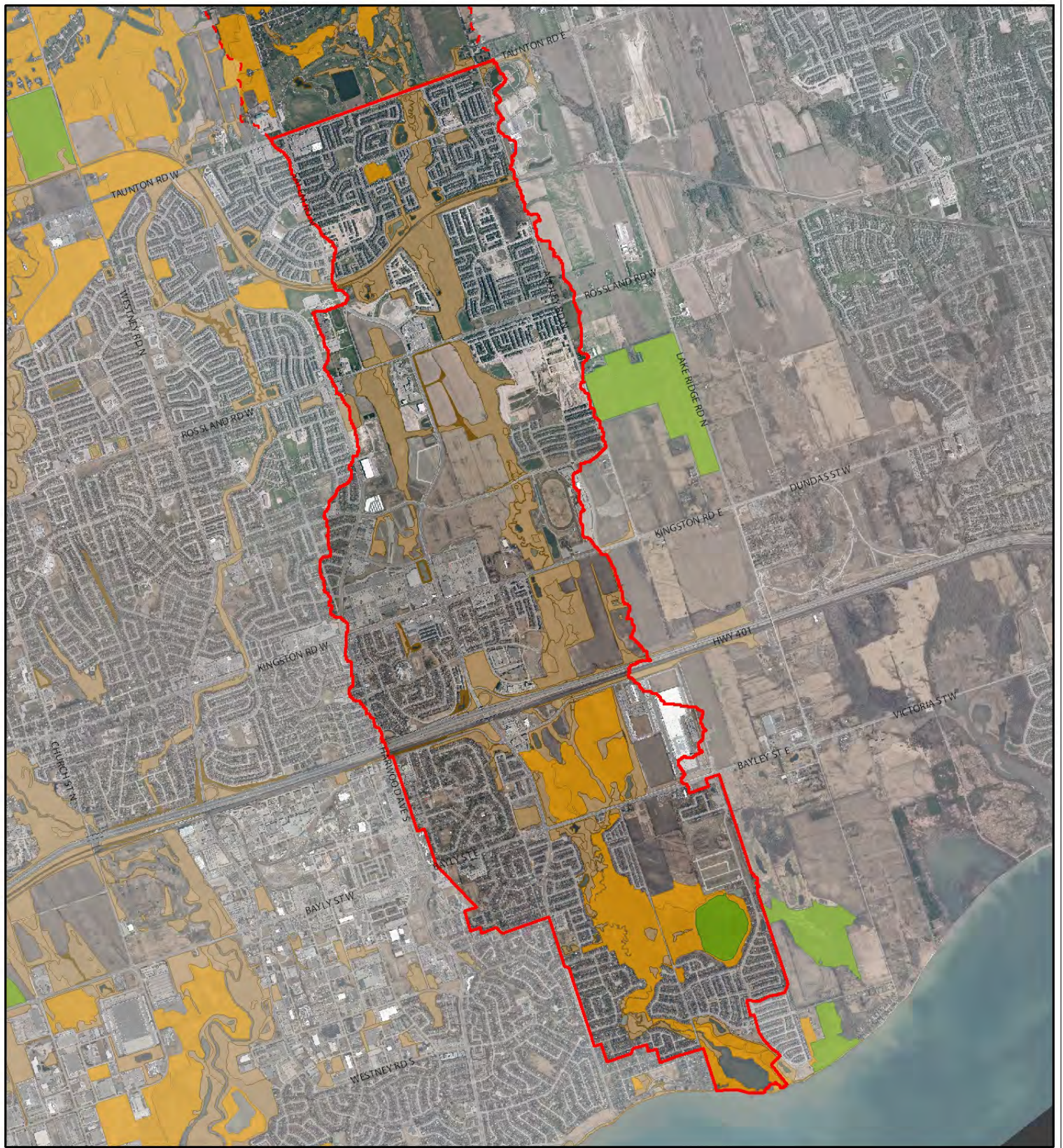
Orthophoto: Spring 2014, First Base Solutions

* Landscape analysis based on 2013 Orthophotography

Map 11a: Habitat Patch Quality (North)

Habitat Patch Quality *

- L1 - Excellent
 - L2 - Good
 - L3 - Fair
 - L4 - Poor
 - L5 - Very Poor
- Carruthers Creek Watershed Study Area Boundary (North)
- Carruthers Creek Watershed Study Area Boundary (South)

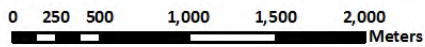
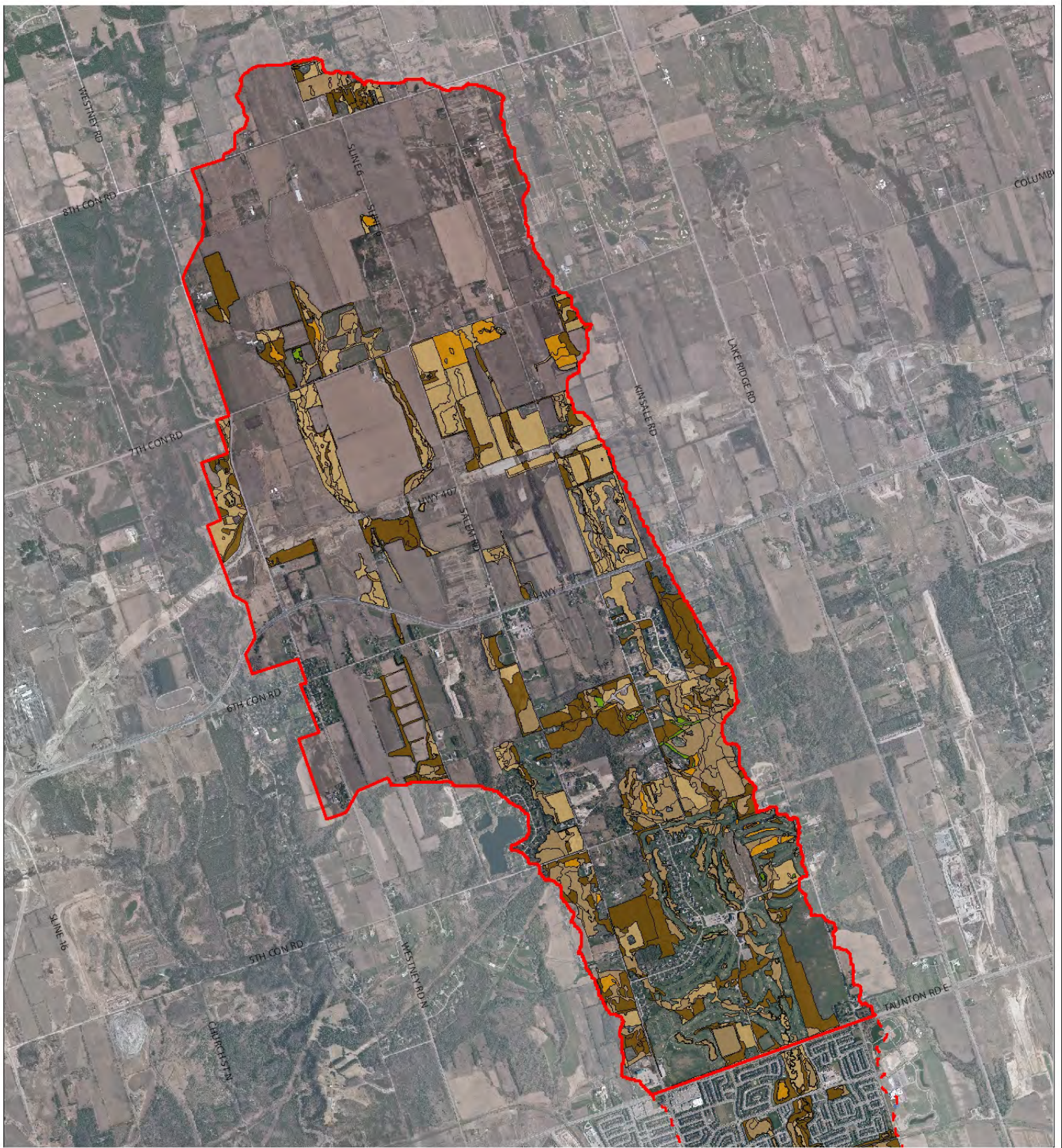


December 2016
 Orthophoto: Spring 2014, First Base Solutions
 * Landscape analysis based on 2013 Orthophotography

Map 11b:
Habitat Patch
Quality (South)

Habitat Patch Quality *

- L1 - Excellent
 - L2 - Good
 - L3 - Fair
 - L4 - Poor
 - L5 - Very Poor
- Carruthers Creek Watershed Study Area Boundary (South)
 - Carruthers Creek Watershed Study Area Boundary (North)









December 2016



Orthophoto: Spring 2014, First Base Solutions

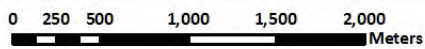
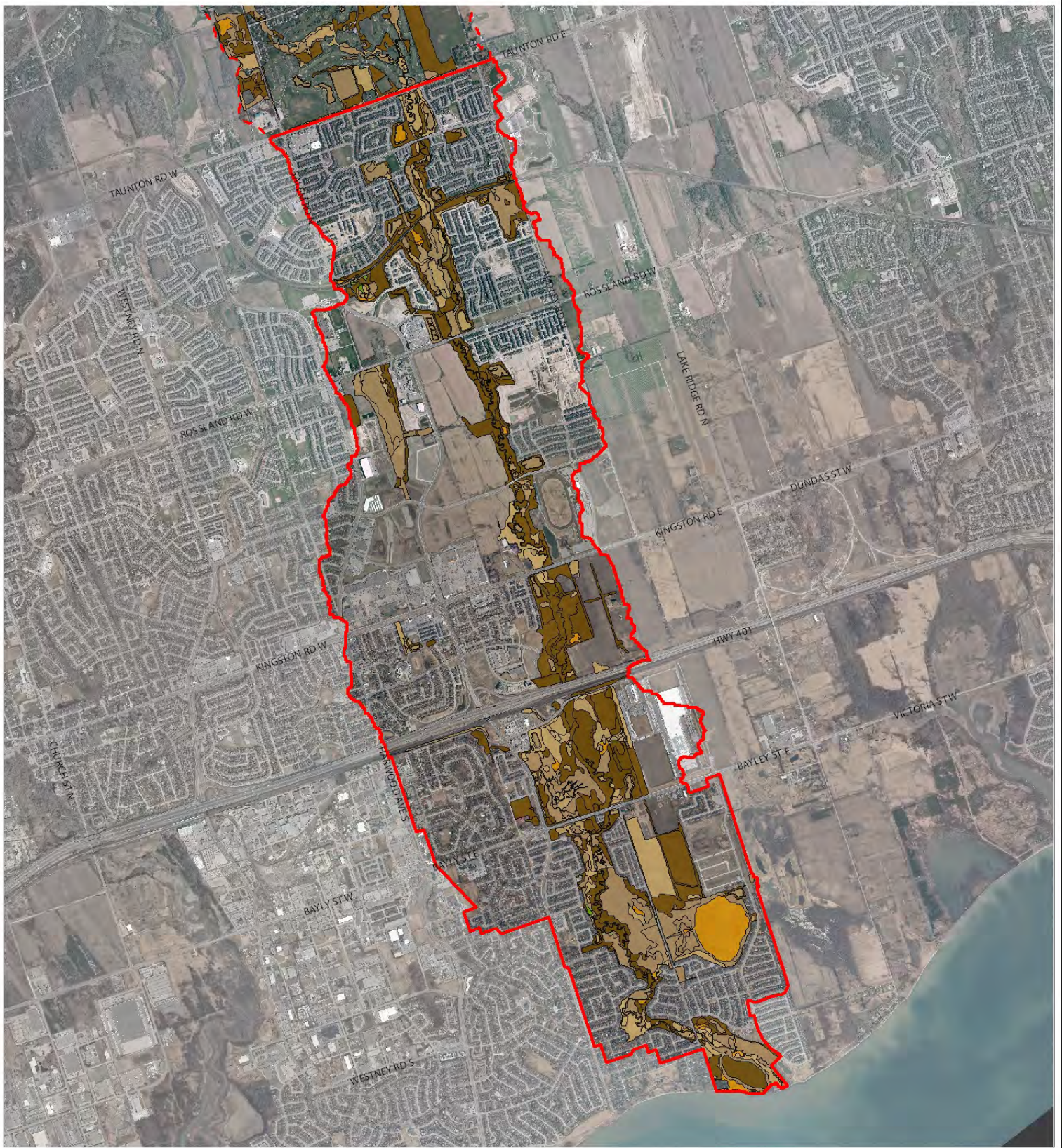
Map 12a: Vegetation Communities with their Associated Local Ranks (North)

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

Vegetation Community Ranks

| | | | |
|---|----|---|----|
|  | L1 |  | L4 |
|  | L2 |  | L5 |
|  | L3 |  | L+ |

-  Carruthers Creek Watershed Study Area Boundary (North)
-  Carruthers Creek Watershed Study Area Boundary (South)



December 2016
 Orthophoto: Spring 2014, First Base Solutions

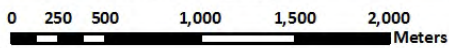
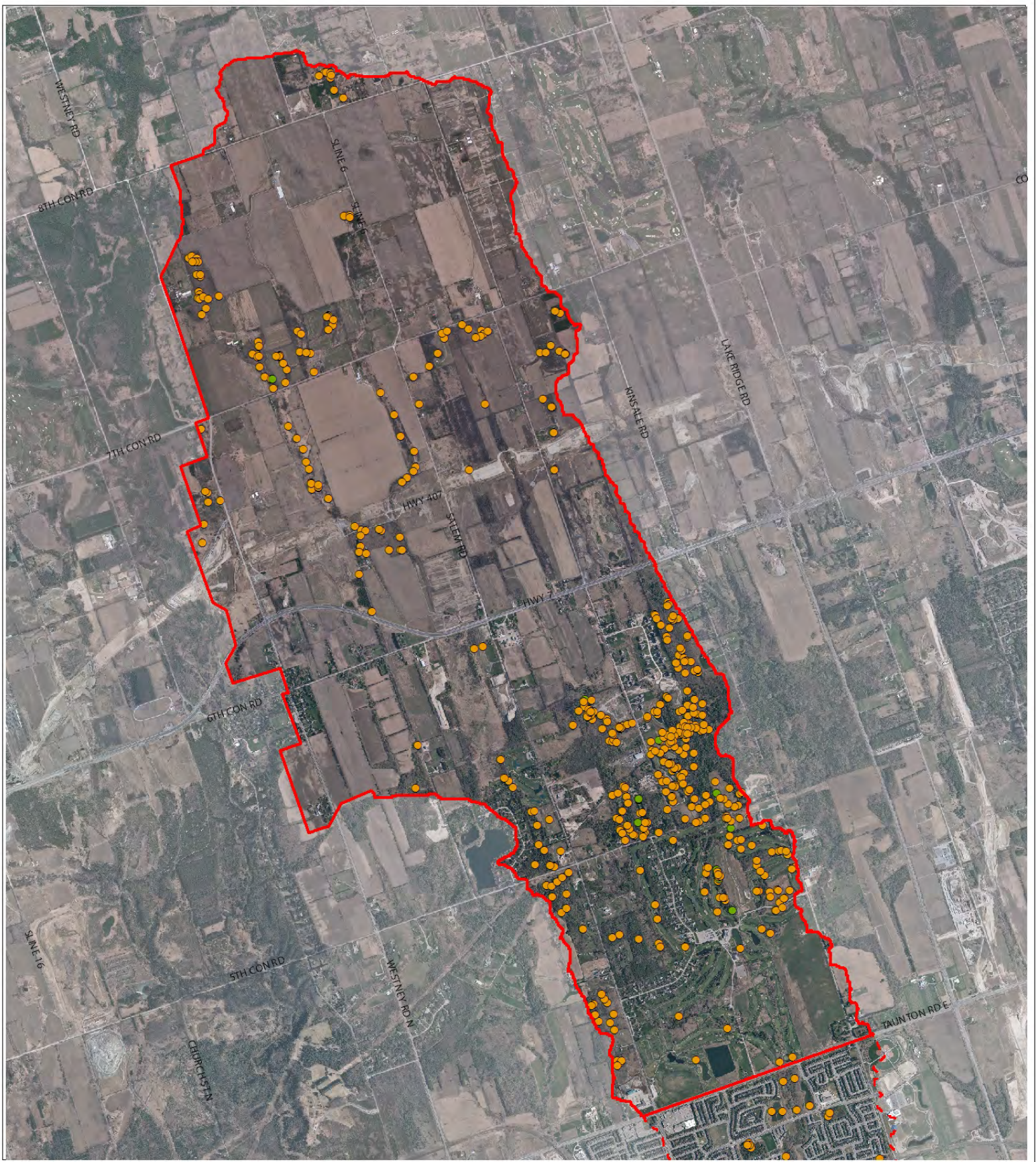
Map 12b: Vegetation Communities with their Associated Local Ranks (South)

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

Vegetation Community Ranks

| | | | |
|--|----|--|----|
| | L1 | | L4 |
| | L2 | | L5 |
| | L3 | | L+ |

- Carruthers Creek Watershed Study Area Boundary (South)
- Carruthers Creek Watershed Study Area Boundary (North)

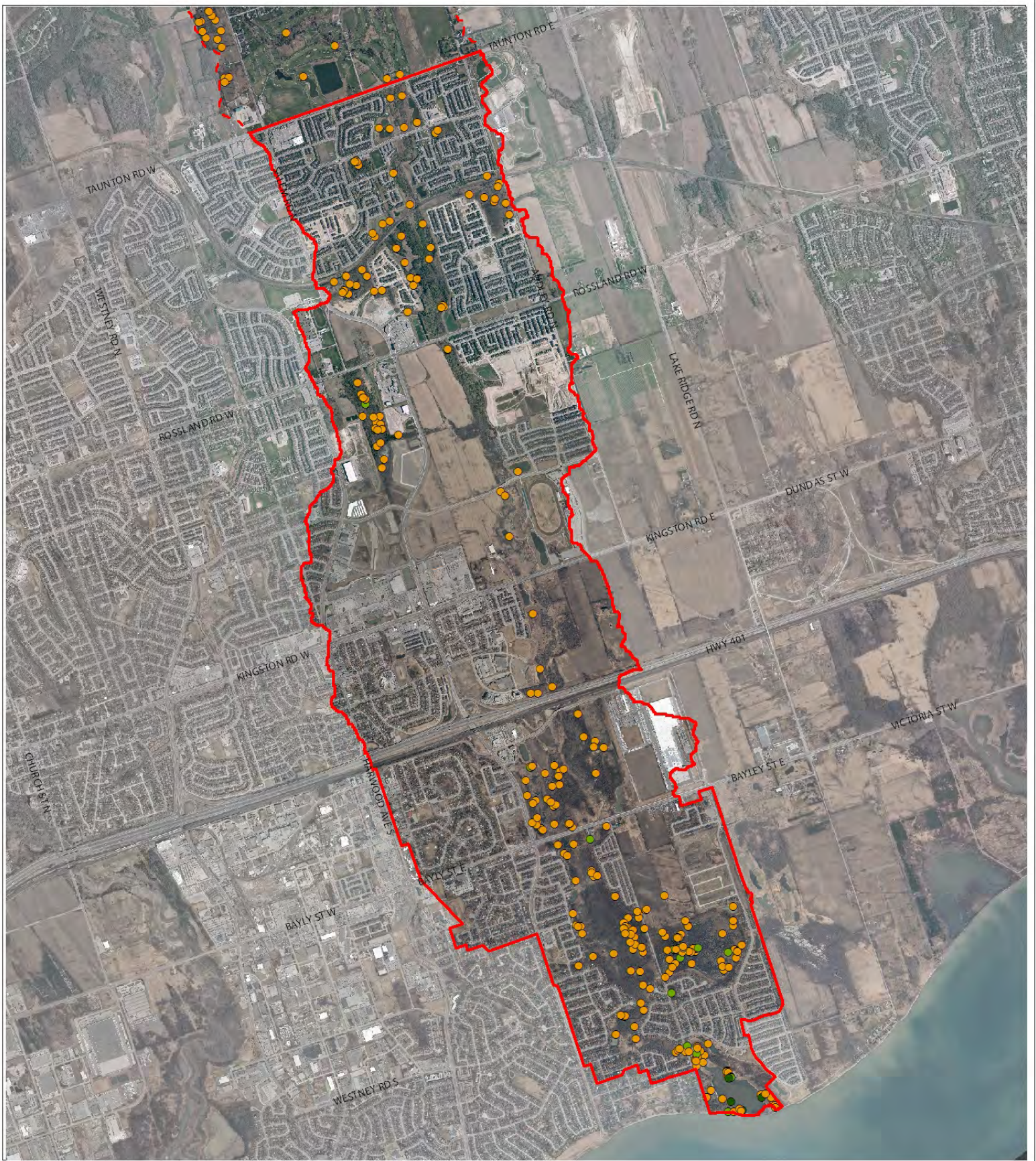


Map 13a: Location of Flora Species of Concern (North)

Flora Species of
 Concern (L1-L3)

- L1
- L2
- L3

- Carruthers Creek Watershed Study Area Boundary (North)
- Carruthers Creek Watershed Study Area Boundary (South)



Map 13b:
Location of Flora
Species of Concern
(South)

| | | |
|-------------------------------------|----|--|
| Flora Species of Concern (L1-L3,LX) | | Carruthers Creek Watershed Study Area Boundary (South) |
| L1 | L3 | Carruthers Creek Watershed Study Area Boundary (North) |
| L2 | LX | |

0 250 500 1,000 1,500 2,000 Meters

Date: April 2016
 Orthophoto: Spring 2014, First Base Solutions



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

- ▭ Carruthers Creek Watershed Study Area Boundary (North)
- - - Carruthers Creek Watershed Study Area Boundary (South)



0 250 500 1,000 1,500 2,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

**Map 14a:
Flora Species Habitat
Dependence Scores
(North)**

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



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

▭ Carruthers Creek Watershed Study Area Boundary (South)

▭ Carruthers Creek Watershed Study Area Boundary (North)

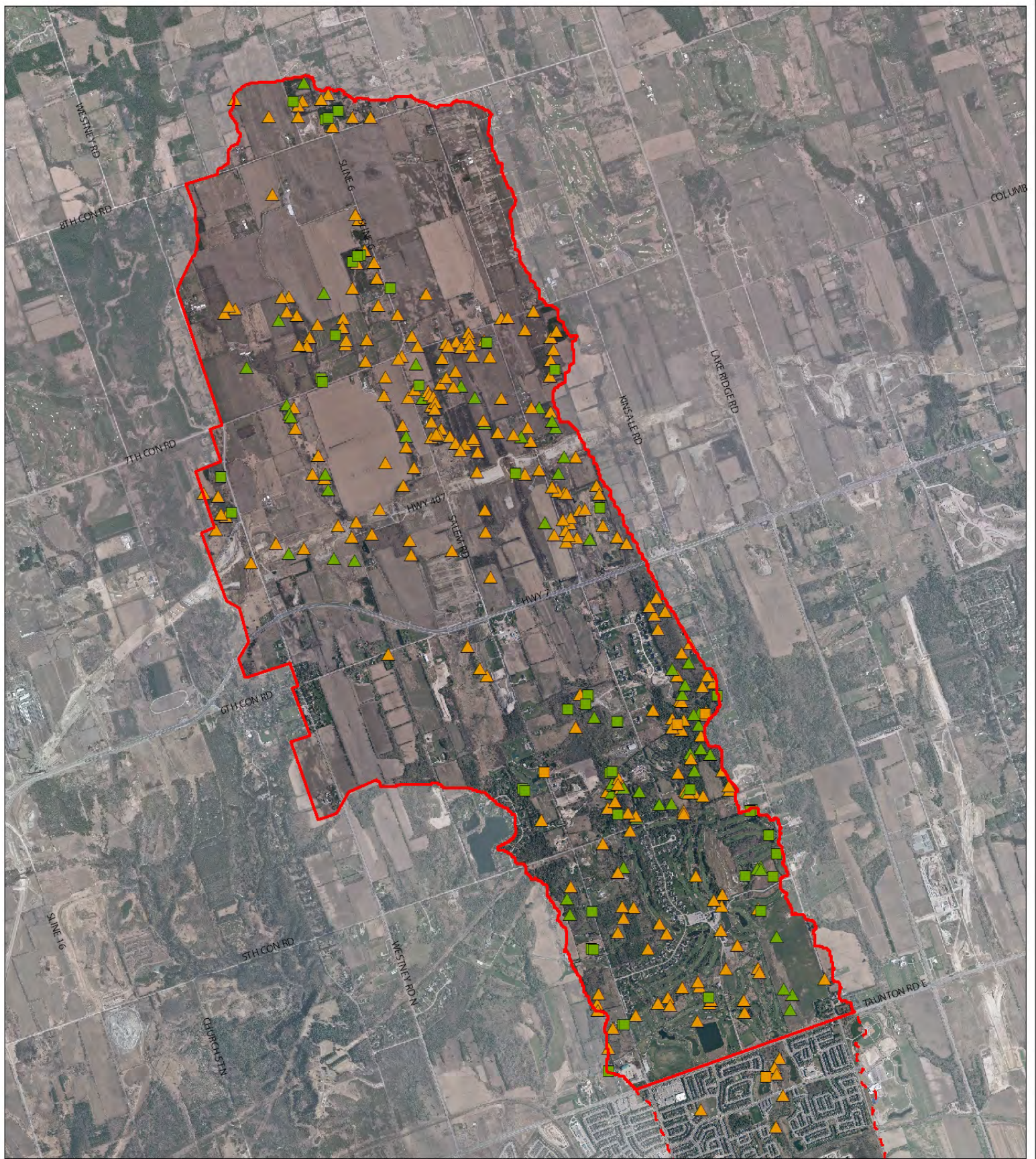


0 250 500 1,000 1,500 2,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

**Map 14b:
Flora Species Habitat
Dependence Scores
(South)**









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

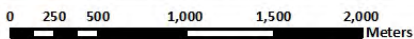
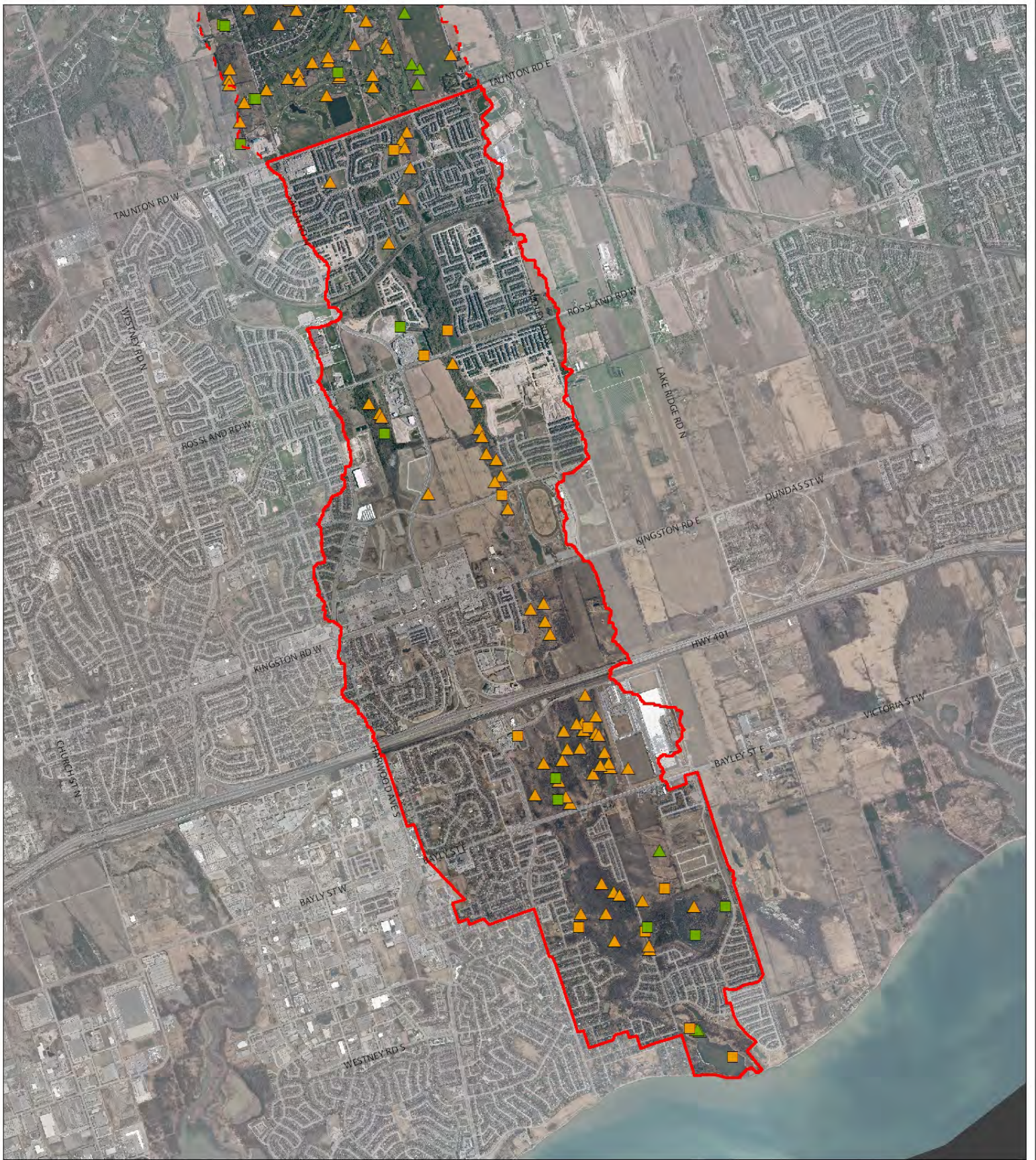


0 250 500 1,000 1,500 2,000 Meters

December 2016
 Orthophoto: Spring 2014, First Base Solutions

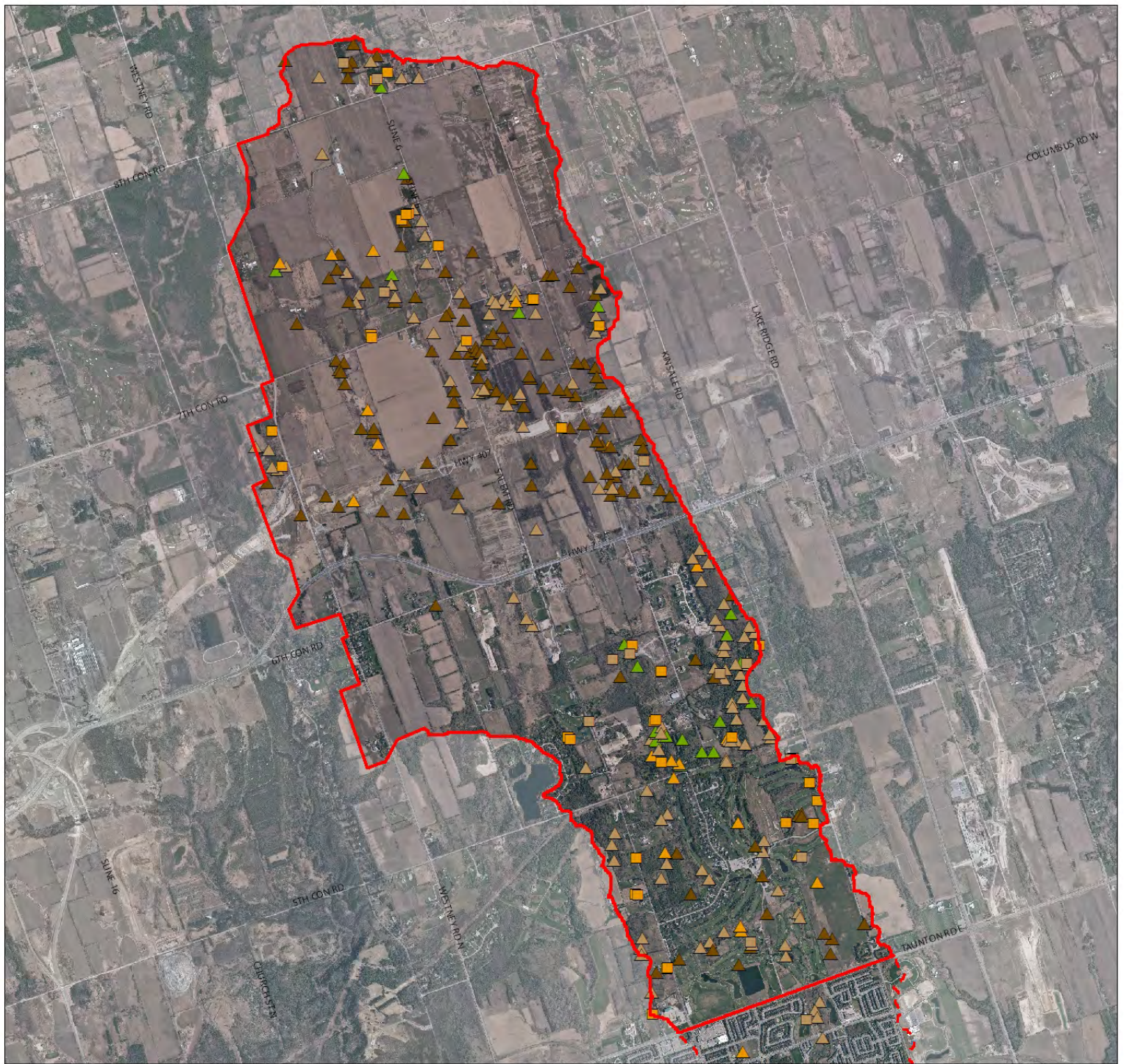
Map 15a: Locations of Fauna Species of Concern (North)

| Fauna Species of Concern | | Frog Species of Concern | |
|--|--|--|--|
|  L1 |  L3 |  L1 |  L3 |
|  L2 | |  L2 | |
|  Carruthers Creek Watershed Study Area Boundary (North) | |  Carruthers Creek Watershed Study Area Boundary (South) | |



Map 15b: Locations of Fauna Species of Concern (South)

| Fauna Species of Concern | | Frog Species of Concern | |
|--|------|--|------|
| ▲ L1 | ▲ L3 | ■ L1 | ■ L3 |
| ▲ L2 | | ■ L2 | |
| Carruthers Creek Watershed Study Area Boundary (South) | | Carruthers Creek Watershed Study Area Boundary (North) | |



Fauna 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

- △ Fauna Species
- Frog Species

- Carruthers Creek Watershed Study Area Boundary (North)
- Carruthers Creek Watershed Study Area Boundary (South)



0 250 500 1,000 1,500 2,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

**Map 16a:
Fauna Species Habitat
Dependence Scores
(North)**

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



Fauna 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

△ Fauna Species

□ Frog Species

▭ Carruthers Creek Watershed Study Area Boundary (South)

- - - Carruthers Creek Watershed Study Area Boundary (North)

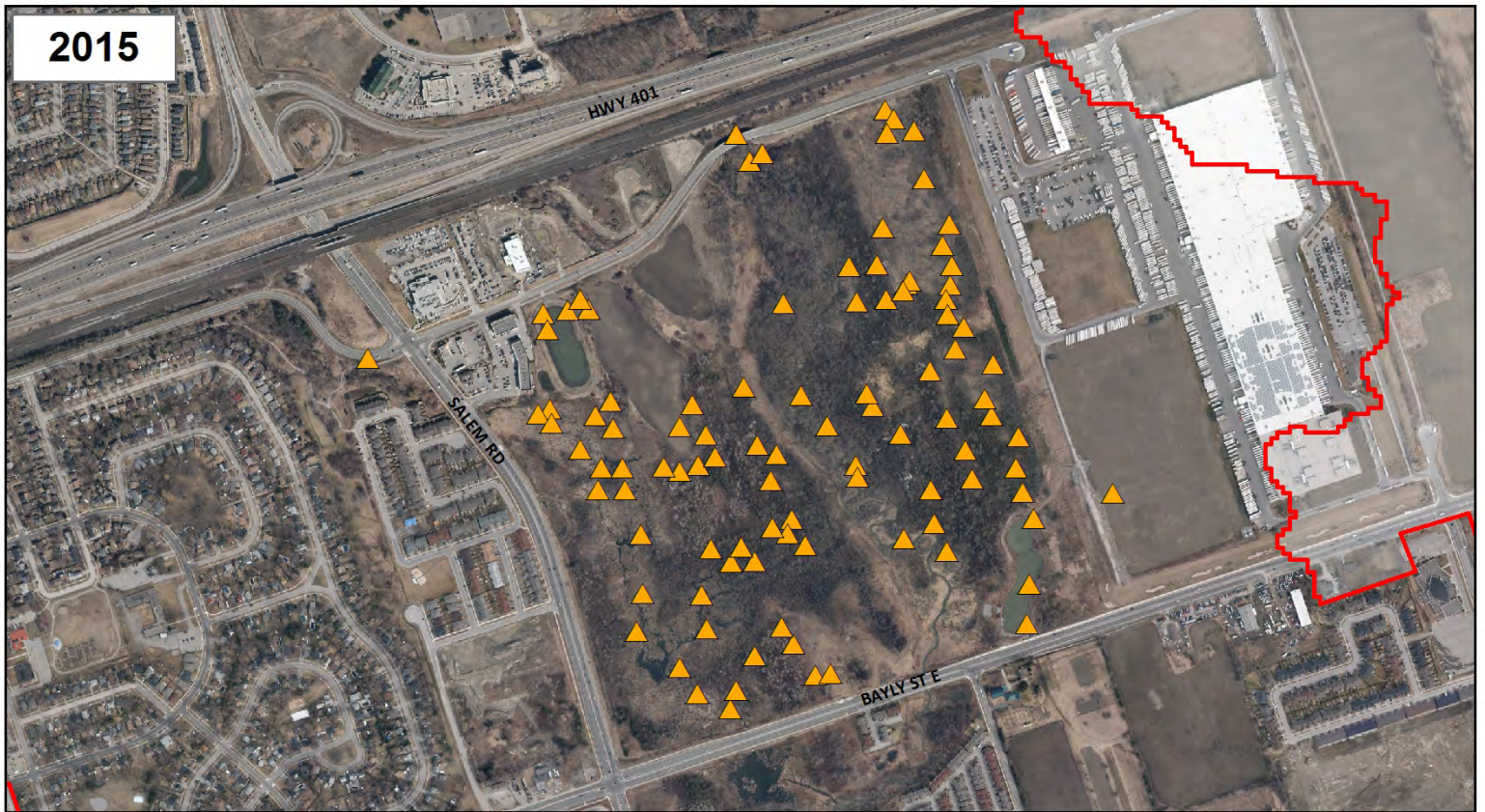
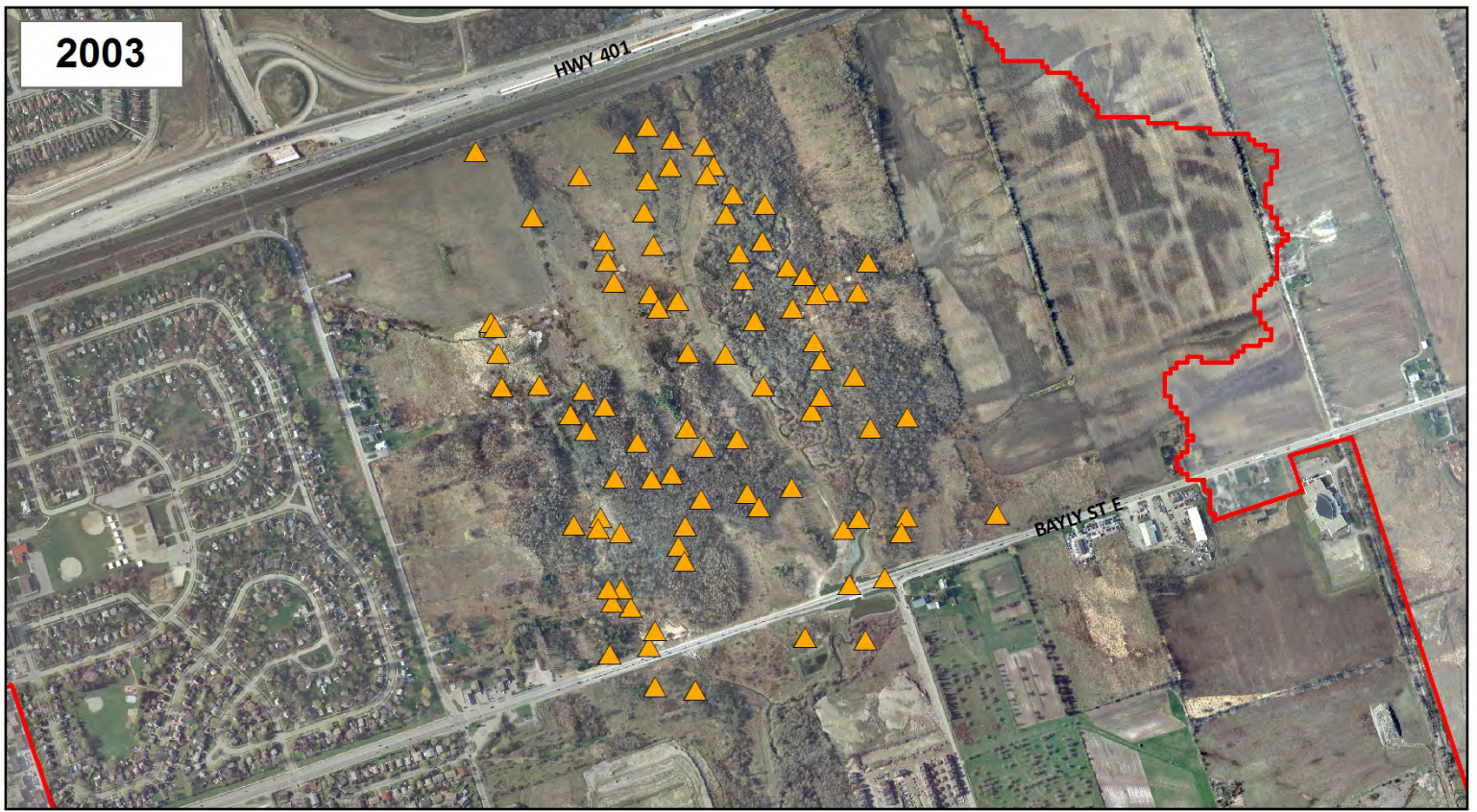


0 250 500 1,000 1,500 2,000 Meters

December 2016
Orthophoto: Spring 2014, First Base Solutions

**Map 16b:
Fauna Species Habitat
Dependence Scores
(South)**

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



Map 17:
Comparison of Bird Records
2003/2015 for the area
N of Bayly, S of Highway 401

▲ Fauna Species

□ Carruthers Creek Watershed Study Area Boundary

| Appendix 1: Carruthers Watershed Vegetation Communities (2016 scores) | | | | | | | | |
|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
| ELC Code | Vegetation Type (* indicates present as inclusion and/or complex only) | area north # ha | area south # ha | Tot. area # ha | Scores | | | Local Rank Apr-16 |
| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| Forest | | | | | | | | |
| *FOC1-a | *Dry-Fresh Scots Pine Coniferous Forest | i | | i | 4.0 | 0.0 | 4.0 | L+ |
| FOC3-1 | Fresh-Moist Hemlock Coniferous Forest | 0.7 | | 0.7 | 2.5 | 2.0 | 4.5 | L4 |
| FOC4-1 | Fresh-Moist White Cedar Coniferous Forest | 9.6 | 2.5 | 12.2 | 2.0 | 2.0 | 4.0 | L4 |
| FOC4-2 | Fresh-Moist White Cedar - Hemlock Coniferous Forest | 1.3 | 2.3 | 3.7 | 2.5 | 2.0 | 4.5 | L4 |
| FOC4-A | Fresh-Moist White Cedar - White Pine Coniferous Forest | 10.9 | | 10.9 | 2.5 | 1.0 | 3.5 | L4 |
| FOM2-1 | Dry-Fresh White Pine - Oak Mixed Forest | 0.5 | | 0.5 | 3.5 | 4.0 | 7.5 | L2 |
| FOM2-2 | Dry-Fresh White Pine - Sugar Maple Mixed Forest | 3.0 | | 3.0 | 2.5 | 1.0 | 3.5 | L4 |
| FOM2-A | Dry-Fresh White Pine - Hardwood Mixed Forest | 0.3 | | 0.3 | 2.5 | 1.0 | 3.5 | L4 |
| FOM3-1 | Dry-Fresh Hardwood Hemlock Mixed Forest | 0.2 | | 0.2 | 2.5 | 3.0 | 5.5 | L3 |
| FOM4-2 | Dry-Fresh White Cedar - Poplar Mixed Forest | 0.4 | | i | 3.0 | 2.0 | 5.0 | L3 |
| FOM4-A | Dry-Fresh White Cedar - Hardwood Mixed Forest | 1.3 | | 1.3 | 2.5 | 1.0 | 3.5 | L4 |
| FOM5-2 | Dry-Fresh Poplar Mixed Forest | 0.4 | 0.4 | 0.8 | 3.5 | 2.0 | 5.5 | L3 |
| FOM6-1 | Fresh-Moist Sugar Maple - Hemlock Mixed Forest | 3.9 | 0.9 | 4.8 | 1.5 | 2.0 | 3.5 | L4 |
| FOM6-2 | Fresh-Moist Hemlock - Hardwood Mixed Forest | | 0.3 | 0.3 | 2.0 | 3.0 | 5.0 | L3 |
| FOM7-1 | Fresh-Moist White Cedar - Sugar Maple Mixed Forest | 4.7 | 2.2 | 6.8 | 2.5 | 2.0 | 4.5 | L4 |
| FOM7-2 | Fresh-Moist White Cedar - Hardwood Mixed Forest | 22.5 | 2.9 | 25.4 | 1.5 | 2.0 | 3.5 | L4 |
| FOM8-1 | Fresh-Moist Poplar Mixed Forest | 0.4 | | 0.4 | 3.0 | 2.0 | 5.0 | L3 |
| FOM8-2 | Fresh-Moist Paper Birch Mixed Forest | 0.3 | | 0.3 | 3.5 | 2.0 | 5.5 | L3 |
| FOM8-B | Fresh-Moist Hardwood Mixed Forest | 7.2 | | 7.2 | 3.0 | 2.0 | 5.0 | L3 |
| FOMA-B | Fresh-Moist White Pine - Hawthorn Mixed Forest | 1.3 | | 1.3 | 4.0 | 0.0 | 4.0 | L4 |
| FOD2-1 | Dry-Fresh Oak - Red Maple Deciduous Forest | 0.9 | | 0.9 | 3.5 | 2.0 | 5.5 | L3 |
| FOD3-1 | Dry-Fresh Poplar Deciduous Forest | 0.2 | 0.9 | 1.1 | 2.0 | 2.0 | 4.0 | L4 |
| *FOD4-1 | *Dry-Fresh Beech Deciduous Forest | c | | c | 2.5 | 1.0 | 3.5 | L4 |
| FOD4-H | Dry-Fresh Hawthorn - Apple Deciduous Forest | | 0.5 | 0.5 | 2.5 | 0.0 | 2.5 | L5 |
| FOD5-1 | Dry-Fresh Sugar Maple Deciduous Forest | 7.5 | 2.3 | 9.8 | 1.0 | 0.0 | 1.0 | L5 |
| FOD5-2 | Dry-Fresh Sugar Maple - Beech Deciduous Forest | 10.0 | 1.9 | 12.0 | 1.5 | 0.0 | 1.5 | L5 |
| FOD5-3 | Dry-Fresh Sugar Maple - Oak Deciduous Forest | 1.0 | | 1.0 | 1.5 | 2.0 | 3.5 | L4 |
| FOD5-6 | Dry-Fresh Sugar Maple - Basswood Deciduous Forest | 2.4 | 4.9 | 7.3 | 2.5 | 0.0 | 2.5 | L5 |
| FOD5-7 | Dry-Fresh Sugar Maple - Black Cherry Deciduous Forest | 1.6 | | 1.6 | 2.0 | 0.0 | 2.0 | L5 |
| FOD5-8 | Dry-Fresh Sugar Maple - White Ash Deciduous Forest | 0.5 | | 0.5 | 1.5 | 0.0 | 1.5 | L5 |
| FOD5-10 | Dry-Fresh Sugar Maple - Paper Birch - Poplar Deciduous Forest | 4.4 | | 4.4 | 2.5 | 1.0 | 3.5 | L4 |
| FOD6-1 | Fresh-Moist Sugar Maple - Ash Deciduous Forest | 3.3 | 0.7 | 4.0 | 2.0 | 0.0 | 2.0 | L5 |
| FOD6-3 | Fresh-Moist Sugar Maple - Yellow Birch Deciduous Forest | 3.5 | | 3.5 | 3.5 | 2.0 | 5.5 | L3 |
| FOD6-4 | Fresh-Moist Sugar Maple - White Elm Deciduous Forest | 1.4 | | | 3.0 | 1.0 | 4.0 | L4 |
| FOD6-5 | Fresh-Moist Sugar Maple - Hardwood Deciduous Forest | 22.9 | 0.4 | 23.4 | 1.5 | 0.0 | 1.5 | L5 |

| Appendix 1: Carruthers Watershed Vegetation Communities (2016 scores) | | | | | | | | |
|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
| ELC Code | Vegetation Type (* indicates present as inclusion and/or complex only) | area north # ha | area south # ha | Tot. area # ha | Scores | | | Local Rank Apr-16 |
| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| FOD7-2 | Fresh-Moist Ash Deciduous Forest | 2.6 | 13.3 | 15.9 | 1.0 | 1.0 | 2.0 | L5 |
| FOD7-3 | Fresh-Moist Willow Lowland Deciduous Forest | 1.8 | 11.3 | 13.1 | 1.5 | 0.0 | 1.5 | L5 |
| FOD7-a | Fresh-Moist Manitoba Maple Lowland Deciduous Forest | 2.1 | 4.5 | 6.6 | 1.5 | 0.0 | 1.5 | L5 |
| FOD7-b | Fresh-Moist Norway Maple Deciduous Forest | | 2.7 | 2.7 | 3.0 | 0.0 | 3.0 | L+ |
| FOD7-c | Fresh-Moist Exotic Lowland Deciduous Forest | 2.1 | | | 2.0 | 0.0 | 2.0 | L+ |
| FOD7-E | Fresh-Moist Hawthorn - Apple Deciduous Forest | 1.3 | 9.7 | 11.0 | 2.5 | 0.0 | 2.5 | L5 |
| FOD7-F | Fresh-Moist Basswood Lowland Deciduous Forest | 1.3 | | 1.3 | 3.0 | 1.0 | 4.0 | L4 |
| FOD8-1 | Fresh-Moist Poplar Deciduous Forest | 6.7 | 6.6 | 13.2 | 1.5 | 0.0 | 1.5 | L5 |
| FOD8-B | Fresh-Moist Paper Birch Deciduous Forest | 1.3 | | 1.3 | 3.0 | 0.0 | 3.0 | L4 |
| FOD9-1 | Fresh-Moist Oak - Sugar Maple Deciduous Forest | 0.6 | | 0.6 | 2.5 | 2.0 | 4.5 | L4 |
| FOD9-3 | Fresh-Moist Bur Oak Deciduous Forest | | 0.3 | 0.3 | 3.0 | 1.0 | 4.0 | L4 |
| FOD9-D | Fresh-Moist Beech - Hardwood Deciduous Forest | 3.8 | | 3.8 | 4.0 | 1.0 | 5.0 | L3 |
| CUP1-1 | Sugar Maple Deciduous Plantation | 0.1 | | | 4.0 | 0.0 | 4.0 | L5 |
| CUP1-3 | Black Walnut Deciduous Plantation | 0.4 | | 0.4 | 3.0 | 0.0 | 3.0 | L5 |
| CUP1-7 | Red Ash Deciduous Plantation | 0.1 | | c | 3.0 | 0.0 | 3.0 | L5 |
| CUP1-A | Restoration Deciduous Plantation | 0.9 | 3.0 | 3.0 | 2.0 | 0.0 | 2.0 | L5 |
| CUP1-b | Willow Deciduous Plantation | 0.1 | | | 3.0 | 0.0 | 3.0 | L5 |
| CUP1-c | Black Locust Deciduous Plantation | 1.7 | | 1.7 | 2.0 | 0.0 | 2.0 | L+ |
| CUP1-d | Horticultural Deciduous Plantation | 0.5 | 1.9 | 2.4 | 3.0 | 0.0 | 3.0 | L+ |
| CUP1-e1 | European Birch Deciduous Plantation | 0.3 | | | 5.0 | 0.0 | 5.0 | L+ |
| CUP1-g | Apple Deciduous Plantation | 4.0 | | 4.0 | 3.0 | 0.0 | 3.0 | L+ |
| CUP2-A | Restoration Mixed Plantation | 1.7 | 17.3 | 19.0 | 2.0 | 0.0 | 2.0 | L5 |
| CUP2-b | Black Locust - Conifer Mixed Plantation | 0.5 | | 0.5 | 3.0 | 0.0 | 3.0 | L+ |
| CUP2-c | Norway Maple - Conifer Mixed Plantation | 0.02 | | 0.02 | 3.0 | 0.0 | 3.0 | L+ |
| CUP2-f | Hybrid Poplar - Conifer Mixed Plantation | 1.0 | | 1.0 | 3.0 | 0.0 | 3.0 | L5 |
| CUP2-h | Horticultural Mixed Plantation | 0.5 | | | 3.0 | 0.0 | 3.0 | L+ |
| CUP3-1 | Red Pine Coniferous Plantation | 0.5 | | 0.7 | 1.5 | 0.0 | 1.5 | L5 |
| CUP3-2 | White Pine Coniferous Plantation | 4.6 | 0.02 | 2.4 | 1.5 | 0.0 | 1.5 | L5 |
| CUP3-3 | Scots Pine Coniferous Plantation | 3.4 | 0.8 | 4.2 | 2.0 | 0.0 | 2.0 | L+ |
| CUP3-A | Restoration Coniferous Plantation | 0.3 | | 0.3 | 2.5 | 0.0 | 2.5 | L5 |
| CUP3-C | White Spruce Coniferous Plantation | 2.0 | 0.8 | 2.8 | 2.0 | 0.0 | 2.0 | L5 |
| CUP3-e | Norway Spruce Coniferous Plantation | 2.8 | | 2.8 | 2.0 | 0.0 | 2.0 | L+ |
| CUP3-G | White Cedar Coniferous Plantation | 0.4 | | 0.4 | 2.0 | 0.0 | 2.0 | L5 |
| CUP3-H | Mixed Conifer Coniferous Plantation | 12.0 | 2.0 | 14.0 | 1.5 | 0.0 | 1.5 | L5 |

| Appendix 1: Carruthers Watershed Vegetation Communities (2016 scores) | | | | | | | | |
|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
| ELC Code | Vegetation Type (* indicates present as inclusion and/or complex only) | area north # ha | area south # ha | Tot. area # ha | Scores | | | Local Rank Apr-16 |
| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| Successional | | | | | | | | |
| CUT1-1 | Sumac Deciduous Thicket | 2.8 | 0.8 | 3.6 | 2.0 | 0.0 | 2.0 | L5 |
| CUT1-5 | Raspberry Deciduous Thicket | 0.4 | 0.2 | 0.6 | 3.0 | 0.0 | 3.0 | L4 |
| CUT1-6 | Poison Ivy Deciduous Thicket | 0.1 | | | 5.0 | 2.0 | 7.0 | L5 |
| CUT1-A1 | Native Deciduous Sapling Regeneration Thicket | 4.7 | 0.3 | 6.4 | 2.0 | 0.0 | 2.0 | L5 |
| CUT1-A2 | Native Mixed Sapling Regeneration Thicket | 1.7 | | 1.7 | 2.5 | 0.0 | 2.5 | L5 |
| CUT1-A3 | Coniferous Sapling Regeneration Thicket | 3.3 | | 3.3 | 2.5 | 1.0 | 3.5 | L4 |
| CUT1-b | Buckthorn Deciduous Thicket | 16.8 | 4.5 | 21.3 | 2.0 | 0.0 | 2.0 | L+ |
| CUT1-c | Exotic Deciduous Thicket | 2.1 | 0.8 | 3.0 | 2.0 | 0.0 | 2.0 | L+ |
| CUT1-E | Red Osier Dogwood Deciduous Thicket | 6.6 | 1.8 | 8.4 | 2.5 | 0.0 | 2.5 | L5 |
| CUH1-A | Treed Hedgerow | 10.2 | 4.9 | 15.1 | 1.5 | 0.0 | 1.5 | L5 |
| CUH1-B | Native Shrub - Sapling Hedgerow | | 1.2 | 1.2 | 3.0 | 0.0 | 3.0 | L4 |
| CUH1-c | Buckthorn Hedgerow | 11.6 | | 11.6 | 2.5 | 0.0 | 2.5 | L+ |
| CUS1-1 | Hawthorn Successional Savannah | | 8.3 | 8.3 | 1.5 | 0.0 | 1.5 | L5 |
| CUS1-2A | White Cedar Successional Savannah | 5.8 | 2.4 | 8.2 | 2.5 | 1.0 | 3.5 | L4 |
| CUS1-A1 | Native Deciduous Successional Savannah | 9.1 | 5.4 | 14.5 | 1.5 | 0.0 | 1.5 | L5 |
| CUS1-A2 | White Pine Successional Savannah | 0.6 | | | 2.5 | 1.0 | 3.5 | L4 |
| CUS1-b | Exotic Successional Savannah | 12.8 | 6.7 | 19.5 | 2.0 | 0.0 | 2.0 | L+ |
| CUW1-A1 | White Cedar Successional Woodland | 4.9 | 1.2 | 6.1 | 2.5 | 1.0 | 3.5 | L4 |
| CUW1-A2 | White Pine Successional Woodland | 0.9 | | 0.9 | 2.5 | 1.0 | 3.5 | L4 |
| CUW1-A3 | Native Deciduous Successional Woodland | 18.4 | 9.6 | 28.0 | 1.0 | 0.0 | 1.0 | L5 |
| CUW1-A4 | Fresh-Moist Cottonwood Tall Treed Woodland | | 1.5 | 1.5 | 3.5 | 2.0 | 5.5 | L3 |
| CUW1-b | Exotic Successional Woodland | 26.1 | 7.2 | 33.3 | 1.0 | 0.0 | 1.0 | L+ |
| CUW1-D | Hawthorn Successional Woodland | 0.9 | 23.3 | 24.2 | 2.0 | 0.0 | 2.0 | L5 |
| Wetland | | | | | | | | |
| SWC1-1 | White Cedar Mineral Coniferous Swamp | 0.6 | 0.9 | 1.5 | 2.5 | 2.0 | 4.5 | L4 |
| SWC1-2 | White Cedar - Conifer Mineral Coniferous Swamp | 0.7 | | 0.7 | 3.5 | 2.0 | 5.5 | L3 |
| SWC3-1 | White Cedar Organic Coniferous Swamp | 0.7 | | 0.7 | 2.5 | 3.0 | 5.5 | L3 |
| SWM1-1 | White Cedar - Hardwood Mineral Mixed Swamp | 5.5 | 4.5 | 10.0 | 1.5 | 2.0 | 3.5 | L4 |
| SWM4-1 | White Cedar - Hardwood Organic Mixed Swamp | 2.0 | 8.0 | 9.9 | 1.5 | 3.0 | 4.5 | L4 |
| SWM6-1 | Birch - Conifer Organic Mixed Swamp | 0.8 | | 0.8 | 2.5 | 3.0 | 5.5 | L3 |
| SWD2-1 | Black Ash Mineral Deciduous Swamp | 1.9 | | | 2.5 | 2.0 | 4.5 | L4 |
| SWD2-2 | Red Ash Mineral Deciduous Swamp | 5.0 | 52.8 | 57.8 | 2.0 | 2.0 | 4.0 | L4 |
| SWD3-2 | Silver Maple Mineral Deciduous Swamp | 0.8 | | 0.8 | 2.0 | 2.0 | 4.0 | L4 |
| SWD4-1 | Willow Mineral Deciduous Swamp | 9.5 | 2.4 | 11.8 | 2.0 | 1.0 | 3.0 | L4 |
| SWD4-2 | White Elm Mineral Deciduous Swamp | 0.2 | | 0.2 | 3.0 | 2.0 | 5.0 | L3 |

| Appendix 1: Carruthers Watershed Vegetation Communities (2016 scores) | | | | | | | | |
|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
| ELC Code | Vegetation Type (* indicates present as inclusion and/or complex only) | area north # ha | area south # ha | Tot. area # ha | Scores | | | Local Rank Apr-16 |
| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| SWD4-3 | Paper Birch - Poplar Mineral Deciduous Swamp | 3.0 | | 3.0 | 2.0 | 2.0 | 4.0 | L4 |
| SWD6-1 | Red Maple Organic Deciduous Swamp | 0.1 | | 0.1 | 3.5 | 3.0 | 6.5 | L2 |
| SWD7-1 | Paper Birch - Poplar Organic Deciduous Swamp | 2.0 | | 2.0 | 2.5 | 3.0 | 5.5 | L3 |
| SWD7-2 | Yellow Birch Organic Deciduous Swamp | 0.8 | | 0.8 | 3.0 | 3.0 | 6.0 | L3 |
| SWT2-2 | Willow Mineral Thicket Swamp | 9.7 | 0.3 | 10.0 | 2.0 | 2.0 | 4.0 | L4 |
| SWT2-5 | Red-osier Mineral Thicket Swamp | 3.2 | 8.5 | 11.7 | 2.0 | 2.0 | 4.0 | L4 |
| SWT2-10 | Nannyberry Mineral Thicket Swamp | | 1.1 | 1.1 | 4.0 | 1.0 | 5.0 | L3 |
| SWT3-5 | Red-osier Organic Thicket Swamp | 0.1 | | 0.1 | 3.0 | 3.0 | 6.0 | L3 |
| FES2-A | Willow Shrub Mineral Fen | 0.1 | | 0.1 | 4.5 | 3.0 | 7.5 | L2 |
| FET2-A | White Cedar Low Treed Mineral Fen | 0.1 | | 0.1 | 3.5 | 4.0 | 7.5 | L2 |
| FET2-B | White Cedar - Scots Pine Low Treed Mineral Fen | 0.2 | | 0.2 | 4.0 | 4.0 | 8.0 | L2 |
| MAM5-1 | Mineral Fen Meadow Marsh | 0.7 | 0.2 | 1.0 | 3.5 | 3.0 | 6.5 | L2 |
| MAM2-1 | Buejoint Mineral Meadow Marsh | | 0.2 | 0.2 | 3.5 | 2.0 | 5.5 | L3 |
| MAM2-2 | Reed Canary Grass Mineral Meadow Marsh | 11.7 | 2.8 | 14.5 | 1.0 | 1.0 | 2.0 | L+ |
| *MAM2-3 | *Red-top Mineral Meadow Marsh | c | c | c | 3.0 | 0.0 | 3.0 | L4 |
| MAM2-4 | Fowl Manna Grass Mineral Meadow Marsh | 0.2 | | 0.2 | 4.0 | 0.0 | 4.0 | L4 |
| MAM2-5 | Narrow-leaved Sedge Mineral Meadow Marsh | 0.4 | 0.1 | 0.5 | 3.0 | 2.0 | 5.0 | L3 |
| MAM2-6 | Broad-leaved Sedge Mineral Meadow Marsh | 0.3 | 0.8 | 1.1 | 3.0 | 2.0 | 5.0 | L3 |
| MAM2-7 | Horsetail Mineral Meadow Marsh | 0.1 | | 0.1 | 3.0 | 2.0 | 5.0 | L3 |
| MAM2-10 | Forb Mineral Meadow Marsh | 10.3 | 4.3 | 14.6 | 2.0 | 1.0 | 3.0 | L4 |
| MAM2-a | Common Reed Mineral Meadow Marsh | 6.7 | 6.2 | 12.9 | 3.0 | 0.0 | 3.0 | L+ |
| MAM2-b | Purple Loosestrife Mineral Meadow Marsh | | 0.7 | 0.7 | 3.0 | 0.0 | 3.0 | L+ |
| MAM2-C | Rush Mineral Meadow Marsh | 0.2 | 0.2 | 0.4 | 3.5 | 2.0 | 5.5 | L3 |
| *MAM2-f | *Miscanthus Mineral Meadow Marsh | i | | i | 4.0 | 0.0 | 4.0 | L+ |
| MAM3-2 | Reed Canary Grass Organic Meadow Marsh | 0.2 | | 0.2 | 3.5 | 2.0 | 5.5 | L+ |
| MAM3-3 | Rice Cut-grass Organic Meadow Marsh | 0.1 | | 0.1 | 4.0 | 2.0 | 6.0 | L3 |
| MAM3-6 | Broad-leaved Sedge Organic Meadow Marsh | 0.6 | | 0.6 | 3.5 | 3.0 | 6.5 | L2 |
| MAM3-9 | Forb Organic Meadow Marsh | 0.4 | | 0.4 | 3.0 | 3.0 | 6.0 | L3 |

| Appendix 1: Carruthers Watershed Vegetation Communities (2016 scores) | | | | | | | | |
|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
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| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| MAS2-1A | Broad-leaved Cattail Mineral Shallow Marsh | 1.5 | 8.0 | 9.5 | 2.0 | 1.0 | 3.0 | L4 |
| MAS2-1b | Narrow-Leaved Cattail Mineral Shallow Marsh | 5.0 | 11.7 | 16.7 | 1.0 | 0.0 | 1.0 | L+ |
| MAS2-2 | Bulrush Mineral Shallow Marsh | | 0.4 | 0.4 | 3.0 | 1.0 | 4.0 | L4 |
| MAS2-4 | Broad-leaved Sedge Mineral Shallow Marsh | 0.02 | 0.5 | 0.5 | 3.0 | 2.0 | 5.0 | L3 |
| MAS2-7 | Bur-reed Mineral Shallow Marsh | | 0.1 | 0.1 | 3.0 | 2.0 | 5.0 | L3 |
| MAS2-9 | Forb Mineral Shallow Marsh | 2.7 | 1.9 | 4.6 | 2.5 | 1.0 | 3.5 | L4 |
| MAS2-a | Common Reed Mineral Shallow Marsh | 1.2 | 0.6 | 1.9 | 3.0 | 0.0 | 3.0 | L+ |
| MAS2-b | Purple Loosestrife Mineral Shallow Marsh | | 0.9 | 0.9 | 3.0 | 0.0 | 3.0 | L+ |
| MAS2-C | Horsetail Mineral Shallow Marsh | | 0.03 | 0.03 | 4.0 | 1.0 | 5.0 | L3 |
| MAS2-d | Reed Canary Grass Mineral Shallow Marsh | 0.8 | 1.3 | 2.0 | 2.5 | 1.0 | 3.5 | L+ |
| MAS3-1A | Broad-leaved Cattail Organic Shallow Marsh | | 18.0 | 18.0 | 2.5 | 3.0 | 5.5 | L3 |
| MAS3-9 | Common Reed Organic Shallow Marsh | 0.3 | | 0.3 | 5.0 | 2.0 | 7.0 | L+ |
| Aquatic | | | | | | | | |
| SAS1-1 | Pondweed Submerged Shallow Aquatic | 0.9 | 9.4 | 10.2 | 2.0 | 2.0 | 4.0 | L4 |
| SAS1-2 | Waterweed Submerged Shallow Aquatic | 0.4 | 0.9 | 1.3 | 3.0 | 1.0 | 4.0 | L4 |
| SAS1-3 | Stonewort Submerged Shallow Aquatic | 1.2 | 1.7 | 2.9 | 2.0 | 1.0 | 3.0 | L4 |
| SAS1-4 | Water Milfoil Submerged Shallow Aquatic | 5.9 | | 5.9 | 3.0 | 1.0 | 4.0 | L4 |
| SAS1-A | Coon-tail Submerged Shallow Aquatic | 0.5 | 0.2 | 0.7 | 2.5 | 1.0 | 3.5 | L4 |
| SAM1-2 | Duckweed Mixed Shallow Aquatic | 0.1 | 1.6 | 1.7 | 2.0 | 2.0 | 4.0 | L4 |
| SAM1-4 | Pondweed Mixed Shallow Aquatic | 0.1 | 1.8 | 1.9 | 3.0 | 2.0 | 5.0 | L3 |
| SAM1-6 | Bladderwort Mixed Shallow Aquatic | 0.2 | | 0.2 | 4.0 | 3.0 | 7.0 | L2 |
| SAM1-A | Water Lily - Bullhead Lily Mixed Shallow Aquatic | 1.9 | 0.1 | 2.0 | 2.5 | 2.0 | 4.5 | L4 |
| SAF1-1 | Water Lily - Bullhead Lily Floating-leaved Shallow Aquatic | 0.1 | | | 3.5 | 2.0 | 5.5 | L3 |
| SAF1-3 | Duckweed Floating-leaved Shallow Aquatic | 0.04 | i | 0.01 | 2.5 | 1.0 | 3.5 | L4 |
| OAO1 | Open Aquatic (deep or riverine unvegetated) | 0.9 | 12.2 | 13.1 | 1.5 | 0.0 | 1.5 | L5 |
| OAO1-T | Turbid Open Aquatic (disturbed unvegetated) | 0.6 | 1.7 | 2.3 | 2.0 | 0.0 | 2.0 | L+ |

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|---|---|-----------------------|-----------------------|----------------------|-----------------|--------------------|----------------|-------------------------|
| ELC Code | Vegetation Type (* indicates present as inclusion and/or complex only) | area north # ha | area south # ha | Tot. area # ha | Scores | | | Local Rank Apr-16 |
| | | | | | Local Occur. | Geophy. Requir. | Total Score | |
| Dynamic (Beach, Bluff, Barren, Prairie, Savannah) | | | | | | | | |
| BBO1-1 | Sea Rocket Open Sand Beach | | 0.4 | 0.4 | 3.5 | 3.0 | 6.5 | L2 |
| BBS1-2A | Willow Shrub Beach | | 0.1 | 0.1 | 3.5 | 3.0 | 6.5 | L2 |
| BBT1-A | Mineral Treed Beach | | 0.02 | 0.02 | 4.0 | 2.0 | 6.0 | L3 |
| BLO1 | Mineral Open Bluff | 0.01 | | 0.01 | 3.0 | 2.0 | 5.0 | L3 |
| BLS1-A | Sumac - Willow - Cherry Shrub Bluff | 0.04 | | 0.04 | 3.5 | 2.0 | 5.5 | L3 |
| BLT1-A | White Cedar Treed Bluff | | 0.1 | 0.1 | 3.5 | 3.0 | 6.5 | L2 |
| CBS1 | Shrub Clay Barren | | 0.2 | 0.2 | 3.0 | 3.0 | 6.0 | L3 |
| SBO1-A | Sand Dropseed Sand Barren | 0.1 | | | 3.5 | 4.0 | 7.5 | L2 |
| SBO1-B | Dry-Fresh Flat-stemmed Bluegrass - Forb Sand Barren | i,c | 0.1 | 0.1 | 3.5 | 3.0 | 6.5 | L2 |
| *SBO1-D | *Forb Sand Barren | i | | i | 5.0 | 3.0 | 8.0 | L2 |
| SBO2 | Anthropogenic Sand / Gravel Barren | 0.3 | | 0.3 | 4.0 | 0.0 | 4.0 | L4 |
| SBT1 | Treed Sand Barren | 1.1 | 0.3 | 1.4 | 3.5 | 4.0 | 7.5 | L2 |
| TPO2-A | Fresh-Moist Tallgrass Prairie Planting | i | 1.1 | 1.1 | 3.5 | 1.0 | 4.5 | L5 |
| CUW1-2 | Red Oak Non-tallgrass Woodland | | 0.5 | 0.5 | 3.5 | 2.0 | 5.5 | L3 |
| Meadow | | | | | | | | |
| CUM1-A | Native Forb Meadow | 48.7 | 50.2 | 98.9 | 1.0 | 0.0 | 1.0 | L5 |
| CUM1-b | Exotic Cool-season Grass Graminoid Meadow | 54.5 | 3.2 | 57.7 | 1.0 | 0.0 | 1.0 | L+ |
| CUM1-c | Exotic Forb Meadow | 10.5 | 20.7 | 31.2 | 1.0 | 0.0 | 1.5 | L+ |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|------------------------------------|--------------|-------------|-----------|----------------|------------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Cladium mariscoides</i> | twig-rush | 5 | 5 | 5 | 5 | 20 | L1 | | x | 2015 |
| <i>Zannichellia palustris</i> | horned pondweed | 5 | 5 | 5 | 4 | 19 | L1 | | x | 2015 |
| <i>Amelanchier spicata</i> | running serviceberry | 4 | 4 | 4 | 5 | 17 | L2 | | x | 2015 |
| <i>Cakile edentula</i> | sea-rocket | 4 | 4 | 5 | 4 | 17 | L2 | | x | 2015 |
| <i>Carex aquatilis</i> | water sedge | 3 | 4 | 5 | 5 | 17 | L2 | | x | 2015 |
| <i>Carex prasina</i> | drooping sedge | 5 | 4 | 4 | 4 | 17 | L2 | x | | 2009 |
| <i>Dichanthelium linearifolium</i> | narrow-leaved panic grass | 4 | 3 | 5 | 5 | 17 | L2 | x | | 2016 |
| <i>Dryopteris x uliginosa</i> | spinulose-crested hybrid wood fern | 5 | 3 | 5 | 4 | 17 | L2 | | x | 2015 |
| <i>Gentianopsis crinita</i> | fringed gentian | 3 | 4 | 5 | 5 | 17 | L2 | x | | 2016 |
| <i>Hypericum fraseri</i> | marsh St. John's-wort | 3 | 5 | 4 | 5 | 17 | L2 | x | | 2002 |
| <i>Hypericum majus</i> | larger Canada St. John's-wort | 4 | 4 | 4 | 5 | 17 | L2 | x | | 2015 |
| <i>Myriophyllum sibiricum</i> | northern water-milfoil | 4 | 5 | 5 | 4 | 18 | L2 | | x | 2015 |
| <i>Oenothera perennis</i> | perennial eve primrose | 5 | 3 | 4 | 5 | 17 | L2 | x | | 2015 |
| <i>Osmunda claytoniana</i> | interrupted fern | 3 | 5 | 5 | 5 | 18 | L2 | | x | 2003 |
| <i>Platanthera aquilonis</i> | tall northern green orchis | 4 | 4 | 5 | 5 | 18 | L2 | | x | 2015 |
| <i>Pyrola asarifolia</i> | pink pyrola | 3 | 4 | 5 | 5 | 17 | L2 | x | | 2015 |
| <i>Rosa palustris</i> | swamp rose | 5 | 4 | 5 | 4 | 18 | L2 | | x | 2015 |
| <i>Rubus hispidus</i> | swamp dewberry | 4 | 5 | 4 | 4 | 17 | L2 | x | | 2015 |
| <i>Sagittaria rigida</i> | sessile-fruited arrowhead | 5 | 4 | 5 | 4 | 18 | L2 | | x | 2015 |
| <i>Spiranthes lucida</i> | shining ladies' tresses | 4 | 4 | 5 | 5 | 18 | L2 | x | | 2015 |
| <i>Thelypteris noveboracensis</i> | New York fern | 3 | 4 | 5 | 5 | 17 | L2 | x | | 2015 |
| <i>Acorus americanus</i> | sweet flag | 3 | 3 | 5 | 4 | 15 | L3 | | x | 2015 |
| <i>Actaea x ludovici</i> | hybrid baneberry | 4 | 3 | 4 | 3 | 14 | L3 | x | | 2016 |
| <i>Agalinis tenuifolia</i> | slender gerardia | 3 | 4 | 5 | 4 | 16 | L3 | x | x | 2016 |
| <i>Alisma subcordatum</i> | small-flowered water-plantain | 5 | 2 | 5 | 3 | 15 | L3 | x | x | 2016 |
| <i>Alnus incana ssp. rugosa</i> | speckled alder | 1 | 4 | 4 | 5 | 14 | L3 | | x | 2015 |
| <i>Anemone acutiloba</i> | sharp-lobed hepatica | 1 | 4 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Anemone cylindrica</i> | long-fruited thimbleweed | 3 | 4 | 3 | 4 | 14 | L3 | x | x | 2016 |
| <i>Aralia racemosa ssp. racemosa</i> | spikenard | 2 | 4 | 4 | 4 | 14 | L3 | x | x | 2016 |
| <i>Bolboschoenus fluviatilis</i> | river bulrush | 3 | 2 | 5 | 4 | 14 | L3 | | x | 2015 |
| <i>Callitriche palustris</i> | marsh water starwort | 3 | 3 | 4 | 4 | 14 | L3 | | x | 2015 |
| <i>Campanula aparinoides</i> | marsh bellflower | 3 | 4 | 5 | 4 | 16 | L3 | x | x | 2015 |
| <i>Cardamine concatenata</i> | cut-leaved toothwort | 2 | 3 | 5 | 4 | 14 | L3 | x | | 2009 |
| <i>Carex albursina</i> | white bear sedge | 2 | 3 | 5 | 4 | 14 | L3 | x | x | 2016 |
| <i>Carex alopecoidea</i> | foxtail wood sedge | 2 | 3 | 5 | 4 | 14 | L3 | x | x | 2015 |
| <i>Carex atherodes</i> | awned sedge | 3 | 3 | 5 | 4 | 15 | L3 | | x | 2015 |
| <i>Carex backii</i> | Back's sedge | 4 | 3 | 4 | 4 | 15 | L3 | x | | 2015 |
| <i>Carex brevior</i> | short-fruited sedge | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2015 |
| <i>Carex comosa</i> | bristly sedge | 2 | 3 | 5 | 4 | 14 | L3 | x | x | 2015 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | | |
|--|--------------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|--|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | | |
| <i>Carex crinita</i> | fringed sedge | 2 | 4 | 4 | 4 | 14 | L3 | | x | 2015 | |
| <i>Carex disperma</i> | two-seeded sedge | 2 | 3 | 5 | 4 | 14 | L3 | x | | 2002 | |
| <i>Carex eburnea</i> | bristle-leaved sedge | 3 | 4 | 4 | 4 | 15 | L3 | x | | 2015 | |
| <i>Carex flava</i> | yellow sedge | 3 | 3 | 5 | 4 | 15 | L3 | x | x | 2015 | |
| <i>Carex interior</i> | fen star sedge | 2 | 4 | 4 | 4 | 14 | L3 | x | | 2016 | |
| <i>Carex laevivaginata</i> | smooth-sheathed sedge | 2 | 4 | 4 | 4 | 14 | L3 | x | | 2009 | |
| <i>Carex leptalea</i> | bristle-stalked sedge | 2 | 3 | 5 | 4 | 14 | L3 | x | | 2016 | |
| <i>Carex leptoneuria</i> | few-nerved wood sedge | 2 | 4 | 4 | 4 | 14 | L3 | x | x | 2016 | |
| <i>Carex molesta</i> | troublesome sedge | 3 | 3 | 4 | 4 | 14 | L3 | | x | 2015 | |
| <i>Carex pallescens</i> | pale sedge | 3 | 3 | 5 | 3 | 14 | L3 | x | x | 2016 | |
| <i>Carex plantaginea</i> | plantain-leaved sedge | 2 | 4 | 5 | 4 | 15 | L3 | x | | 2016 | |
| <i>Carex siccata</i> | hay sedge | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2016 | |
| <i>Carex tonsa</i> var. <i>rugosperma</i> | red-seeded sedge | 3 | 4 | 4 | 4 | 15 | L3 | x | | 2016 | |
| <i>Carex tuckermanii</i> | Tuckerman's sedge | 2 | 4 | 4 | 4 | 14 | L3 | x | x | 2016 | |
| <i>Carex utriculata</i> | beaked sedge | 2 | 3 | 4 | 5 | 14 | L3 | x | x | 2015 | |
| <i>Carex viridula</i> ssp. <i>viridula</i> | greenish sedge | 3 | 3 | 5 | 5 | 16 | L3 | x | | 2016 | |
| <i>Carex woodii</i> | purple-tinged sedge | 4 | 3 | 5 | 3 | 15 | L3 | x | | 2015 | |
| <i>Caulophyllum thalictroides</i> | blue cohosh | 3 | 3 | 4 | 5 | 15 | L3 | x | | 2016 | |
| <i>Celastrus scandens</i> | American bittersweet | 2 | 4 | 3 | 5 | 14 | L3 | x | x | 2016 | |
| <i>Chelone glabra</i> | turtlehead | 2 | 3 | 4 | 5 | 14 | L3 | | x | 2015 | |
| <i>Chrysosplenium americanum</i> | golden saxifrage | 2 | 3 | 5 | 4 | 14 | L3 | | x | 2015 | |
| <i>Circaea alpina</i> | smaller enchanter's nightshade | 2 | 4 | 5 | 4 | 15 | L3 | x | x | 2016 | |
| <i>Claytonia caroliniana</i> | broad-leaved spring beauty | 2 | 4 | 5 | 5 | 16 | L3 | x | | 2016 | |
| <i>Claytonia virginica</i> | narrow-leaved spring beauty | 2 | 4 | 4 | 5 | 15 | L3 | x | x | 2015 | |
| <i>Clintonia borealis</i> | bluebead lily | 2 | 5 | 4 | 5 | 16 | L3 | x | | 2015 | |
| <i>Collinsonia canadensis</i> | richweed | 4 | 5 | 4 | 3 | 16 | L3 | x | | 2016 | |
| <i>Crataegus chrysocarpa</i> var. <i>phoenicea</i> | glabrate fireberry hawthorn | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2009 | |
| <i>Crataegus coccinea</i> var. <i>fulleriana</i> | Fuller's hawthorn | 3 | 3 | 5 | 3 | 14 | L3 | | x | 2015 | |
| <i>Crataegus coccinioides</i> | conspecta hawthorn | 5 | 3 | 5 | 3 | 16 | L3? | xcf | | 2016 | |
| <i>Cyperus bipartitus</i> | two-parted umbrella-sedge | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2015 | |
| <i>Cyperus strigosus</i> | straw-coloured umbrella-sedge | 4 | 2 | 5 | 4 | 15 | L3 | x | | 2015 | |
| <i>Cypripedium parviflorum</i> var. <i>makasin</i> | smaller yellow lady's slipper | 2 | 4 | 4 | 5 | 15 | L3 | x | x | 2016 | |
| <i>Cystopteris tenuis</i> | Mackay's fragile fern | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2015 | |
| <i>Deparia acrostichoides</i> | silvery glade fern | 3 | 4 | 5 | 4 | 16 | L3 | | x | 2015 | |
| <i>Dicentra canadensis</i> | squirrel-corn | 1 | 4 | 5 | 4 | 14 | L3 | x | x | 2015 | |
| <i>Dicentra cucullaria</i> | Dutchman's breeches | 2 | 4 | 4 | 5 | 15 | L3 | x | | 2009 | |
| <i>Diphasiastrum digitatum</i> | crowfoot club-moss | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2003 | |
| <i>Doellingeria umbellata</i> var. <i>umbellata</i> | flat-topped aster | 3 | 4 | 3 | 4 | 14 | L3 | x | | 2015 | |
| <i>Dryopteris clintoniana</i> | Clinton's wood fern | 2 | 4 | 5 | 4 | 15 | L3 | x | x | 2016 | |

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|--|-----------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Dryopteris filix-mas</i> | male fern | 4 | 2 | 5 | 3 | 14 | L3 | | x | 2015 |
| <i>Eleocharis acicularis</i> | needle spike-rush | 3 | 2 | 4 | 5 | 14 | L3 | | x | 2015 |
| <i>Eleocharis obtusa</i> | blunt spike-rush | 3 | 4 | 5 | 2 | 14 | L3 | x | x | 2015 |
| <i>Elodea nuttallii</i> | Nuttall's water-weed | 3 | 3 | 5 | 3 | 14 | L3 | x | | 2015 |
| <i>Epilobium leptophyllum</i> | narrow-leaved willow-herb | 2 | 5 | 4 | 4 | 15 | L3 | | x | 2015 |
| <i>Equisetum fluviatile</i> | water horsetail | 2 | 4 | 5 | 4 | 15 | L3 | x | x | 2015 |
| <i>Equisetum pratense</i> | thicket horsetail | 2 | 4 | 5 | 3 | 14 | L3 | x | x | 2015 |
| <i>Equisetum scirpoides</i> | dwarf scouring-rush | 2 | 4 | 5 | 5 | 16 | L3 | x | | 2016 |
| <i>Equisetum x litorale</i> | shore horsetail | 5 | 3 | 4 | 3 | 15 | L3 | x | | 2009 |
| <i>Equisetum x mackayi</i> | Mack's horsetail | 5 | 2 | 4 | 3 | 14 | L3 | x | | 2016 |
| <i>Gentiana andrewsii</i> | bottle gentian | 3 | 4 | 4 | 5 | 16 | L3 | x | x | 2016 |
| <i>Geum rivale</i> | water avens | 3 | 4 | 5 | 4 | 16 | L3 | | x | 2015 |
| <i>Glyceria septentrionalis</i> | eastern manna grass | 2 | 3 | 5 | 4 | 14 | L3 | | x | 2015 |
| <i>Gymnocarpium dryopteris</i> | oak fern | 1 | 3 | 5 | 5 | 14 | L3 | x | x | 2016 |
| <i>Hamamelis virginiana</i> | witch-hazel | 2 | 4 | 4 | 4 | 14 | L3 | x | xp | 2016 |
| <i>Hydrophyllum canadense</i> | Canada waterleaf | 2 | 3 | 5 | 4 | 14 | L3 | x | | 2009 |
| <i>Hylodesmum glutinosum</i> | pointed-leaved tick-trefoil | 2 | 4 | 4 | 5 | 15 | L3 | x | | 2016 |
| <i>Hypopitys monotropa</i> | pinemap | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2016 |
| <i>Ilex verticillata</i> | winterberry | 2 | 4 | 4 | 5 | 15 | L3 | | x | 2003 |
| <i>Juglans cinerea</i> | butternut | 1 | 5 | 4 | 4 | 14 | L3 | x | x | 2016 |
| <i>Juncus alpinoarticulatus</i> | Richardson's rush | 4 | 3 | 4 | 3 | 14 | L3 | x | | 2015 |
| <i>Juniperus communis</i> var. <i>depressa</i> | common juniper | 2 | 3 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Larix laricina</i> | tamarack | 2 | 4 | 4 | 4 | 14 | L3 | xp | x | 2016 |
| <i>Lemna trisulca</i> | star duckweed | 2 | 4 | 5 | 3 | 14 | L3 | x | x | 2016 |
| <i>Liparis loeselii</i> | Loesel's twayblade | 2 | 3 | 5 | 5 | 15 | L3 | x | x | 2015 |
| <i>Lobelia inflata</i> | Indian tobacco | 2 | 4 | 4 | 4 | 14 | L3 | x | x | 2016 |
| <i>Lobelia siphilitica</i> | great blue lobelia | 2 | 3 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Luzula acuminata</i> | hairy wood rush | 3 | 4 | 4 | 3 | 14 | L3 | | x | 2015 |
| <i>Luzula multiflora</i> ssp. <i>multiflora</i> | wood rush | 3 | 4 | 4 | 3 | 14 | L3 | | x | 2015 |
| <i>Menispermum canadense</i> | moonseed | 2 | 4 | 4 | 4 | 14 | L3 | x | | 2016 |
| <i>Mitchella repens</i> | partridgeberry | 2 | 4 | 4 | 5 | 15 | L3 | x | | 2016 |
| <i>Mitella diphylla</i> | mitrewort | 2 | 3 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Mitella nuda</i> | naked mitrewort | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2015 |
| <i>Monotropa uniflora</i> | Indian-pipe | 2 | 4 | 5 | 5 | 16 | L3 | x | | 2016 |
| <i>Nabalus albus</i> | white wood lettuce | 3 | 4 | 4 | 3 | 14 | L3 | x | x | 2016 |
| <i>Najas flexilis</i> | bushy naiad | 2 | 4 | 5 | 5 | 16 | L3 | x | | 2015 |
| <i>Nuphar variegata</i> | bullhead lily | 2 | 4 | 5 | 3 | 14 | L3 | | x | 2015 |
| <i>Nymphaea odorata</i> ssp. <i>tuberosa</i> | tuberous water-lily | 3 | 3 | 5 | 3 | 14 | L3 | xpr | x | 2016 |
| <i>Oenothera parviflora</i> | smaller evening-primrose | 4 | 3 | 4 | 3 | 14 | L3 | x | x | 2016 |

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| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Osmunda regalis</i> var. <i>spectabilis</i> | royal fern | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2016 |
| <i>Osmundastrum cinnamomeum</i> | cinnamon fern | 2 | 4 | 5 | 5 | 16 | L3 | x | x | 2016 |
| <i>Penstemon digitalis</i> | foxglove beard-tongue | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2016 |
| <i>Persicaria punctata</i> | dotted water-pepper | 4 | 3 | 5 | 4 | 16 | L3 | x | x | 2015 |
| <i>Picea glauca</i> | white spruce | 3 | 5 | 4 | 4 | 16 | L3 | xpr | xpr | 2016 |
| <i>Potamogeton natans</i> | floating pondweed | 2 | 4 | 5 | 3 | 14 | L3 | x | x | 2015 |
| <i>Potentilla simplex</i> | old-field cinquefoil | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2015 |
| <i>Prunus nigra</i> | Canada plum | 2 | 4 | 4 | 4 | 14 | L3 | x | x | 2015 |
| <i>Pycnanthemum tenuifolium</i> | narrow-leaved mountain-mint | 5 | 3 | 5 | 3 | 16 | L3 | x | | 2016 |
| <i>Ribes triste</i> | swamp red currant | 2 | 4 | 4 | 5 | 15 | L3 | x | x | 2016 |
| <i>Rubus flagellaris</i> | northern dewberry | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2015 |
| <i>Rumex britannica</i> | great water dock | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2009 |
| <i>Sagittaria cuneata</i> | arum-leaved arrowhead | 3 | 4 | 5 | 4 | 16 | L3 | | x | 2015 |
| <i>Salix lucida</i> | shining willow | 2 | 4 | 5 | 3 | 14 | L3 | x | xp | 2015 |
| <i>Sanicula odorata</i> | clustered sanicle | 4 | 3 | 4 | 3 | 14 | L3 | x | xcf | 2016 |
| <i>Scirpus pendulus</i> | drooping bulrush | 3 | 4 | 5 | 4 | 16 | L3 | x | x | 2016 |
| <i>Solidago patula</i> | rough-leaved goldenrod | 3 | 3 | 4 | 4 | 14 | L3 | x | x | 2016 |
| <i>Sparganium emersum</i> | green-fruited bur-reed | 2 | 3 | 5 | 4 | 14 | L3 | x | x | 2016 |
| <i>Sparganium eurycarpum</i> | great bur-reed | 2 | 4 | 5 | 4 | 15 | L3 | x | x | 2016 |
| <i>Spiranthes cernua</i> | nodding ladies' tresses | 3 | 3 | 5 | 4 | 15 | L3 | x | x | 2016 |
| <i>Sporobolus cryptandrus</i> | sand dropseed | 3 | 3 | 5 | 3 | 14 | L3 | x | | 2016 |
| <i>Streptopus lanceolatus</i> var. <i>lanceolatus</i> | rose twisted-stalk | 2 | 4 | 4 | 5 | 15 | L3 | x | | 2016 |
| <i>Teucrium canadense</i> ssp. <i>canadense</i> | wood-sage | 3 | 3 | 4 | 4 | 14 | L3 | | x | 2015 |
| <i>Trientalis borealis</i> | star-flower | 1 | 4 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Triosteum aurantiacum</i> | wild coffee | 2 | 5 | 4 | 3 | 14 | L3 | | x | 2015 |
| <i>Turritis glabra</i> | tower mustard | 3 | 4 | 4 | 4 | 15 | L3 | x | | 2016 |
| <i>Ulmus rubra</i> | slippery elm | 4 | 5 | 4 | 3 | 16 | L3 | x | | 2009 |
| <i>Utricularia vulgaris</i> | common bladderwort | 3 | 4 | 5 | 4 | 16 | L3 | x | | 2016 |
| <i>Uvularia grandiflora</i> | large-flowered bellwort | 1 | 4 | 5 | 5 | 15 | L3 | x | x | 2016 |
| <i>Vallisneria americana</i> | tape-grass | 3 | 4 | 5 | 4 | 16 | L3 | x | | 2009 |
| <i>Verbena stricta</i> | hoary vervain | 3 | 5 | 4 | 4 | 16 | L3 | x | x | 2016 |
| <i>Viburnum acerifolium</i> | maple-leaved viburnum | 2 | 3 | 4 | 5 | 14 | L3 | x | x | 2016 |
| <i>Viola blanda</i> | sweet white violet | 2 | 4 | 4 | 5 | 15 | L3 | | x | 2015 |
| <i>Viola canadensis</i> | Canada violet | 2 | 4 | 4 | 4 | 14 | L3 | x | | 2009 |
| <i>Viola rostrata</i> | long-spurred violet | 2 | 4 | 4 | 4 | 14 | L3 | x | | 2016 |
| <i>Viola selkirkii</i> | Selkirk's violet | 3 | 3 | 4 | 4 | 14 | L3 | x | | 2015 |
| <i>Abies balsamea</i> | balsam fir | 1 | 3 | 4 | 5 | 13 | L4 | x | x | 2015 |
| <i>Acer rubrum</i> | red maple | 1 | 4 | 1 | 5 | 11 | L4 | x | x | 2016 |
| <i>Acer saccharinum</i> | silver maple | 1 | 2 | 5 | 3 | 11 | L4 | x | x | 2016 |

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| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Acer saccharum</i> ssp. <i>nigrum</i> | black maple | 2 | 3 | 4 | 2 | 11 | L4 | x | x | 2016 |
| <i>Acer spicatum</i> | mountain maple | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Acer x freemanii</i> | hybrid swamp maple | 2 | 3 | 5 | 2 | 12 | L4 | xp | x | 2016 |
| <i>Actaea pachypoda</i> | white baneberry | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Allium tricoccum</i> | wild leek | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Amelanchier arborea</i> | downy serviceberry | 2 | 2 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Amelanchier interior</i> | hybrid serviceberry complex | 3 | 3 | 3 | 3 | 12 | L4 | x | | 2016 |
| <i>Amelanchier laevis</i> | smooth serviceberry | 2 | 2 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Amelanchier sanguinea</i> | round-leaved serviceberry | 2 | 2 | 3 | 4 | 11 | L4 | | x | 2015 |
| <i>Anemone quinquefolia</i> var. <i>quinquefolia</i> | wood-anemone | 1 | 4 | 3 | 5 | 13 | L4 | x | x | 2015 |
| <i>Apios americana</i> | ground-nut | 3 | 4 | 3 | 3 | 13 | L4 | x | | 2016 |
| <i>Aquilegia canadensis</i> | wild columbine | 1 | 4 | 3 | 5 | 13 | L4 | x | | 2016 |
| <i>Asarum canadense</i> | wild ginger | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Asclepias incarnata</i> ssp. <i>incarnata</i> | swamp milkweed | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Betula alleghaniensis</i> | yellow birch | 1 | 4 | 3 | 5 | 13 | L4 | x | x | 2016 |
| <i>Betula papyrifera</i> | paper birch | 1 | 4 | 2 | 4 | 11 | L4 | x | x | 2016 |
| <i>Bidens vulgata</i> | tall beggar's-ticks | 2 | 2 | 3 | 4 | 11 | L4 | x | x | 2016 |
| <i>Boehmeria cylindrica</i> | false nettle | 2 | 4 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Bromus latiglumis</i> | eared brome | 3 | 2 | 4 | 3 | 12 | L4 | x | x | 2015 |
| <i>Calamagrostis canadensis</i> | Canada blue joint | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2015 |
| <i>Caltha palustris</i> | marsh marigold | 1 | 4 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Calystegia sepium</i> ssp. <i>angulata</i> | white hedge bindweed | 4 | 2 | 3 | 2 | 11 | L4 | x | x | 2016 |
| <i>Cardamine diphylla</i> | broad-leaved toothwort | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Cardamine maxima</i> | hybrid toothwort | 2 | 3 | 3 | 3 | 11 | L4 | x | x | 2015 |
| <i>Cardamine pennsylvanica</i> | bitter cress | 2 | 2 | 4 | 4 | 12 | L4 | x | x | 2015 |
| <i>Carex aurea</i> | golden-fruited sedge | 1 | 2 | 4 | 4 | 11 | L4 | x | x | 2016 |
| <i>Carex cephaloidea</i> | thin-leaved sedge | 2 | 3 | 5 | 3 | 13 | L4 | x | | 2015 |
| <i>Carex cephalophora</i> | oval-headed sedge | 2 | 3 | 4 | 4 | 13 | L4 | x | | 2016 |
| <i>Carex communis</i> | fibrous-rooted sedge | 1 | 4 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Carex deweyana</i> | Dewey's sedge | 1 | 4 | 3 | 3 | 11 | L4 | x | x | 2015 |
| <i>Carex echinodes</i> | marsh straw sedge | 3 | 3 | 2 | 3 | 11 | L4 | xcf | x | 2016 |
| <i>Carex grisea</i> | grey sedge | 3 | 2 | 4 | 3 | 12 | L4 | | x | 2015 |
| <i>Carex hirtifolia</i> | hairy wood sedge | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Carex hitchcockiana</i> | Hitchcock's sedge | 2 | 3 | 5 | 3 | 13 | L4 | x | x | 2016 |
| <i>Carex hystericina</i> | porcupine sedge | 1 | 3 | 2 | 5 | 11 | L4 | x | x | 2016 |
| <i>Carex intumescens</i> | bladder sedge | 2 | 4 | 4 | 2 | 12 | L4 | x | x | 2016 |
| <i>Carex lacustris</i> | lake-bank sedge | 2 | 3 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Carex laxiflora</i> | loose-flowered sedge | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Carex lupulina</i> | hop sedge | 1 | 4 | 4 | 4 | 13 | L4 | x | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|---|-------------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+=exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Carex peckii</i> | Peck's sedge | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Carex pellita</i> | woolly sedge | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2015 |
| <i>Carex pensylvanica</i> | Pennsylvania sedge | 1 | 4 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Carex projecta</i> | necklace sedge | 2 | 2 | 4 | 3 | 11 | L4 | | x | 2015 |
| <i>Carex pseudocyperus</i> | pseudocyperus sedge | 1 | 3 | 3 | 4 | 11 | L4 | x | x | 2015 |
| <i>Carex retrorsa</i> | retorse sedge | 1 | 3 | 3 | 4 | 11 | L4 | x | x | 2016 |
| <i>Carex scabrata</i> | rough sedge | 2 | 3 | 4 | 3 | 12 | L4 | x | | 2016 |
| <i>Carex sparganioides</i> | bur-reed sedge | 2 | 2 | 5 | 2 | 11 | L4 | x | | 2015 |
| <i>Carex spengelii</i> | long-beaked sedge | 2 | 4 | 4 | 2 | 12 | L4 | x | x | 2016 |
| <i>Carex stricta</i> | tussock sedge | 2 | 3 | 3 | 4 | 12 | L4 | | x | 2015 |
| <i>Carpinus caroliniana</i> ssp. <i>virginiana</i> | blue beech | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Carya cordiformis</i> | bitternut hickory | 1 | 4 | 4 | 2 | 11 | L4 | x | x | 2016 |
| <i>Caulophyllum giganteum</i> | long-styled blue cohosh | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Ceratophyllum demersum</i> | coontail | 1 | 3 | 5 | 3 | 12 | L4 | x | x | 2015 |
| <i>Cicuta bulbifera</i> | bulblet-bearing water-hemlock | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Cornus rugosa</i> | round-leaved dogwood | 2 | 4 | 4 | 3 | 13 | L4 | x | | 2005 |
| <i>Corylus cornuta</i> | beaked hazel | 2 | 4 | 3 | 4 | 13 | L4 | x | x | 2016 |
| <i>Crataegus coccinea</i> var. <i>pringlei</i> | Pringle's hawthorn | 2 | 3 | 5 | 3 | 13 | L4 | x | x | 2016 |
| <i>Crataegus holmesiana</i> | Holmes' hawthorn | 2 | 3 | 4 | 3 | 12 | L4 | xcf | x | 2016 |
| <i>Crataegus macracantha</i> | long-spined hawthorn | 2 | 2 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Crataegus submollis</i> | Emerson's hawthorn | 2 | 3 | 4 | 3 | 12 | L4 | | x | 2015 |
| <i>Cuscuta gronovii</i> | swamp dodder | 2 | 3 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Cystopteris bulbifera</i> | bulblet fern | 1 | 3 | 4 | 4 | 12 | L4 | x | x | 2016 |
| <i>Danthonia spicata</i> | poverty oat grass | 2 | 3 | 3 | 4 | 12 | L4 | x | | 2016 |
| <i>Dichanthelium acuminatum</i> ssp. <i>acuminatum</i> | hairy panic grass | 2 | 3 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Dryopteris cristata</i> | crested wood fern | 1 | 4 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Dryopteris intermedia</i> | evergreen wood fern | 1 | 4 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Dryopteris marginalis</i> | marginal wood fern | 1 | 3 | 3 | 4 | 11 | L4 | x | x | 2016 |
| <i>Dryopteris x triploidea</i> | confusing hybrid wood fern | 3 | 2 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Elodea canadensis</i> | common water-weed | 1 | 3 | 5 | 3 | 12 | L4 | x | x | 2016 |
| <i>Elymus hystrix</i> | bottle-brush grass | 2 | 3 | 4 | 3 | 12 | L4 | x | xp | 2016 |
| <i>Epifagus virginiana</i> | beech-drops | 2 | 3 | 5 | 2 | 12 | L4 | x | | 2016 |
| <i>Equisetum variegatum</i> ssp. <i>variegatum</i> | variegated scouring-rush | 2 | 2 | 5 | 4 | 13 | L4 | x | x | 2016 |
| <i>Eupatorium perfoliatum</i> | boneset | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Fagus grandifolia</i> | American beech | 1 | 4 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Fraxinus nigra</i> | black ash | 1 | 4 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Galium trifidum</i> ssp. <i>trifidum</i> | small bedstraw | 2 | 4 | 4 | 3 | 13 | L4 | | x | 2015 |
| <i>Geum fragarioides</i> | barren strawberry | 2 | 4 | 4 | 3 | 13 | L4 | x | | 2015 |
| <i>Geum laciniatum</i> | cut-leaved avens | 3 | 3 | 4 | 2 | 12 | L4 | x | x | 2015 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|------------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Hydrocotyle americana</i> | marsh pennywort | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Impatiens pallida</i> | yellow touch-me-not | 2 | 3 | 4 | 2 | 11 | L4 | x | | 2016 |
| <i>Iris virginica</i> var. <i>shrevei</i> | southern blue flag | 4 | 2 | 4 | 3 | 13 | L4 | x | x | 2015 |
| <i>Juncus balticus</i> ssp. <i>littoralis</i> | Baltic rush | 3 | 2 | 5 | 2 | 12 | L4 | x | x | 2015 |
| <i>Juncus effusus</i> | soft rush | 1 | 4 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Juncus nodosus</i> | knotted rush | 2 | 2 | 5 | 3 | 12 | L4 | x | x | 2016 |
| <i>Juncus torreyi</i> | Torrey's rush | 2 | 3 | 4 | 2 | 11 | L4 | x | x | 2016 |
| <i>Juniperus virginiana</i> | red cedar | 2 | 2 | 4 | 3 | 11 | L4 | x | xcf | 2016 |
| <i>Lactuca biennis</i> | tall blue lettuce | 2 | 4 | 2 | 4 | 12 | L4 | x | x | 2016 |
| <i>Lepidium virginicum</i> | Virginia pepper-grass | 4 | 3 | 4 | 2 | 13 | L4 | x | | 2016 |
| <i>Lilium michiganense</i> | Michigan lily | 1 | 4 | 3 | 5 | 13 | L4 | x | x | 2016 |
| <i>Lycopus americanus</i> | cut-leaved water-horehound | 1 | 4 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Lysimachia thyrsiflora</i> | tufted loosestrife | 2 | 3 | 4 | 4 | 13 | L4 | | x | 2015 |
| <i>Maianthemum canadense</i> | Canada May-flower | 1 | 4 | 1 | 5 | 11 | L4 | x | x | 2016 |
| <i>Mimulus ringens</i> | square-stemmed monkey-flower | 2 | 3 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Myosotis laxa</i> | smaller forget-me-not | 1 | 4 | 3 | 4 | 12 | L4 | x | x | 2015 |
| <i>Oryzopsis asperifolia</i> | white-fruited mountain-rice | 2 | 4 | 3 | 4 | 13 | L4 | x | | 2005 |
| <i>Osmorhiza claytonii</i> | woolly sweet cicely | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Penthorum sedoides</i> | ditch stonecrop | 2 | 2 | 4 | 3 | 11 | L4 | x | x | 2015 |
| <i>Persicaria amphibia</i> var. <i>stipulacea</i> | water smartweed | 3 | 2 | 4 | 3 | 12 | L4 | x | x | 2015 |
| <i>Persicaria pensylvanica</i> | Pennsylvania smartweed | 2 | 2 | 4 | 3 | 11 | L4 | x | x | 2015 |
| <i>Pilea fontana</i> | spring clearweed | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Pinus strobus</i> | white pine | 1 | 4 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Polygonatum pubescens</i> | downy Solomon's seal | 1 | 4 | 2 | 5 | 12 | L4 | x | x | 2016 |
| <i>Polystichum acrostichoides</i> | Christmas fern | 1 | 3 | 5 | 4 | 13 | L4 | x | x | 2016 |
| <i>Populus grandidentata</i> | large-toothed aspen | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Potamogeton foliosus</i> | leafy pondweed | 1 | 3 | 5 | 4 | 13 | L4 | x | x | 2016 |
| <i>Prunus pensylvanica</i> | pin cherry | 2 | 4 | 3 | 3 | 12 | L4 | x | x | 2016 |
| <i>Pteridium aquilinum</i> var. <i>latiusculum</i> | eastern bracken | 1 | 4 | 2 | 4 | 11 | L4 | x | x | 2016 |
| <i>Pyrola elliptica</i> | shinleaf | 1 | 4 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Quercus macrocarpa</i> | bur oak | 1 | 4 | 3 | 3 | 11 | L4 | x | x | 2016 |
| <i>Quercus rubra</i> | red oak | 1 | 4 | 2 | 4 | 11 | L4 | x | x | 2016 |
| <i>Ranunculus hispidus</i> var. <i>caricetorum</i> | swamp buttercup | 2 | 4 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Ranunculus pensylvanicus</i> | bristly buttercup | 3 | 3 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Rorippa palustris</i> ssp. <i>hispida</i> | hispid marsh cress | 3 | 2 | 4 | 2 | 11 | L4 | x | | 2002 |
| <i>Rosa blanda</i> | smooth wild rose | 2 | 3 | 3 | 4 | 12 | L4 | x | x | 2016 |
| <i>Rubus pubescens</i> | dwarf raspberry | 1 | 3 | 3 | 5 | 12 | L4 | x | x | 2016 |
| <i>Rudbeckia hirta</i> | black-eyed Susan | 1 | 4 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Rudbeckia laciniata</i> | cut-leaved coneflower | 3 | 2 | 4 | 2 | 11 | L4 | x | xpr | 2016 |

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| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Sagittaria latifolia</i> | common arrowhead | 1 | 2 | 5 | 4 | 12 | L4 | x | x | 2015 |
| <i>Salix amygdaloides</i> | peach-leaved willow | 1 | 2 | 5 | 3 | 11 | L4 | x | x | 2016 |
| <i>Salix bebbiana</i> | Bebb's willow | 1 | 3 | 3 | 4 | 11 | L4 | x | x | 2016 |
| <i>Salix discolor</i> | pussy willow | 1 | 3 | 4 | 3 | 11 | L4 | x | x | 2016 |
| <i>Salix petiolaris</i> | slender willow | 2 | 3 | 5 | 3 | 13 | L4 | x | x | 2016 |
| <i>Sanicula marilandica</i> | sanicle | 3 | 3 | 3 | 3 | 12 | L4 | | xcf | 2015 |
| <i>Schizachne purpurascens</i> | purple melic grass | 2 | 3 | 3 | 5 | 13 | L4 | x | | 2016 |
| <i>Schoenoplectus pungens</i> var. <i>pungens</i> | three-square | 3 | 2 | 5 | 3 | 13 | L4 | x | | 2015 |
| <i>Schoenoplectus tabernaemontani</i> | soft-stemmed bulrush | 1 | 2 | 5 | 3 | 11 | L4 | x | x | 2016 |
| <i>Scirpus cyperinus</i> | woolly bulrush | 2 | 3 | 3 | 5 | 13 | L4 | x | x | 2016 |
| <i>Sisyrinchium montanum</i> | blue-eyed grass | 1 | 3 | 4 | 5 | 13 | L4 | x | x | 2016 |
| <i>Sium suave</i> | water-parsnip | 2 | 2 | 4 | 4 | 12 | L4 | x | x | 2015 |
| <i>Smilax tamnoides</i> | bristly greenbrier | 3 | 3 | 3 | 3 | 12 | L4 | x | | 2016 |
| <i>Solidago juncea</i> | early goldenrod | 2 | 3 | 4 | 2 | 11 | L4 | x | x | 2016 |
| <i>Sphenopholis intermedia</i> | slender wedge grass | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2015 |
| <i>Spiraea alba</i> | wild spiraea | 2 | 4 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Spirodela polyrhiza</i> | greater duckweed | 1 | 4 | 5 | 3 | 13 | L4 | x | x | 2016 |
| <i>Stellaria longifolia</i> | long-leaved chickweed | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2015 |
| <i>Stuckenia pectinata</i> | sago pondweed | 2 | 2 | 5 | 3 | 12 | L4 | x | x | 2016 |
| <i>Symphyotrichum firmum</i> | shining aster | 3 | 3 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Symphyotrichum oolentangiense</i> | sky-blue aster | 3 | 1 | 4 | 4 | 12 | L4 | x | | 2009 |
| <i>Symphyotrichum urophyllum</i> | arrow-leaved aster | 2 | 3 | 4 | 4 | 13 | L4 | x | | 2016 |
| <i>Thelypteris palustris</i> var. <i>pubescens</i> | marsh fern | 1 | 4 | 2 | 4 | 11 | L4 | x | x | 2016 |
| <i>Thuja occidentalis</i> | white cedar | 1 | 4 | 1 | 5 | 11 | L4 | x | x | 2016 |
| <i>Tiarella cordifolia</i> | foam-flower | 1 | 3 | 3 | 4 | 11 | L4 | x | x | 2016 |
| <i>Trillium erectum</i> | red trillium | 1 | 4 | 3 | 5 | 13 | L4 | x | x | 2016 |
| <i>Trillium grandiflorum</i> | white trillium | 1 | 3 | 4 | 5 | 13 | L4 | x | x | 2016 |
| <i>Tsuga canadensis</i> | eastern hemlock | 1 | 4 | 3 | 5 | 13 | L4 | x | x | 2016 |
| <i>Typha latifolia</i> | broad-leaved cattail | 1 | 4 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Veronica americana</i> | American speedwell | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2016 |
| <i>Veronica anagallis-aquatica</i> | water speedwell | 2 | 3 | 4 | 3 | 12 | L4 | x | x | 2016 |
| <i>Viola cucullata</i> | marsh blue violet | 2 | 3 | 4 | 4 | 13 | L4 | x | x | 2015 |
| <i>Viola sororia</i> var. <i>affinis</i> | Le Conte's violet | 2 | 4 | 4 | 3 | 13 | L4 | x | x | 2016 |
| <i>Wolffia borealis</i> | dotted water-meal | 2 | 4 | 5 | 2 | 13 | L4 | x | x | 2016 |
| <i>Wolffia columbiana</i> | Columbia water-meal | 2 | 4 | 5 | 2 | 13 | L4 | x | | 2016 |
| <i>Acalypha rhomboidea</i> | three-seeded mercury | 2 | 1 | 2 | 0 | 5 | L5 | x | x | 2016 |
| <i>Acer saccharum</i> ssp. <i>saccharum</i> | sugar maple | 1 | 3 | 0 | 2 | 6 | L5 | x | x | 2016 |
| <i>Achillea borealis</i> var. <i>borealis</i> | woolly yarrow | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Actaea rubra</i> ssp. <i>rubra</i> | red baneberry | 1 | 3 | 1 | 3 | 8 | L5 | x | x | 2016 |

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| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Ageratina altissima</i> var. <i>altissima</i> | white snakeroot | 1 | 2 | 2 | 1 | 6 | L5 | x | x | 2016 |
| <i>Agrimonia gryposepala</i> | agrimony | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Alisma triviale</i> | common water-plantain | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Ambrosia artemisiifolia</i> | common ragweed | 1 | 1 | 3 | 0 | 5 | L5 | x | x | 2016 |
| <i>Amphicarpaea bracteata</i> | hog-peanut | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Anemone canadensis</i> | Canada anemone | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Anemone virginiana</i> | common thimbleweed | 1 | 3 | 0 | 3 | 7 | L5 | x | x | 2016 |
| <i>Antennaria howellii</i> ssp. <i>howellii</i> | Howell's pussytoes | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Apocynum androsaemifolium</i> | spreading dogbane | 1 | 3 | 2 | 4 | 10 | L5 | x | x | 2016 |
| <i>Apocynum cannabinum</i> var. <i>cannabinum</i> | hemp dogbane | 3 | 2 | 2 | 2 | 9 | L5 | x | x | 2016 |
| <i>Apocynum cannabinum</i> var. <i>hypericifolium</i> | clasping-leaved hemp dogbane | 2 | 2 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Aralia nudicaulis</i> | wild sarsaparilla | 1 | 3 | 1 | 4 | 9 | L5 | x | x | 2016 |
| <i>Arisaema triphyllum</i> | Jack-in-the-pulpit | 1 | 3 | 2 | 3 | 9 | L5 | x | x | 2016 |
| <i>Asclepias syriaca</i> | common milkweed | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Athyrium filix-femina</i> var. <i>angustum</i> | northeastern lady fern | 1 | 3 | 1 | 3 | 8 | L5 | x | x | 2016 |
| <i>Bidens cernua</i> | nodding bur-marigold | 1 | 2 | 3 | 3 | 9 | L5 | x | x | 2016 |
| <i>Bidens frondosa</i> | common beggar's-ticks | 1 | 1 | 4 | 0 | 6 | L5 | x | x | 2016 |
| <i>Bidens tripartita</i> | three-parted beggar's-ticks | 2 | 2 | 4 | 2 | 10 | L5 | x | x | 2016 |
| <i>Calystegia sepium</i> ssp. <i>americana</i> | pink hedge bindweed | 3 | 2 | 2 | 2 | 9 | L5 | x | x | 2015 |
| <i>Carex arctata</i> | nodding wood sedge | 1 | 4 | 2 | 3 | 10 | L5 | x | x | 2016 |
| <i>Carex bebbii</i> | Bebb's sedge | 1 | 2 | 3 | 3 | 9 | L5 | x | x | 2016 |
| <i>Carex blanda</i> | common wood sedge | 1 | 2 | 1 | 2 | 6 | L5 | x | x | 2016 |
| <i>Carex cristatella</i> | crested sedge | 1 | 2 | 4 | 1 | 8 | L5 | x | x | 2016 |
| <i>Carex gracillima</i> | graceful sedge | 1 | 3 | 4 | 2 | 10 | L5 | x | x | 2016 |
| <i>Carex granularis</i> | meadow sedge | 1 | 2 | 1 | 3 | 7 | L5 | x | x | 2016 |
| <i>Carex pedunculata</i> | early-flowering sedge | 1 | 3 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Carex radiata</i> | straight-styled sedge | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Carex rosea</i> | curly-styled sedge | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Carex stipata</i> | awl-fruited sedge | 1 | 3 | 2 | 3 | 9 | L5 | x | x | 2016 |
| <i>Carex vulpinoidea</i> | fox sedge | 1 | 2 | 4 | 1 | 8 | L5 | x | x | 2016 |
| <i>Chenopodium simplex</i> | maple-leaved goosefoot | 3 | 2 | 3 | 1 | 9 | L5 | | x | 2015 |
| <i>Cicuta maculata</i> | spotted water-hemlock | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Circaea canadensis</i> ssp. <i>canadensis</i> | enchanter's nightshade | 1 | 1 | 1 | 1 | 4 | L5 | x | x | 2016 |
| <i>Clematis virginiana</i> | virgin's bower | 1 | 2 | 2 | 3 | 8 | L5 | x | x | 2016 |
| <i>Clinopodium vulgare</i> | wild basil | 2 | 3 | 1 | 3 | 9 | L5 | x | | 2016 |
| <i>Cornus alternifolia</i> | alternate-leaved dogwood | 1 | 2 | 1 | 2 | 6 | L5 | x | x | 2016 |
| <i>Cornus racemosa</i> | grey dogwood | 2 | 2 | 3 | 2 | 9 | L5 | x | xp | 2016 |
| <i>Cornus stolonifera</i> | red osier dogwood | 1 | 2 | 0 | 3 | 6 | L5 | x | x | 2016 |
| <i>Crataegus coccinea</i> var. <i>coccinea</i> | scarlet hawthorn | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|-----------------------------|--------|-------|------|---------|-------|----------|-----------|-------|------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local | Popn. | Hab. | Sens. | Total | Rank | Watershed | | Last |
| | | Occur. | Trend | Dep. | Dev. 0- | Score | TRCA | Section | obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Crataegus punctata</i> | dotted hawthorn | 1 | 2 | 3 | 3 | 9 | L5 | x | x | 2016 |
| <i>Cryptotaenia canadensis</i> | honestwort | 2 | 2 | 4 | 1 | 9 | L5 | x | x | 2016 |
| <i>Desmodium canadense</i> | showy tick-trefoil | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Diervilla lonicera</i> | bush honeysuckle | 1 | 3 | 2 | 4 | 10 | L5 | x | x | 2015 |
| <i>Dryopteris carthusiana</i> | spinulose wood fern | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Echinochloa muricata</i> var. <i>microstachya</i> | small-spiked barnyard grass | 2 | 2 | 4 | 0 | 8 | L5 | x | x | 2016 |
| <i>Echinocystis lobata</i> | wild cucumber | 1 | 2 | 3 | 1 | 7 | L5 | x | x | 2016 |
| <i>Eleocharis erythropoda</i> | creeping spike-rush | 1 | 2 | 4 | 1 | 8 | L5 | x | x | 2016 |
| <i>Elymus virginicus</i> var. <i>virginicus</i> | Virginia wild rye | 2 | 2 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Epilobium ciliatum</i> ssp. <i>ciliatum</i> | sticky willow-herb | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Epilobium coloratum</i> | purple-leaved willow-herb | 1 | 3 | 4 | 2 | 10 | L5 | x | x | 2016 |
| <i>Equisetum arvense</i> | field horsetail | 1 | 2 | 1 | 1 | 5 | L5 | x | x | 2016 |
| <i>Equisetum hyemale</i> ssp. <i>affine</i> | scouring-rush | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Erigeron annuus</i> | daisy fleabane | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Erigeron canadensis</i> | horse-weed | 2 | 1 | 2 | 0 | 5 | L5 | x | x | 2016 |
| <i>Erigeron philadelphicus</i> var. <i>philadelphicus</i> | Philadelphia fleabane | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Erigeron strigosus</i> | rough fleabane | 2 | 2 | 1 | 1 | 6 | L5 | x | x | 2015 |
| <i>Erythronium americanum</i> ssp. <i>americanum</i> | yellow trout-lily | 1 | 3 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Eurybia macrophylla</i> | big-leaved aster | 1 | 3 | 2 | 4 | 10 | L5 | x | x | 2016 |
| <i>Euthamia graminifolia</i> | grass-leaved goldenrod | 1 | 1 | 4 | 1 | 7 | L5 | x | x | 2016 |
| <i>Eutrochium maculatum</i> var. <i>maculatum</i> | spotted Joe-Pye weed | 1 | 2 | 3 | 3 | 9 | L5 | x | x | 2016 |
| <i>Fragaria vesca</i> ssp. <i>americana</i> | woodland strawberry | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Fragaria virginiana</i> ssp. <i>glauca</i> | blue-leaved wild strawberry | 3 | 2 | 0 | 2 | 7 | L5 | x | x | 2016 |
| <i>Fragaria virginiana</i> ssp. <i>virginiana</i> | common wild strawberry | 2 | 2 | 0 | 2 | 6 | L5 | x | x | 2016 |
| <i>Fraxinus americana</i> | white ash | 1 | 5 | 0 | 3 | 9 | L5 | x | x | 2016 |
| <i>Fraxinus pennsylvanica</i> | red ash | 1 | 5 | 0 | 3 | 9 | L5 | x | x | 2016 |
| <i>Galium aparine</i> | cleavers | 2 | 1 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Galium asprellum</i> | rough bedstraw | 2 | 2 | 4 | 2 | 10 | L5 | x | x | 2016 |
| <i>Galium palustre</i> | marsh bedstraw | 1 | 2 | 3 | 3 | 9 | L5 | x | x | 2016 |
| <i>Galium triflorum</i> | sweet-scented bedstraw | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Geum aleppicum</i> | yellow avens | 1 | 3 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Geum canadense</i> | white avens | 1 | 2 | 1 | 2 | 6 | L5 | x | x | 2016 |
| <i>Glyceria grandis</i> | tall manna grass | 1 | 3 | 4 | 2 | 10 | L5 | x | x | 2016 |
| <i>Glyceria striata</i> | fowl manna grass | 1 | 2 | 1 | 2 | 6 | L5 | x | x | 2016 |
| <i>Hackelia virginiana</i> | Virginia stickseed | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Helianthus tuberosus</i> | Jerusalem artichoke | 2 | 1 | 2 | 0 | 5 | L5 | x | x | 2016 |
| <i>Heracleum maximum</i> | cow-parsonip | 2 | 2 | 3 | 2 | 9 | L5 | | x | 2015 |
| <i>Hydrophyllum virginianum</i> | Virginia waterleaf | 1 | 2 | 1 | 2 | 6 | L5 | x | x | 2016 |
| <i>Impatiens capensis</i> | orange touch-me-not | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|-----------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Juglans nigra</i> | black walnut | 1 | 1 | 2 | 1 | 5 | L5 | x | x | 2016 |
| <i>Juncus articulatus</i> | jointed rush | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Juncus bufonius</i> | toad rush | 2 | 1 | 4 | 1 | 8 | L5 | x | x | 2016 |
| <i>Juncus dudleyi</i> | Dudley's rush | 1 | 2 | 3 | 1 | 7 | L5 | x | x | 2016 |
| <i>Juncus tenuis</i> | path rush | 1 | 2 | 1 | 1 | 5 | L5 | x | x | 2016 |
| <i>Laportea canadensis</i> | wood nettle | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2015 |
| <i>Leersia oryzoides</i> | rice cut grass | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Lemna minor</i> | common duckweed | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Lemna turionifera</i> | turion duckweed | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Lycopus uniflorus</i> | northern water-horehound | 1 | 3 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Lysimachia ciliata</i> | fringed loosestrife | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Maianthemum racemosum</i> ssp. <i>racemosum</i> | false Solomon's seal | 1 | 3 | 2 | 3 | 9 | L5 | x | x | 2016 |
| <i>Maianthemum stellatum</i> | starry false Solomon's seal | 1 | 2 | 1 | 3 | 7 | L5 | x | x | 2016 |
| <i>Matteuccia struthiopteris</i> var. <i>pennsylvanica</i> | ostrich fern | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Mentha canadensis</i> | wild mint | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Monarda fistulosa</i> | wild bergamot | 2 | 3 | 2 | 3 | 10 | L5 | x | x | 2016 |
| <i>Muhlenbergia mexicana</i> var. <i>filiformis</i> | slender muhly grass | 3 | 2 | 0 | 2 | 7 | L5 | x | x | 2015 |
| <i>Muhlenbergia mexicana</i> var. <i>mexicana</i> | common muhly grass | 2 | 2 | 0 | 1 | 5 | L5 | x | x | 2016 |
| <i>Nabalus altissimus</i> | tall wood lettuce | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Oenothera biennis</i> | common evening-primrose | 1 | 1 | 1 | 1 | 4 | L5 | x | x | 2016 |
| <i>Onoclea sensibilis</i> | sensitive fern | 1 | 3 | 1 | 3 | 8 | L5 | x | x | 2016 |
| <i>Ostrya virginiana</i> | ironwood | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Oxalis dillenii</i> | deflexed yellow wood-sorrel | 3 | 1 | 0 | 1 | 5 | L5 | x | | 2016 |
| <i>Oxalis stricta</i> | common yellow wood-sorrel | 1 | 1 | 1 | 1 | 4 | L5 | x | x | 2016 |
| <i>Panicum capillare</i> | panic grass | 2 | 1 | 4 | 1 | 8 | L5 | x | x | 2016 |
| <i>Parthenocissus quinquefolia</i> | Virginia creeper | 3 | 1 | 4 | 2 | 10 | L5 | x | x | 2015 |
| <i>Parthenocissus vitacea</i> | thicket creeper | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Persicaria lapathifolia</i> | pale smartweed | 1 | 1 | 4 | 0 | 6 | L5 | x | x | 2016 |
| <i>Phryma leptostachya</i> | lopseed | 2 | 2 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Physalis heterophylla</i> | clammy ground-cherry | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2015 |
| <i>Pilea pumila</i> | dwarf clearweed | 1 | 2 | 1 | 1 | 5 | L5 | x | x | 2016 |
| <i>Plantago rugelii</i> | red-stemmed plantain | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Poa palustris</i> | fowl meadow-grass | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Podophyllum peltatum</i> | May-apple | 1 | 3 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Populus balsamifera</i> | balsam poplar | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Populus deltoides</i> | cottonwood | 1 | 1 | 4 | 1 | 7 | L5 | x | x | 2016 |
| <i>Populus tremuloides</i> | trembling aspen | 1 | 3 | 1 | 3 | 8 | L5 | x | x | 2016 |
| <i>Populus x jackii</i> | Jack's poplar | 3 | 2 | 4 | 1 | 10 | L5 | x | | 2015 |
| <i>Potentilla anserina</i> ssp. <i>anserina</i> | silverweed | 2 | 2 | 3 | 2 | 9 | L5 | x | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|----------------------------|--------------|-------------|-----------|----------------|------------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Prunella vulgaris</i> ssp. <i>lanceolata</i> | heal-all (native) | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Prunus serotina</i> | black cherry | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Prunus virginiana</i> var. <i>virginiana</i> | choke cherry | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Ranunculus abortivus</i> | kidney-leaved buttercup | 1 | 3 | 1 | 2 | 7 | L5 | x | x | 2016 |
| <i>Ranunculus recurvatus</i> var. <i>recurvatus</i> | hooked buttercup | 1 | 3 | 2 | 3 | 9 | L5 | x | x | 2016 |
| <i>Ranunculus sceleratus</i> | cursed crowfoot | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Rhus typhina</i> | staghorn sumach | 1 | 1 | 2 | 2 | 6 | L5 | x | x | 2016 |
| <i>Ribes americanum</i> | wild black currant | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Ribes cynosbati</i> | prickly gooseberry | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Rorippa palustris</i> ssp. <i>palustris</i> | Fernald's marsh cress | 2 | 2 | 4 | 2 | 10 | L5 | x | x | 2015 |
| <i>Rubus allegheniensis</i> | common blackberry | 1 | 3 | 0 | 1 | 5 | L5 | x | x | 2016 |
| <i>Rubus idaeus</i> ssp. <i>strigosus</i> | wild red raspberry | 1 | 1 | 0 | 1 | 3 | L5 | x | x | 2016 |
| <i>Rubus occidentalis</i> | wild black raspberry | 1 | 1 | 0 | 1 | 3 | L5 | x | x | 2016 |
| <i>Rubus odoratus</i> | purple-flowering raspberry | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Salix eriocephala</i> | narrow heart-leaved willow | 1 | 1 | 3 | 1 | 6 | L5 | x | x | 2016 |
| <i>Salix interior</i> | sandbar willow | 1 | 1 | 5 | 2 | 9 | L5 | x | x | 2016 |
| <i>Sambucus canadensis</i> | common elderberry | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Sambucus racemosa</i> ssp. <i>pubens</i> | red-berried elder | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Sanguinaria canadensis</i> | bloodroot | 1 | 3 | 0 | 3 | 7 | L5 | x | x | 2016 |
| <i>Scirpus atrovirens</i> | black-fruited bulrush | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Scirpus microcarpus</i> | barber-pole bulrush | 1 | 2 | 4 | 3 | 10 | L5 | x | x | 2015 |
| <i>Scutellaria galericulata</i> | common skullcap | 2 | 2 | 3 | 2 | 9 | L5 | | x | 2015 |
| <i>Scutellaria lateriflora</i> | mad-dog skullcap | 2 | 2 | 3 | 3 | 10 | L5 | x | x | 2016 |
| <i>Smilax herbacea</i> | carrion-flower | 2 | 3 | 2 | 2 | 9 | L5 | x | x | 2016 |
| <i>Solanum ptychanthum</i> | American black nightshade | 3 | 1 | 4 | 0 | 8 | L5 | x | x | 2016 |
| <i>Solidago altissima</i> | tall goldenrod | 1 | 2 | 0 | 0 | 3 | L5 | x | x | 2016 |
| <i>Solidago caesia</i> | blue-stemmed goldenrod | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Solidago canadensis</i> var. <i>canadensis</i> | Canada goldenrod | 1 | 2 | 0 | 1 | 4 | L5 | x | x | 2016 |
| <i>Solidago flexicaulis</i> | zig-zag goldenrod | 1 | 1 | 3 | 2 | 7 | L5 | x | x | 2016 |
| <i>Solidago gigantea</i> | late goldenrod | 1 | 1 | 1 | 1 | 4 | L5 | x | x | 2016 |
| <i>Solidago nemoralis</i> ssp. <i>nemoralis</i> | grey goldenrod | 2 | 2 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Solidago rugosa</i> ssp. <i>rugosa</i> | rough-stemmed goldenrod | 2 | 3 | 2 | 3 | 10 | L5 | x | x | 2016 |
| <i>Symphotrichum cordifolium</i> | heart-leaved aster | 1 | 1 | 0 | 2 | 4 | L5 | x | x | 2016 |
| <i>Symphotrichum ericoides</i> var. <i>ericoides</i> | heath aster | 1 | 1 | 2 | 1 | 5 | L5 | x | x | 2016 |
| <i>Symphotrichum lanceolatum</i> var. <i>lanceolatum</i> | panicled aster | 1 | 2 | 3 | 1 | 7 | L5 | x | x | 2016 |
| <i>Symphotrichum lateriflorum</i> var. <i>lateriflorum</i> | calico aster | 1 | 2 | 3 | 2 | 8 | L5 | x | x | 2016 |
| <i>Symphotrichum novae-angliae</i> | New England aster | 1 | 2 | 2 | 1 | 6 | L5 | x | x | 2016 |
| <i>Symphotrichum puniceum</i> var. <i>puniceum</i> | swamp aster | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Symphotrichum</i> x <i>amethystinum</i> | amethyst aster | 3 | 2 | 2 | 2 | 9 | L5 | | x | 2015 |

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| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Thalictrum dioicum</i> | early meadow rue | 1 | 3 | 3 | 2 | 9 | L5 | x | x | 2016 |
| <i>Thalictrum pubescens</i> | tall meadow rue | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2015 |
| <i>Tilia americana</i> | basswood | 1 | 3 | 2 | 3 | 9 | L5 | x | x | 2016 |
| <i>Toxicodendron radicans</i> var. <i>radicans</i> | poison ivy (vine form) | 2 | 2 | 4 | 2 | 10 | L5 | x | x | 2015 |
| <i>Toxicodendron radicans</i> var. <i>rydbergii</i> | poison ivy (shrub form) | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Ulmus americana</i> | white elm | 1 | 4 | 0 | 2 | 7 | L5 | x | x | 2016 |
| <i>Urtica dioica</i> ssp. <i>gracilis</i> | American stinging nettle | 1 | 3 | 2 | 2 | 8 | L5 | x | x | 2016 |
| <i>Verbena hastata</i> | blue vervain | 1 | 2 | 4 | 2 | 9 | L5 | x | x | 2016 |
| <i>Verbena urticifolia</i> | white vervain | 1 | 2 | 2 | 2 | 7 | L5 | x | x | 2016 |
| <i>Viburnum lentago</i> | nannyberry | 1 | 3 | 1 | 2 | 7 | L5 | x | x | 2016 |
| <i>Viola labradorica</i> | dog violet | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Viola pubescens</i> var. <i>pubescens</i> | downy yellow violet | 2 | 4 | 1 | 2 | 9 | L5 | x | x | 2015 |
| <i>Viola pubescens</i> var. <i>scabriuscula</i> | smooth yellow violet | 2 | 4 | 1 | 2 | 9 | L5 | x | x | 2016 |
| <i>Viola sororia</i> var. <i>sororia</i> | common blue violet | 1 | 2 | 0 | 2 | 5 | L5 | x | x | 2016 |
| <i>Vitis riparia</i> | riverbank grape | 1 | 1 | 0 | 0 | 2 | L5 | x | x | 2016 |
| <i>Xanthium strumarium</i> | clotbur | 2 | 1 | 4 | 0 | 7 | L5 | x | x | 2015 |
| <i>Abutilon theophrasti</i> | velvet-leaf | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Acer platanoides</i> | Norway maple | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Acer tataricum</i> ssp. <i>ginnala</i> | Amur maple | 2 | ns | ns | ns | 2 | L+ | xpr | x | 2016 |
| <i>Achillea millefolium</i> | European yarrow | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Aegopodium podagraria</i> | goutweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Aesculus hippocastanum</i> | horse-chestnut | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Agrostis gigantea</i> | redtop | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Ailanthus altissima</i> | tree-of-heaven | 3 | ns | ns | ns | 3 | L+ | x | | 2015 |
| <i>Ajuga reptans</i> | common bugle | 2 | ns | ns | ns | 2 | L+ | x | x | 2015 |
| <i>Akebia quinata</i> | chocolate-vine | 5 | ns | ns | ns | ns | L+ | x | | 2016 |
| <i>Alliaria petiolata</i> | garlic mustard | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Allium schoenoprasum</i> var. <i>schoenoprasum</i> | chives | 4 | ns | ns | ns | 4 | L+ | x | x | 2015 |
| <i>Alnus glutinosa</i> | European alder | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Alnus glutinosa</i> x <i>incana</i> ssp. <i>rugosa</i> | hybrid European - speckled alder | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Alopecurus pratensis</i> | meadow foxtail | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Amaranthus blitoides</i> | prostrate pigweed | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Amaranthus retroflexus</i> | red-root pigweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Aquilegia vulgaris</i> | garden columbine | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Arabidopsis thaliana</i> | mouse-ear cress | 5 | ns | ns | ns | 5 | L+ | x | | 2016 |
| <i>Arctium lappa</i> | great burdock | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Arctium minus</i> | common burdock | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Arenaria serpyllifolia</i> | thyme-leaved sandwort | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Armoracia rusticana</i> | horse-radish | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 |

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| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Artemisia biennis</i> | biennial wormwood | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Artemisia vulgaris</i> | common mugwort | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Asparagus officinalis</i> | asparagus | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Avena sativa</i> | oats | 4 | ns | ns | ns | 4 | L+ | x | x | 2007 |
| <i>Barbarea vulgaris</i> | winter cress | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Bassia scoparia</i> | summer-cypress | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Berberis thunbergii</i> | Japanese barberry | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Berberis vulgaris</i> | common barberry | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Berteroa incana</i> | hoary alyssum | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Betula pendula</i> | European white birch | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Brassica oleracea</i> | kale | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Bromus commutatus</i> | upright chess | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i> | soft brome | 5 | ns | ns | ns | 5 | L+ | x | | 2016 |
| <i>Bromus inermis</i> | smooth brome grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Bromus japonicus</i> | Japanese chess | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Bromus racemosus</i> | spiked brome | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Bromus secalinus</i> | cheat brome | 5 | ns | ns | ns | 5 | L+ | x | x | 2015 |
| <i>Bromus tectorum</i> | downy chess | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Butomus umbellatus</i> | flowering-rush | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Camelina microcarpa</i> | small-seeded false flax | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 |
| <i>Campanula persicifolia</i> | peach-leaved bellflower | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Campanula rapunculoides</i> | creeping bellflower | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Capsella bursa-pastoris</i> | shepherd's purse | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Caragana arborescens</i> | Siberian pea-shrub | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Carduus nutans</i> ssp. <i>nutans</i> | nodding thistle | 2 | ns | ns | ns | 2 | L+ | x | | 2009 |
| <i>Carex spicata</i> | spiked sedge | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Celastrus orbiculatus</i> | oriental bittersweet | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Centaurea jacea</i> | brown knapweed | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Centaurea stoebe</i> ssp. <i>micranthos</i> | spotted knapweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2015 |
| <i>Centaureum pulchellum</i> | branching centaury | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Cerastium arvense</i> ssp. <i>arvense</i> | field chickweed | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Cerastium fontanum</i> | mouse-ear chickweed | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Cerastium tomentosum</i> | snow-on-the-mountain | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Chaenorhinum minus</i> ssp. <i>minus</i> | dwarf snapdragon | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Chelidonium majus</i> | celandine | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Chenopodium album</i> | lamb's quarters | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Cichorium intybus</i> | chicory | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Cirsium arvense</i> | creeping thistle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Cirsium vulgare</i> | bull thistle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | | |
|--|----------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|--|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | | |
| <i>Commelina communis</i> | Asiatic dayflower | 5 | ns | ns | ns | 5 | L+ | x | | 2016 | |
| <i>Convallaria majalis</i> | lily-of-the-valley | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Convolvulus arvensis</i> | field bindweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Coreopsis lanceolata</i> | lance-leaved coreopsis | 4 | ns | ns | ns | 4 | L+ | x | xpr | 2016 | |
| <i>Crataegus monogyna</i> | English hawthorn | 1 | 1 | 4 | ns | 6 | L+ | x | x | 2016 | |
| <i>Crepis tectorum</i> | narrow-leaved hawk's beard | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Cryptotaenia japonica</i> | Asiatic honewort | 5 | ns | ns | ns | 5 | L+ | | x | 2015 | |
| <i>Cynanchum rossicum</i> | dog-strangling vine | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Cynoglossum officinale</i> | hound's tongue | 2 | ns | ns | ns | 2 | L+ | x | x | 2015 | |
| <i>Cyperus fuscus</i> | brown umbrella-sedge | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Dactylis glomerata</i> | orchard grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Daphne mezereum</i> | daphne | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Daucus carota</i> | Queen Anne's lace | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Deschampsia cespitosa</i> ssp. <i>parviflora</i> | tufted hairgrass | 5 | ns | ns | ns | 5 | L+ | | x | 2015 | |
| <i>Descurainia sophia</i> | flixweed | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 | |
| <i>Dianthus armeria</i> | Deptford pink | 2 | ns | ns | ns | 2 | L+ | x | | 2016 | |
| <i>Dianthus barbatus</i> | sweet William | 5 | ns | ns | ns | 5 | L+ | x | | 2016 | |
| <i>Digitaria ischaemum</i> | smooth crab grass | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Digitaria sanguinalis</i> | hairy crab grass | 2 | ns | ns | ns | 2 | L+ | | x | 2015 | |
| <i>Diploxys muralis</i> | wall rocket | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Diploxys tenuifolia</i> | slender-leaved wall rocket | 5 | ns | ns | ns | 5 | L+ | x | | 2015 | |
| <i>Dipsacus fullonum</i> | teasel | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Draba verna</i> | spring whitlow-grass | 5 | ns | ns | ns | 5 | L+ | x | | 2016 | |
| <i>Echinochloa crus-galli</i> | barnyard grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Echium vulgare</i> | viper's bugloss | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Elaeagnus angustifolia</i> | Russian olive | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Elaeagnus umbellata</i> | autumn olive | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Elymus repens</i> | quack grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Epilobium hirsutum</i> | European willow-herb | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Epilobium parviflorum</i> | small-flowered willow-herb | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Epipactis helleborine</i> | helleborine | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Eragrostis minor</i> | little love grass | 3 | ns | ns | ns | 3 | L+ | x | | 2016 | |
| <i>Erucastrum gallicum</i> | dog mustard | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 | |
| <i>Erysimum cheiranthoides</i> | wormseed mustard | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Erysimum hieraciifolium</i> | hawkweed-leaved mustard | 4 | ns | ns | ns | 4 | L+ | x | | 2015 | |
| <i>Euonymus alatus</i> | winged spindle-tree | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Euonymus europaeus</i> | European spindle-tree | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Euonymus fortunei</i> | wintercreeper euonymus | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Eupatorium altissimum</i> | tall boneset | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Euphorbia cyparissias</i> | cypress spurge | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Euphorbia helioscopia</i> | sun spurge | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Euphorbia hirta</i> | asthma spurge | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Euphorbia virgata</i> | Russian leafy spurge | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Fallopia convolvulus</i> | black bindweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Festuca filiformis</i> | hair fescue | 3 | ns | ns | ns | 3 | L+ | x | | 2015 |
| <i>Festuca rubra</i> ssp. <i>rubra</i> | red fescue | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Festuca trachyphylla</i> | hard fescue | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Forsythia viridissima</i> | forsythia | 2 | ns | ns | ns | 2 | L+ | x | | 2016 |
| <i>Galega officinalis</i> | goat's-rue | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Galeopsis tetrahit</i> | hemp-nettle | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Galinsoga quadriradiata</i> | hairy galinsoga | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Galium mollugo</i> | white bedstraw | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Galium odoratum</i> | sweet woodruff | 4 | ns | ns | ns | 4 | L+ | x | | 2016 |
| <i>Galium verum</i> | yellow bedstraw | 2 | ns | ns | ns | 2 | L+ | x | x | 2015 |
| <i>Geranium sanguineum</i> | bloody crane's bill | 5 | ns | ns | ns | 5 | L+ | xcf | | 2009 |
| <i>Geum urbanum</i> | urban avens | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Glechoma hederacea</i> | creeping Charlie | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Helianthus annuus</i> | common sunflower | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Hemerocallis fulva</i> | orange day-lily | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Heracleum mantegazzianum</i> | giant hog-weed | 4 | ns | ns | ns | 4 | L+ | x | | 2016 |
| <i>Hesperis matronalis</i> | dame's rocket | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Hordeum jubatum</i> ssp. <i>jubatum</i> | squirrel-tail barley | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Hordeum vulgare</i> | barley | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Humulus japonicus</i> | Japanese hops | 5 | ns | ns | ns | 5 | L+ | x | | 2016 |
| <i>Hydrocharis morsus-ranae</i> | European frog-bit | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Hylotelephium spectabile</i> | showy stonecrop | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Hylotelephium telephium</i> | live-forever | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Hypericum perforatum</i> | common St. John's-wort | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Impatiens glandulifera</i> | Himalayan balsam | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Inula helenium</i> | elecampane | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Ipomoea purpurea</i> | common morning-glory | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Iris germanica</i> | garden iris | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Iris pseudacorus</i> | yellow flag | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Juglans ailantifolia</i> | Japanese walnut | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Juglans x bixbyi</i> | buartnut | 4 | ns | ns | ns | 4 | L+ | x | x | 2015 |
| <i>Juncus compressus</i> | round-fruited rush | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Juniperus chinensis</i> | Chinese juniper | 3 | ns | ns | ns | 3 | L+ | xpr | xcf | 2016 |
| <i>Juniperus sabina</i> | savin juniper | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | | |
|--|--------------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|--|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | | |
| <i>Lactuca saligna</i> | willow-leaved lettuce | 5 | ns | ns | ns | 5 | L+ | x | | 2015 | |
| <i>Lactuca serriola</i> | prickly lettuce | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lamium amplexicaule</i> | henbit | 5 | ns | ns | ns | 5 | L+ | x | | 2016 | |
| <i>Lamium maculatum</i> | spotted dead-nettle | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Lamprocapnos spectabilis</i> | bleeding hearts | 4 | ns | ns | ns | 4 | L+ | x | | 2009 | |
| <i>Lappula squarrosa</i> | Eurasian stickseed | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |
| <i>Lapsana communis</i> | nipplewort | 2 | ns | ns | ns | 2 | L+ | x | | 2016 | |
| <i>Larix x pendula</i> | European-tamarack hybrid larch | 5 | ns | ns | ns | 5 | L+ | x | xp | 2015 | |
| <i>Lathyrus latifolius</i> | everlasting pea | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 | |
| <i>Lathyrus odoratus</i> | sweet pea | 4 | ns | ns | ns | 4 | L+ | x | | 2015 | |
| <i>Leonurus cardiaca</i> ssp. <i>cardiaca</i> | motherwort | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lepidium campestre</i> | field pepper-grass | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Leucanthemum vulgare</i> | ox-eye daisy | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lilium lancifolium</i> | tiger lily | 4 | ns | ns | ns | 4 | L+ | x | | 2009 | |
| <i>Linaria vulgaris</i> | butter-and-eggs | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Linum usitatissimum</i> | common flax | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |
| <i>Lithospermum officinale</i> | Eurasian gromwell | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lolium arundinaceum</i> | tall fescue | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Lolium perenne</i> | perennial rye | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Lolium pratense</i> | meadow fescue | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lonicera japonica</i> | Japanese honeysuckle | 4 | ns | ns | ns | 4 | L+ | x | | 2016 | |
| <i>Lonicera maackii</i> | Amur honeysuckle | 4 | ns | ns | ns | 4 | L+ | x | x | 2015 | |
| <i>Lonicera morrowii</i> | Morrow's honeysuckle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lonicera tatarica</i> | Tartarian honeysuckle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lonicera x bella</i> | shrub honeysuckle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lonicera xylosteum</i> | European fly honeysuckle | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Lotus corniculatus</i> | bird's foot trefoil | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lunaria annua</i> | silver dollars | 4 | ns | ns | ns | 4 | L+ | | x | 2003 | |
| <i>Lycopus americanus</i> x <i>europaeus</i> | hybrid water-horehound | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Lycopus europaeus</i> | European water-horehound | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Lysimachia arvensis</i> | scarlet pimpernel | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Lysimachia nummularia</i> | moneywort | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Lythrum salicaria</i> | purple loosestrife | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Malus baccata</i> | Siberian crab-apple | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Malus prunifolia</i> | Chinese crab-apple | 3 | ns | ns | ns | 3 | L+ | x | | 2015 | |
| <i>Malus pumila</i> | apple | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Malus toringo</i> | Toringo crab-apple | 5 | ns | ns | ns | 5 | L+ | xcf | | 2016 | |
| <i>Malva moschata</i> | musk mallow | 3 | ns | ns | ns | 3 | L+ | x | | 2016 | |
| <i>Malva sylvestris</i> | high mallow | 5 | ns | ns | ns | 5 | L+ | | x | 2003 | |

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|--|-------------------------|--------------|-------------|-----------|----------------|------------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score 2-20 | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Matricaria discoidea</i> | pineappleweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Medicago falcata</i> | alfalfa | 4 | ns | ns | ns | 4 | L+ | x | | 2016 |
| <i>Medicago lupulina</i> | black medick | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Medicago sativa</i> ssp. <i>sativa</i> | alfalfa | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Melilotus albus</i> | white sweet clover | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Melilotus officinalis</i> | yellow sweet clover | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Mentha spicata</i> | spear mint | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Mentha x gentilis</i> | red mint | 4 | ns | ns | ns | 4 | L+ | x | x | 2015 |
| <i>Miscanthus sacchariflorus</i> | eulalia | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Mollugo verticillata</i> | carpet-weed | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Morus alba</i> | white mulberry | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Muscari armeniacum</i> | Armenian grape hyacinth | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Muscari botryoides</i> | grape hyacinth | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Mycelis muralis</i> | wall lettuce | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Myosotis scorpioides</i> | true forget-me-not | 1 | ns | ns | ns | 1 | L+ | x | x | 2015 |
| <i>Myosotis stricta</i> | upright forget-me-not | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 |
| <i>Myosotis sylvatica</i> | woodland forget-me-not | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Myosoton aquaticum</i> | giant chickweed | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Myriophyllum spicatum</i> | Eurasian water-milfoil | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Narcissus poeticus</i> | narcissus | 3 | ns | ns | ns | 3 | L+ | xpr | x | 2016 |
| <i>Narcissus pseudonarcissus</i> | daffodil | 3 | ns | ns | ns | 3 | L+ | x | | 2009 |
| <i>Nasturtium microphyllum</i> | small-leaved watercress | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Nepeta cataria</i> | catnip | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Oenothera fruticosa</i> ssp. <i>tetragona</i> | sundrops | 5 | ns | ns | ns | 5 | L+ | x | | 2016 |
| <i>Origanum vulgare</i> | wild marjoram | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Oxybasis glauca</i> ssp. <i>glauca</i> | oak-leaved goosefoot | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Panicum dichotomiflorum</i> | fall panic grass | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Pastinaca sativa</i> | wild parsnip | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Persicaria maculosa</i> | lady's thumb | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Persicaria orientalis</i> | prince's feather | 4 | ns | ns | ns | 4 | L+ | x | | 2016 |
| <i>Phleum pratense</i> | Timothy grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Phragmites australis</i> ssp. <i>australis</i> | common reed | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Physalis alkekengi</i> | Chinese lantern | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Picea abies</i> | Norway spruce | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Pilosella caespitosa</i> | yellow hawkweed | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Pilosella officinarum</i> | mouse-ear hawkweed | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Pilosella piloselloides</i> | smooth yellow hawkweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Pilosella x floribunda</i> | smoothish hawkweed | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Pinus nigra</i> | Austrian pine | 4 | ns | ns | ns | 4 | L+ | xp | x | 2016 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|--------------------------|------------------|-----------------|---------------|----------------|------------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| 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-16) | Watershed Section | | Last obs. |
| | | | | | | | | north | south | |
| <i>Pinus sylvestris</i> | Scots pine | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Plantago lanceolata</i> | English plantain | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Plantago major</i> | common plantain | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Poa annua</i> | annual blue grass | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Poa compressa</i> | flat-stemmed blue grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Poa nemoralis</i> | woodland spear grass | 2 | ns | ns | ns | 2 | L+ | | x | 2015 |
| <i>Poa pratensis</i> ssp. <i>pratensis</i> | Kentucky blue grass | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Poa trivialis</i> | rough blue grass | 5 | ns | ns | ns | 5 | L+ | x | | 2009 |
| <i>Polygonatum multiflorum</i> | European Solomon's seal | 3 | ns | ns | ns | 3 | L+ | | x | 2016 |
| <i>Polygonum achoreum</i> | striate knotweed | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Polygonum aviculare</i> ssp. <i>aviculare</i> | prostrate knotweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Populus alba</i> | white poplar | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Populus x canadensis</i> | Carolina poplar | 2 | ns | ns | ns | 2 | L+ | xpr | x | 2016 |
| <i>Populus x heimburgeri</i> | Heimburger's poplar | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Portulaca oleracea</i> | purslane | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Potamogeton crispus</i> | curly pondweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Potentilla argentea</i> | silvery cinquefoil | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Potentilla inclinata</i> | lintermediate cinquefoil | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Potentilla recta</i> | sulphur cinquefoil | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Prunella vulgaris</i> ssp. <i>vulgaris</i> | heal-all (European) | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Prunus avium</i> | mazzard cherry | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Prunus domestica</i> | common plum | 4 | ns | ns | ns | 4 | L+ | x | | 2007 |
| <i>Puccinellia distans</i> | alkali grass | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Pyrus communis</i> | pear | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Quercus robur</i> | English oak | 3 | ns | ns | ns | 3 | L+ | x | | 2016 |
| <i>Ranunculus acris</i> | tall buttercup | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Ranunculus lingua</i> | greater spearwort | 5 | ns | ns | ns | ns | L+ | x | | 2016 |
| <i>Ranunculus repens</i> | creeping buttercup | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Reynoutria japonica</i> var. <i>japonica</i> | Japanese knotweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Reynoutria x bohemica</i> | hybrid knotweed | 4 | ns | ns | ns | 4 | L+ | | x | 2015 |
| <i>Rhamnus cathartica</i> | common buckthorn | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Rheum rhabarbarum</i> | rhubarb | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Ribes nigrum</i> | black currant | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Ribes rubrum</i> | garden red currant | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Ribes uva-crispa</i> | European gooseberry | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Robinia pseudoacacia</i> | black locust | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Rosa canina</i> | dog rose | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Rosa multiflora</i> | multiflora rose | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Rosa rubiginosa</i> var. <i>rubiginosa</i> | sweet brier rose | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | | |
|--|---------------------------------|--------------|-------------|-----------|---------------|-------------|--------------------|-------------------|-------|-----------|--|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0- | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | | |
| <i>Rosa rugosa</i> | wrinkled rose | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Rubus idaeus</i> ssp. <i>idaeus</i> | garden red raspberry | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |
| <i>Rubus phoenicolasius</i> | wine raspberry | 5 | ns | ns | ns | 5 | L+ | | xcf | 2015 | |
| <i>Rudbeckia fulgida</i> | orange coneflower | 3 | ns | ns | ns | 3 | L+ | x | | 2016 | |
| <i>Rudbeckia triloba</i> | brown-eyed Susan | 2 | ns | ns | ns | 2 | L+ | x | x | 2009 | |
| <i>Rumex acetosella</i> | sheep sorrel | 3 | 2 | 5 | 4 | 14 | L+ | x | | 2016 | |
| <i>Rumex crispus</i> | curly dock | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Rumex obtusifolius</i> | bitter dock | 2 | ns | ns | ns | 2 | L+ | | x | 2015 | |
| <i>Salix alba</i> | white willow | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Salix purpurea</i> | purple-osier willow | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Salix x fragilis</i> | crack willow | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Salix x pendulina</i> | Wisconsin weeping willow | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |
| <i>Salix x sepulcralis</i> | weeping willow | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Saponaria officinalis</i> | bouncing Bet | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Scilla siberica</i> | Siberian squill | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Securigera varia</i> | crown vetch | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Sedum acre</i> | mossy stonecrop | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Sedum hispanicum</i> | Spanish stonecrop | 4 | ns | ns | ns | 4 | L+ | | x | 2015 | |
| <i>Senecio vulgaris</i> | common groundsel | 3 | ns | ns | ns | 3 | L+ | x | | 2016 | |
| <i>Setaria faberi</i> | giant foxtail | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Setaria pumila</i> ssp. <i>pumila</i> | yellow foxtail | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Setaria verticillata</i> | bristly foxtail | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Setaria viridis</i> | green foxtail | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Silene latifolia</i> | evening lychnis | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Silene vulgaris</i> | bladder campion | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Sinapis arvensis</i> | charlock | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Sisymbrium altissimum</i> | tumble mustard | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 | |
| <i>Solanum dulcamara</i> | bittersweet nightshade | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Sonchus arvensis</i> ssp. <i>arvensis</i> | glandular perennial sow-thistle | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Sonchus arvensis</i> ssp. <i>uliginosus</i> | smooth perennial sow-thistle | 3 | ns | ns | ns | 3 | L+ | | x | 2015 | |
| <i>Sonchus asper</i> | spiny sow-thistle | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Sonchus oleraceus</i> | annual sow-thistle | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Sorbus aucuparia</i> | European mountain-ash | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 | |
| <i>Spergularia media</i> | intermediate sand spurrey | 4 | ns | ns | ns | 4 | L+ | x | | 2016 | |
| <i>Spergularia salina</i> | salt-marsh sand spurrey | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 | |
| <i>Spiraea x vanhouttei</i> | bridalwreath spiraea | 4 | ns | ns | ns | 4 | L+ | x | xp | 2015 | |
| <i>Stachys palustris</i> | marsh hedge-nettle | 2 | 3 | 4 | 3 | 12 | L+ | | x | 2015 | |
| <i>Stellaria graminea</i> | grass-leaved chickweed | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 | |
| <i>Stellaria media</i> | common chickweed | 3 | ns | ns | ns | 3 | L+ | x | | 2016 | |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | |
|--|---------------------------|--------------|-------------|-----------|----------------|-------------|--------------------|-------------------|-------|-----------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Symphotrichum ciliatum</i> | rayless aster | 3 | ns | ns | ns | 3 | L+ | | x | 2015 |
| <i>Symphytum asperum</i> | prickly comfrey | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Symphytum officinale</i> | common comfrey | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Syringa vulgaris</i> | common lilac | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Tanacetum vulgare</i> | tansy | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Taraxacum officinale</i> | dandelion | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Taraxacum palustre</i> | marsh dandelion | 5 | ns | ns | ns | 5 | L+ | x | x | 2016 |
| <i>Taxus cuspidata</i> | Japanese yew | 3 | ns | ns | ns | 3 | L+ | xp | x | 2016 |
| <i>Thlaspi arvense</i> | penny-cress | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Thymus praecox ssp. arcticus</i> | creeping thyme | 4 | ns | ns | ns | 4 | L+ | x | | 2015 |
| <i>Tilia cordata</i> | little-leaf linden | 2 | ns | ns | ns | 2 | L+ | x | xp | 2016 |
| <i>Torilis japonica</i> | hedge-parsley | 2 | ns | ns | ns | 2 | L+ | x | | 2016 |
| <i>Tragopogon dubius</i> | lemon-yellow goat's beard | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Tragopogon pratensis</i> | meadow goat's beard | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Trifolium aureum</i> | hop-clover | 3 | ns | ns | ns | 3 | L+ | x | x | 2015 |
| <i>Trifolium campestre</i> | large hop-clover | 5 | ns | ns | ns | 5 | L+ | x | x | 2016 |
| <i>Trifolium fragiferum</i> | strawberry clover | 5 | ns | ns | ns | 5 | L+ | x | | 2015 |
| <i>Trifolium hybridum</i> | alsike clover | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Trifolium pratense</i> | red clover | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Trifolium repens</i> | white clover | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Tripleurospermum inodorum</i> | scentless chamomile | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Triticum aestivum</i> | wheat | 5 | ns | ns | ns | 5 | L+ | x | x | 2016 |
| <i>Tussilago farfara</i> | coltsfoot | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Typha angustifolia</i> | narrow-leaved cattail | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Typha x glauca</i> | hybrid cattail | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Ulmus glabra</i> | Scotch elm | 2 | ns | ns | ns | 2 | L+ | x | | 2015 |
| <i>Ulmus pumila</i> | Siberian elm | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Urtica dioica ssp. dioica</i> | European stinging nettle | 2 | ns | ns | ns | 2 | L+ | x | x | 2015 |
| <i>Vaccaria hispanica</i> | Spanish cow-herb | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Valeriana officinalis</i> | common valerian | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Verbascum thapsus</i> | common mullein | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Veronica arvensis</i> | corn speedwell | 2 | ns | ns | ns | 2 | L+ | | x | 2015 |
| <i>Veronica austriaca</i> | broad-leaved speedwell | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Veronica longifolia</i> | long-leaved speedwell | 5 | ns | ns | ns | 5 | L+ | x | | 2016 |
| <i>Veronica officinalis</i> | common speedwell | 1 | ns | ns | ns | 1 | L+ | x | x | 2015 |
| <i>Veronica persica</i> | Persian speedwell | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 |
| <i>Veronica serpyllifolia ssp. serpyllifolia</i> | thyme-leaved speedwell | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Veronica verna</i> | spring speedwell | 4 | ns | ns | ns | 4 | L+ | x | x | 2016 |
| <i>Viburnum lantana</i> | wayfaring tree | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |

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| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0-5 | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | |
| <i>Viburnum opulus ssp. opulus</i> | European highbush cranberry | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Vicia cracca</i> | cow vetch | 1 | ns | ns | ns | 1 | L+ | x | x | 2016 |
| <i>Vicia sativa var. angustifolia</i> | common vetch | 5 | ns | ns | ns | 5 | L+ | | x | 2015 |
| <i>Vicia tetrasperma</i> | slender vetch | 3 | ns | ns | ns | 3 | L+ | x | x | 2016 |
| <i>Vinca minor</i> | periwinkle | 2 | ns | ns | ns | 2 | L+ | x | x | 2016 |
| <i>Acer negundo</i> | Manitoba maple | 1 | ns | ns | ns | 1 | L+? | x | x | 2016 |
| <i>Agrostis stolonifera</i> | creeping bent grass | 1 | ns | ns | ns | 1 | L+? | x | x | 2016 |
| <i>Atriplex patula</i> | halberd-leaved orache | 2 | ns | ns | ns | 2 | L+? | x | x | 2016 |
| <i>Atriplex prostrata</i> | spreading orache | 2 | ns | ns | ns | 2 | L+? | x | x | 2016 |
| <i>Chenopodium pratericola</i> | meadow goosefoot | 4 | ns | ns | ns | 4 | L+? | | x | 2015 |
| <i>Cyperus esculentus</i> | yellow nut-sedge | 3 | ns | ns | ns | 3 | L+? | x | x | 2016 |
| <i>Eragrostis pectinacea var. pectinacea</i> | tufted love grass | 4 | 1 | 4 | 3 | 12 | L+? | x | | 2015 |
| <i>Euphorbia glyptosperma</i> | ridge-seeded spurge | 3 | ns | ns | ns | 3 | L+? | x | | 2016 |
| <i>Euphorbia maculata</i> | spotted spurge | 3 | ns | ns | ns | 3 | L+? | x | x | 2015 |
| <i>Euphorbia vermiculata</i> | hairy spurge | 4 | ns | ns | ns | 4 | L+? | x | | 2015 |
| <i>Geranium robertianum</i> | herb Robert | 1 | ns | ns | ns | 1 | L+? | x | x | 2016 |
| <i>Humulus lupulus</i> | common hops | 3 | ns | ns | ns | 3 | L+? | x | | 2016 |
| <i>Lepidium densiflorum</i> | common pepper-grass | 2 | ns | ns | ns | 2 | L+? | x | x | 2016 |
| <i>Nasturtium officinale</i> | watercress | 4 | ns | ns | ns | 4 | L+? | x | x | 2016 |
| <i>Persicaria hydropiper</i> | water-pepper | 2 | ns | ns | ns | 2 | L+? | x | x | 2015 |
| <i>Phalaris arundinacea</i> | reed canary grass | 1 | ns | ns | ns | 1 | L+? | x | x | 2016 |
| <i>Potentilla norvegica</i> | rough cinquefoil | 1 | ns | ns | ns | 1 | L+? | x | x | 2016 |
| <i>Rosa virginiana</i> | Virginia rose | 3 | ns | ns | ns | 3 | L+? | x | xpr | 2016 |
| <i>Sporobolus neglectus</i> | overlooked dropseed | 3 | ns | ns | ns | 3 | L+? | x | x | 2016 |
| <i>Sporobolus vaginiflorus</i> | ensheathed dropseed | 3 | ns | ns | ns | 3 | L+? | x | | 2015 |
| <i>Veronica peregrina ssp. peregrina</i> | purslane speedwell | 3 | ns | ns | ns | 3 | L+? | x | | 2015 |
| <i>Crataegus crus-galli</i> | cockspur hawthorn | 5 | 4 | 5 | 4 | 18 | pL2 | | xp | 2015 |
| <i>Picea mariana</i> | black spruce | 3 | 4 | 5 | 5 | 17 | pL2 | xp | | 2015 |
| <i>Cornus obliqua</i> | silky dogwood | 3 | 3 | 5 | 3 | 14 | pL3 | | xp | 2015 |
| <i>Euonymus obovatus</i> | running strawberry-bush | 2 | 4 | 4 | 4 | 14 | pL3 | xp | | 2016 |
| <i>Physocarpus opulifolius</i> | ninebark | 3 | 2 | 5 | 4 | 14 | pL3 | | xp | 2015 |
| <i>Pycnanthemum virginianum</i> | Virginia mountain-mint | 5 | 2 | 5 | 3 | 15 | pL3 | | xp | 2015 |
| <i>Quercus alba</i> | white oak | 2 | 5 | 4 | 5 | 16 | pL3 | xp | | 2016 |
| <i>Salix nigra</i> | black willow | 3 | 2 | 5 | 4 | 14 | pL3 | | xp | 2015 |
| <i>Staphylea trifolia</i> | bladdernut | 3 | 3 | 4 | 4 | 14 | pL3 | xp | | 2016 |
| <i>Viburnum opulus ssp. trilobum</i> | American highbush cranberry | 3 | 5 | 4 | 4 | 16 | pL3 | | xp | 2015 |
| <i>Salix cordata</i> | heart-leaved willow | 5 | 5 | 5 | 4 | 19 | pLX | | xp | 2015 |
| <i>Abies concolor</i> | silver fir | ns | ns | ns | ns | ns | pL+ | | xp | 2015 |
| <i>Aesculus glabra</i> | Ohio buckeye | 4 | ns | ns | ns | 4 | pL+ | | xp | 2015 |

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|--|-------------------------|--------------|-------------|-----------|---------------|-------------|--------------------|-------------------|-------|-----------|--|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local Occur. | Popn. Trend | Hab. Dep. | Sens. Dev. 0- | Total Score | Rank TRCA (Apr-16) | Watershed Section | | Last obs. | |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | north | south | | |
| <i>Alchemilla mollis</i> | lady's mantle | 5 | ns | ns | ns | 5 | pL+ | xp | | 2009 | |
| <i>Buxus sempervirens</i> | boxwood | 4 | ns | ns | ns | 4 | pL+ | xp | | 2016 | |
| <i>Camassia leichtlinii</i> | great camas | ns | ns | ns | ns | ns | pL+ | xp | | 2015 | |
| <i>Cannabis sativa</i> | marijuana | 5 | ns | ns | ns | 5 | pL+ | xp | | 2016 | |
| <i>Coreopsis tripteris</i> | tall tickseed | 5 | ns | ns | ns | 5 | pL+ | | xp | 2015 | |
| <i>Cotinus coggygia</i> | European smoke-tree | 4 | ns | ns | ns | 4 | pL+ | xp | | 2016 | |
| <i>Dasiphora fruticosa</i> | shrubby cinquefoil | ns | ns | ns | ns | ns | pL+ | xp | | 2016 | |
| <i>Fagus sylvatica</i> | European beech | ns | ns | ns | ns | ns | pL+ | xp | | 2015 | |
| <i>Fraxinus excelsior</i> | European ash | 3 | ns | ns | ns | 3 | pL+ | | xp | 2015 | |
| <i>Gleditsia triacanthos</i> | honey locust | 3 | ns | ns | ns | 3 | pL+ | xp | | 2016 | |
| <i>Hydrangea macrophylla</i> | big-leaved hydrangea | 5 | ns | ns | ns | 5 | pL+ | xp | | 2015 | |
| <i>Juglans regia</i> | English walnut | 5 | ns | ns | ns | 5 | pL+ | xp | | 2016 | |
| <i>Juniperus x pfitzeriana</i> | pfitzer juniper | 3 | ns | ns | ns | 3 | pL+ | xp | | 2016 | |
| <i>Liriodendron tulipifera</i> | tulip-tree | ns | ns | ns | ns | ns | pL+ | xp | xp | 2016 | |
| <i>Metasequoia glyptostroboides</i> | dawn redwood | ns | ns | ns | ns | ns | pL+ | xp | | 2016 | |
| <i>Morella pensylvanica</i> | bayberry | 5 | ns | ns | ns | 5 | pL+ | | xp | 2015 | |
| <i>Phellodendron amurense</i> | Amur cork tree | 5 | ns | ns | ns | 5 | pL+ | | xp | 2015 | |
| <i>Picea pungens</i> | Colorado spruce | 5 | ns | ns | ns | 5 | pL+ | xp | xp | 2016 | |
| <i>Pinus banksiana</i> | Jack pine | 5 | ns | ns | ns | 5 | pL+ | xp | | 2016 | |
| <i>Platanus x hispanica</i> | London plane tree | 5 | ns | ns | ns | 5 | pL+ | | xp | 2015 | |
| <i>Populus tremula</i> | European aspen | ns | ns | ns | ns | ns | pL+ | | xp | 2015 | |
| <i>Quercus bicolor</i> | swamp white oak | ns | ns | ns | ns | ns | pL+ | | xp | 2015 | |
| <i>Quercus palustris</i> | pin oak | ns | ns | ns | ns | ns | pL+ | | xp | 2015 | |
| <i>Rhus aromatica</i> | fragrant sumach | 4 | ns | ns | ns | 4 | pL+ | | xp | 2016 | |
| <i>Salix viminalis</i> | basket willow | 4 | ns | ns | ns | 4 | pL+ | | xp | 2015 | |
| <i>Sedum sarmentosum</i> | Asiatic stonecrop | 5 | ns | ns | ns | 5 | pL+ | xpr | | 2015 | |
| <i>Sorbus x thuringiaca</i> | oak-leaved mountain-ash | ns | ns | ns | ns | ns | pL+ | xp | | 2016 | |
| <i>Tilia x flavescens</i> | hybrid linden | 4 | ns | ns | ns | 4 | pL+ | | xp | 2016 | |
| <i>Viburnum recognitum</i> | southern arrow-wood | 5 | ns | ns | ns | 5 | pL+ | | xp | 2015 | |
| <i>Weigela florida</i> | weigela | ns | ns | ns | ns | ns | pL+ | | xp | 2015 | |
| <i>Pinus resinosa</i> | red pine | 5 | 5 | 5 | 5 | 20 | prL1 | xpr | xp | 2016 | |
| <i>Heliopsis helianthoides</i> | ox-eye | 5 | 5 | 4 | 4 | 18 | prL2 | xpr | | 2015 | |
| <i>Nymphaea odorata</i> ssp. <i>odorata</i> | fragrant water-lily | 4 | 4 | 5 | 4 | 17 | prL2 | xpr | | 2015 | |
| <i>Pontederia cordata</i> | pickerel-weed | 4 | 4 | 5 | 4 | 17 | prL2 | xpr | | 2016 | |
| <i>Schizachyrium scoparium</i> | little bluestem | 4 | 4 | 5 | 5 | 18 | prL2 | | xpr | 2015 | |
| <i>Sorghastrum nutans</i> | Indian grass | 5 | 4 | 5 | 4 | 18 | prL2 | | xpr | 2015 | |
| <i>Andropogon gerardii</i> | big bluestem | 3 | 3 | 4 | 4 | 14 | prL3 | xpr | xpr | 2015 | |
| <i>Carex lurida</i> | sallow sedge | 5 | 2 | 4 | 5 | 16 | prL3 | | xpr | 2015 | |
| <i>Panicum virgatum</i> | switch grass | 3 | 2 | 5 | 5 | 15 | prL3 | xpr | xpr | 2015 | |

| Appendix 2: Carruthers Watershed Flora (2002-2016) (sorted by L-rank then by species) | | | | | | | | | | | |
|--|------------------------|--------|-------|------|---------|-------|----------|-----------|-------|------|------|
| "ns"=not scored; "LX"=extirpated; L+ =exotic; "p"=planted; "pr"=planted but regenerating | | | | | | | | | | | |
| Scientific Name | Common Name | Local | Popn. | Hab. | Sens. | Total | Rank | Watershed | | Last | |
| | | Occur. | Trend | Dep. | Dev. 0- | Score | TRCA | north | south | | obs. |
| | | 1-5 | 1-5 | 0-5 | 5 | 2-20 | (Apr-16) | | | | |
| <i>Physostegia virginiana</i> ssp. <i>virginiana</i> | false dragonhead | 4 | 3 | 4 | 4 | 15 | prL3 | xp | xp | 2016 | |
| <i>Spartina pectinata</i> | prairie cord grass | 4 | 3 | 5 | 3 | 15 | prL3 | | xpr | 2015 | |
| <i>Elymus canadensis</i> | Canada wild rye | 3 | 2 | 5 | 3 | 13 | prL4 | | xpr | 2015 | |
| <i>Achillea filipendulina</i> | fern-leaved yarrow | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Allium giganteum</i> | giant onion | 5 | ns | ns | ns | 5 | prL+ | xpr | xpr | 2016 | |
| <i>Bouteloua curtipendula</i> | side-oats grama | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Brunnera macrophylla</i> | Siberian bugloss | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Calamagrostis epigeios</i> | feathertop | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2015 | |
| <i>Campsis radicans</i> | trumpet creeper | 5 | ns | ns | ns | 5 | prL+ | xpr | | 2016 | |
| <i>Catalpa speciosa</i> | northern catalpa | 3 | ns | ns | ns | 3 | prL+ | xpr | | 2016 | |
| <i>Celtis occidentalis</i> | hackberry | 4 | ns | ns | ns | 4 | prL+ | xpr | xpr | 2016 | |
| <i>Cota tinctoria</i> | yellow chamomile | 5 | ns | ns | ns | ns | prL+ | xpr | | 2016 | |
| <i>Gaillardia aristata</i> | blanket-flower | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Gymnocladus dioicus</i> | Kentucky coffee-tree | 4 | ns | ns | ns | 4 | prL+ | xpr | xp | 2016 | |
| <i>Hosta ventricosa</i> | hosta | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2016 | |
| <i>Larix decidua</i> | European larch | 3 | ns | ns | ns | 3 | prL+ | xp | xp | 2016 | |
| <i>Ligularia dentata</i> | summer ragwort | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Lonicera caerulea</i> | blue fly-honeysuckle | 5 | ns | ns | ns | ns | prL+ | xpr | | 2016 | |
| <i>Lupinus polyphyllus</i> | garden lupine | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2016 | |
| <i>Nymphaea</i> cultivar | hort pink water-lily | ns | ns | ns | ns | ns | prL+ | xp | | 2016 | |
| <i>Nymphoides peltata</i> | floating-heart | 5 | ns | ns | ns | 5 | prL+ | xpr | | 2016 | |
| <i>Paeonia suffruticosa</i> | tree peony | 5 | ns | ns | ns | 5 | prL+ | xpr | | 2015 | |
| <i>Phlox paniculata</i> | garden phlox | 3 | ns | ns | ns | 3 | prL+ | xpr | | 2016 | |
| <i>Populus nigra</i> var. <i>italica</i> | Lombardy poplar | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2003 | |
| <i>Ratibida pinnata</i> | grey-headed coneflower | 3 | ns | ns | ns | 3 | prL+ | xpr | xpr | 2015 | |
| <i>Rhodotypos scandens</i> | jet-bead | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2015 | |
| <i>Rosa glauca</i> | red-leaved rose | 5 | ns | ns | ns | 5 | prL+ | xpr | | 2016 | |
| <i>Salix caprea</i> | goat willow | 3 | ns | ns | ns | 3 | prL+ | xpr | xp | 2016 | |
| <i>Salix cinerea</i> | grey willow | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2016 | |
| <i>Salvia sclarea</i> | clary sage | 5 | ns | ns | ns | ns | prL+ | xpr | | 2016 | |
| <i>Secale cereale</i> | rye | 5 | ns | ns | ns | 5 | prL+ | xpr | | 2016 | |
| <i>Silphium laciniatum</i> | compass-plant | 5 | ns | ns | ns | 5 | prL+ | | xpr | 2015 | |
| <i>Sorbaria sorbifolia</i> | false spiraea | 2 | ns | ns | ns | 2 | prL+ | xpr | | 2016 | |
| <i>Symphoricarpos albus</i> var. <i>laevigatus</i> | western snowberry | 2 | ns | ns | ns | 2 | prL+ | | xpr | 2015 | |
| <i>Syringa reticulata</i> | Japanese tree lilac | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2016 | |
| <i>Tulipa x hybrida</i> | garden tulip | 3 | ns | ns | ns | 3 | prL+ | xpr | | 2015 | |
| <i>Yucca filamentosa</i> | Adam's needle | 4 | ns | ns | ns | 4 | prL+ | xpr | | 2015 | |
| <i>Crataegus mollis</i> | downy hawthorn | 4 | ns | ns | ns | 4 | prL+? | xpr | xpr | 2015 | |

Appendix 3: Fauna List for Carruthers Watershed, showing all records from the period 2006 to 2016.

| Common Name | Scientific Name | Code | 2006 to 2016 | LO | PTn | PTt | AS | PIS | StD | HD | + | TS | L-Rank |
|---|-----------------|------|--------------|----|-----|-----|----|-----|-----|----|---|----|--------|
| Survey Species: species for which the TRCA protocol effectively surveys. | | | | | | | | | | | | | |

Birds

| | | | | | | | | | | | | | |
|------------------------------|----------------------------------|------|----|---|---|---|---|---|---|---|---|----|----|
| black and white warbler | <i>Mniotilta varia</i> | BAWW | 2 | 2 | 3 | 3 | 4 | 2 | 5 | 2 | 1 | 22 | L2 |
| bobolink | <i>Dolichonyx oryzivorus</i> | BOBO | 38 | 1 | 4 | 4 | 3 | 1 | 5 | 1 | 1 | 20 | L2 |
| grasshopper sparrow | <i>Ammodramus savannarum</i> | GRSP | 1 | 3 | 4 | 3 | 2 | 2 | 3 | 3 | 0 | 20 | L2 |
| ovenbird | <i>Seiurus aurocapillus</i> | OVEN | 13 | 1 | 1 | 3 | 4 | 2 | 5 | 4 | 1 | 21 | L2 |
| ruffed grouse | <i>Bonasa umbellus</i> | RUGR | 5 | 1 | 2 | 3 | 3 | 3 | 5 | 2 | 1 | 20 | L2 |
| alder flycatcher | <i>Empidonax alnorum</i> | ALFL | 14 | 1 | 4 | 2 | 1 | 1 | 4 | 2 | 0 | 15 | L3 |
| American redstart | <i>Setophaga ruticilla</i> | AMRE | 70 | 0 | 3 | 2 | 3 | 1 | 4 | 2 | 0 | 15 | L3 |
| American woodcock | <i>Scolopax minor</i> | AMWO | 8 | 0 | 2 | 2 | 3 | 2 | 4 | 2 | 0 | 15 | L3 |
| bank swallow | <i>Riparia riparia</i> | BANS | 2 | 1 | 5 | 2 | 1 | 1 | 3 | 3 | 0 | 16 | L3 |
| black-billed cuckoo | <i>Coccyzus erythrophthalmus</i> | BBCU | 4 | 1 | 2 | 3 | 3 | 1 | 3 | 3 | 0 | 16 | L3 |
| black-throated green warbler | <i>Setophaga virens</i> | BTNW | 3 | 1 | 4 | 2 | 3 | 1 | 4 | 3 | 0 | 18 | L3 |
| blue-winged warbler | <i>Vermivora pinus</i> | BWWA | 1 | 3 | 2 | 2 | 3 | 1 | 5 | 2 | 1 | 19 | L3 |
| brown creeper | <i>Certhia americana</i> | BRCR | 3 | 1 | 2 | 2 | 3 | 2 | 4 | 2 | 0 | 16 | L3 |
| brown thrasher | <i>Toxostoma rufum</i> | BRTH | 28 | 0 | 4 | 3 | 2 | 2 | 4 | 1 | 0 | 16 | L3 |
| chestnut-sided warbler | <i>Setophaga pensylvanica</i> | CSWA | 1 | 2 | 4 | 2 | 3 | 1 | 4 | 1 | 0 | 17 | L3 |
| clay-coloured sparrow | <i>Spizella pallida</i> | CCSP | 17 | 2 | 4 | 2 | 2 | 1 | 4 | 1 | 0 | 16 | L3 |
| eastern meadowlark | <i>Sturnella magna</i> | EAME | 2 | 0 | 2 | 3 | 3 | 1 | 5 | 1 | 1 | 16 | L3 |
| eastern towhee | <i>Pipilo erythrophthalmus</i> | EATO | 2 | 2 | 4 | 2 | 2 | 2 | 4 | 1 | 0 | 17 | L3 |
| great blue heron | <i>Ardea herodias</i> | GBHE | 1 | 3 | 2 | 2 | 3 | 1 | 4 | 2 | 0 | 17 | L3 |
| hooded merganser | <i>Lophodytes cucullatus</i> | HOME | 1 | 2 | 2 | 1 | 4 | 2 | 4 | 2 | 0 | 17 | L3 |
| horned lark | <i>Eremophila alpestris</i> | HOLA | 7 | 1 | 4 | 2 | 2 | 1 | 3 | 2 | 0 | 15 | L3 |
| least flycatcher | <i>Empidonax minimus</i> | LEFL | 5 | 1 | 4 | 3 | 2 | 1 | 3 | 1 | 0 | 15 | L3 |
| marsh wren | <i>Cistothorus palustris</i> | MAWR | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 0 | 19 | L3 |
| mourning warbler | <i>Geothlypis philadelphia</i> | MOWA | 18 | 1 | 4 | 3 | 2 | 2 | 4 | 2 | 0 | 18 | L3 |
| northern harrier | <i>Circus cyaneus</i> | NOHA | 2 | 3 | 2 | 2 | 4 | 1 | 3 | 3 | 0 | 18 | L3 |
| northern shoveler | <i>Anas clypeata</i> | NSHO | 1 | 5 | 1 | 2 | 3 | 2 | 3 | 2 | 0 | 18 | L3 |
| northern waterthrush | <i>Parquesia noveboracensis</i> | NOWA | 1 | 1 | 1 | 2 | 3 | 1 | 5 | 4 | 1 | 18 | L3 |
| osprey | <i>Pandion haliaetus</i> | OSPR | 1 | 3 | 2 | 2 | 3 | 1 | 5 | 2 | 1 | 19 | L3 |
| pileated woodpecker | <i>Dryocopus pileatus</i> | PIWO | 3 | 0 | 2 | 2 | 4 | 1 | 3 | 3 | 0 | 15 | L3 |
| scarlet tanager | <i>Piranga olivacea</i> | SCTA | 1 | 0 | 2 | 2 | 4 | 1 | 4 | 3 | 0 | 16 | L3 |
| sharp-shinned hawk | <i>Accipiter striatus</i> | SSHA | 1 | 2 | 2 | 3 | 4 | 1 | 3 | 3 | 0 | 18 | L3 |
| veery | <i>Catharus fuscescens</i> | VEER | 11 | 2 | 3 | 2 | 3 | 1 | 5 | 2 | 1 | 19 | L3 |
| vesper sparrow | <i>Pooecetes gramineus</i> | VESP | 23 | 2 | 3 | 2 | 2 | 2 | 5 | 1 | 1 | 18 | L3 |
| Virginia rail | <i>Rallus limicola</i> | VIRA | 2 | 1 | 2 | 2 | 2 | 3 | 4 | 3 | 0 | 17 | L3 |

Appendix 3: Fauna List for Carruthers Watershed, showing all records from the period 2006 to 2016.

| Common Name | Scientific Name | Code | 2006 to 2016 | LO | PTn | PTt | AS | PIS | StD | HD | + | TS | L-Rank |
|-------------------------------|-----------------------------------|------|--------------|----|-----|-----|----|-----|-----|----|---|----|--------|
| wild turkey | <i>Meleagris gallopavo</i> | WITU | 8 | 0 | 1 | 0 | 4 | 3 | 3 | 4 | 0 | 15 | L3 |
| winter wren | <i>Troglodytes troglodytes</i> | WIWR | 4 | 1 | 1 | 2 | 3 | 2 | 5 | 3 | 1 | 18 | L3 |
| wood thrush | <i>Hylocichla mustelina</i> | WOTH | 31 | 0 | 4 | 2 | 3 | 2 | 4 | 2 | 0 | 17 | L3 |
| yellow-billed cuckoo | <i>Coccyzus americanus</i> | YBCU | 3 | 1 | 4 | 2 | 3 | 1 | 3 | 3 | 0 | 17 | L3 |
| American kestrel | <i>Falco sparverius</i> | AMKE | 1 | 1 | 2 | 2 | 2 | 1 | 0 | 2 | 0 | 10 | L4 |
| barn swallow | <i>Hirundo rustica</i> | BARS | 17 | 0 | 4 | 2 | 1 | 1 | 1 | 2 | 0 | 11 | L4 |
| belted kingfisher | <i>Ceryle alcyon</i> | BEKI | 8 | 0 | 3 | 2 | 2 | 1 | 2 | 2 | 0 | 12 | L4 |
| blue-grey gnatcatcher | <i>Polioptila caerulea</i> | BGGN | 23 | 0 | 1 | 1 | 3 | 1 | 3 | 1 | 0 | 10 | L4 |
| common raven | <i>Corvus corax</i> | CORA | 2 | 2 | 1 | 1 | 2 | 1 | 3 | 4 | 0 | 14 | L4 |
| common yellowthroat | <i>Geothlypis trichas</i> | COYE | 102 | 0 | 3 | 2 | 1 | 2 | 4 | 1 | 0 | 13 | L4 |
| Cooper's hawk | <i>Accipiter cooperii</i> | COHA | 5 | 0 | 2 | 2 | 4 | 1 | 2 | 3 | 0 | 14 | L4 |
| eastern bluebird | <i>Sialia sialis</i> | EABL | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 0 | 11 | L4 |
| eastern kingbird | <i>Tyrannus tyrannus</i> | EAKI | 57 | 0 | 4 | 2 | 2 | 1 | 3 | 1 | 0 | 13 | L4 |
| eastern wood-pewee | <i>Contopus virens</i> | EAWP | 45 | 0 | 4 | 2 | 2 | 1 | 3 | 1 | 0 | 13 | L4 |
| field sparrow | <i>Spizella pusilla</i> | FISP | 23 | 1 | 2 | 3 | 2 | 1 | 4 | 1 | 0 | 14 | L4 |
| gadwall | <i>Anas strepera</i> | GADW | 4 | 3 | 1 | 2 | 1 | 2 | 3 | 1 | 0 | 13 | L4 |
| great-crested flycatcher | <i>Myiarchus crinitus</i> | GCFL | 26 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| great-horned owl | <i>Bubo virginianus</i> | GHOW | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 1 | 0 | 11 | L4 |
| green heron | <i>Butorides virescens</i> | GRHE | 7 | 0 | 3 | 2 | 2 | 1 | 4 | 2 | 0 | 14 | L4 |
| grey catbird | <i>Dumetella carolinensis</i> | GRCA | 160 | 0 | 3 | 2 | 1 | 1 | 3 | 1 | 0 | 11 | L4 |
| hairy woodpecker | <i>Picoides villosus</i> | HAWO | 18 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| indigo bunting | <i>Passerina cyanea</i> | INBU | 50 | 0 | 3 | 2 | 1 | 1 | 4 | 2 | 0 | 13 | L4 |
| northern flicker | <i>Colaptes auratus</i> | NOFL | 42 | 0 | 4 | 2 | 1 | 1 | 3 | 2 | 0 | 13 | L4 |
| northern rough-winged swallow | <i>Stelgidopteryx serripennis</i> | NRWS | 16 | 0 | 3 | 2 | 1 | 1 | 2 | 3 | 0 | 12 | L4 |
| pine warbler | <i>Setophaga pinus</i> | PIWA | 10 | 0 | 1 | 2 | 4 | 1 | 3 | 3 | 0 | 14 | L4 |
| purple finch | <i>Carpodacus purpureus</i> | PUFI | 1 | 2 | 4 | 2 | 1 | 1 | 1 | 0 | 0 | 11 | L4 |
| purple martin | <i>Progne subis</i> | PUMA | 1 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 0 | 13 | L4 |
| red-bellied woodpecker | <i>Melanerpes carolinus</i> | RBWO | 4 | 1 | 1 | 1 | 3 | 1 | 2 | 2 | 0 | 11 | L4 |
| red-breasted nuthatch | <i>Sitta canadensis</i> | RBNU | 9 | 0 | 1 | 2 | 3 | 1 | 2 | 1 | 0 | 10 | L4 |
| red-eyed vireo | <i>Vireo olivaceus</i> | REVI | 89 | 0 | 1 | 2 | 2 | 1 | 3 | 1 | 0 | 10 | L4 |
| rose-breasted grosbeak | <i>Pheucticus ludovicianus</i> | RBGR | 37 | 0 | 3 | 2 | 3 | 1 | 3 | 2 | 0 | 14 | L4 |
| ruby-throated hummingbird | <i>Archilochus colubris</i> | RTHU | 5 | 0 | 2 | 2 | 1 | 1 | 2 | 2 | 0 | 10 | L4 |
| savannah sparrow | <i>Passerculus sandwichensis</i> | SAVS | 83 | 0 | 4 | 2 | 1 | 1 | 4 | 1 | 0 | 13 | L4 |
| spotted sandpiper | <i>Actitis macularia</i> | SPSA | 22 | 0 | 3 | 2 | 1 | 2 | 4 | 1 | 0 | 13 | L4 |
| swamp sparrow | <i>Melospiza georgiana</i> | SWSP | 38 | 0 | 1 | 2 | 1 | 2 | 5 | 1 | 1 | 13 | L4 |
| tree swallow | <i>Tachycineta bicolor</i> | TRES | 17 | 0 | 4 | 2 | 1 | 1 | 2 | 2 | 0 | 12 | L4 |
| turkey vulture | <i>Cathartes aura</i> | TUVU | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 0 | 8 | L4 |

Appendix 3: Fauna List for Carruthers Watershed, showing all records from the period 2006 to 2016.

| Common Name | Scientific Name | Code | 2006 to 2016 | LO | PTn | PTt | AS | PIS | StD | HD | + | TS | L-Rank |
|-------------------------|---------------------------------|------|--------------|----|-----|-----|----|-----|-----|----|---|----|--------|
| white-breasted nuthatch | <i>Sitta carolinensis</i> | WBNU | 21 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| willow flycatcher | <i>Empidonax traillii</i> | WIFL | 53 | 0 | 4 | 2 | 1 | 1 | 3 | 1 | 0 | 12 | L4 |
| wood duck | <i>Aix sponsa</i> | WODU | 3 | 0 | 2 | 1 | 3 | 2 | 3 | 2 | 0 | 13 | L4 |
| American Crow | <i>Corvus brachyrhynchos</i> | AMCR | x | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 5 | L5 |
| American goldfinch | <i>Carduelis tristis</i> | AMGO | x | 0 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 8 | L5 |
| American robin | <i>Turdus migratorius</i> | AMRO | x | 0 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 6 | L5 |
| Baltimore oriole | <i>Icterus galbula</i> | BAOR | x | 0 | 4 | 2 | 1 | 1 | 1 | 0 | 0 | 9 | L5 |
| black-capped chickadee | <i>Parus atricapillus</i> | BCCH | x | 0 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 6 | L5 |
| blue jay | <i>Cyanocitta cristata</i> | BLJA | x | 0 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 8 | L5 |
| brown-headed cowbird | <i>Molothrus ater</i> | BHCO | x | 0 | 3 | 2 | 1 | 1 | 1 | 0 | 0 | 8 | L5 |
| Canada goose | <i>Branta canadensis</i> | CANG | x | 0 | 0 | 2 | 1 | 2 | 0 | 1 | 0 | 6 | L5 |
| cedar waxwing | <i>Bombycilla cedrorum</i> | CEDW | x | 0 | 1 | 2 | 1 | 1 | 1 | 0 | 0 | 6 | L5 |
| chipping sparrow | <i>Spizella passerina</i> | CHSP | x | 0 | 3 | 2 | 1 | 1 | 2 | 0 | 0 | 9 | L5 |
| cliff swallow | <i>Petrochelidon pyrrhonota</i> | CLSW | 8 c | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 0 | 9 | L5 |
| common grackle | <i>Quiscalus quiscula</i> | COGR | x | 0 | 4 | 2 | 1 | 1 | 1 | 0 | 0 | 9 | L5 |
| downy woodpecker | <i>Picoides pubescens</i> | DOWO | x | 0 | 1 | 2 | 1 | 1 | 1 | 1 | 0 | 7 | L5 |
| eastern phoebe | <i>Sayornis phoebe</i> | EAPH | 17 | 0 | 1 | 2 | 1 | 1 | 1 | 2 | 0 | 8 | L5 |
| house wren | <i>Troglodytes aedon</i> | HOWR | x | 0 | 1 | 2 | 1 | 2 | 1 | 1 | 0 | 8 | L5 |
| killdeer | <i>Charadrius vociferus</i> | KILL | 6 | 0 | 2 | 2 | 1 | 2 | 2 | 0 | 0 | 9 | L5 |
| mallard | <i>Anas platyrhynchos</i> | MALL | x | 0 | 1 | 2 | 1 | 2 | 1 | 0 | 0 | 7 | L5 |
| mourning dove | <i>Zenaidura macroura</i> | MODO | x | 0 | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 6 | L5 |
| northern cardinal | <i>Cardinalis cardinalis</i> | NOCA | x | 0 | 1 | 2 | 1 | 1 | 2 | 1 | 0 | 8 | L5 |
| orchard oriole | <i>Icterus spurius</i> | OROR | 13 | 0 | 3 | 1 | 1 | 1 | 1 | 0 | 0 | 7 | L5 |
| red-tailed hawk | <i>Buteo jamaicensis</i> | RTHA | x | 0 | 2 | 2 | 2 | 1 | 1 | 1 | 0 | 9 | L5 |
| red-winged blackbird | <i>Agelaius phoeniceus</i> | RWBL | x | 0 | 3 | 2 | 1 | 1 | 2 | 0 | 0 | 9 | L5 |
| song sparrow | <i>Melospiza melodia</i> | SOSP | x | 0 | 3 | 2 | 1 | 1 | 2 | 0 | 0 | 9 | L5 |
| warbling vireo | <i>Vireo gilvus</i> | WAVI | x | 0 | 1 | 2 | 1 | 1 | 2 | 1 | 0 | 8 | L5 |
| yellow warbler | <i>Setophaga petechia</i> | YWAR | x | 0 | 3 | 2 | 1 | 1 | 2 | 0 | 0 | 9 | L5 |
| European starling | <i>Sturnus vulgaris</i> | EUST | x | 0 | 4 | | | | | | | | L+ |
| house finch | <i>Carpodacus mexicanus</i> | HOFI | x | 1 | 1 | | | | | | | | L+ |
| house sparrow | <i>Passer domesticus</i> | HOSP | x | 1 | 4 | | | | | | | | L+ |
| rock dove | <i>Columba livia</i> | ROPI | x | 0 | 4 | | | | | | | | L+ |
| mute swan | <i>Cygnus olor</i> | MUSW | x | 3 | 2 | | | | | | | | L+ |
| ring-necked pheasant | <i>Phasianus colchicus</i> | RINP | x | 3 | 3 | | | | | | | | L+ |
| trumpeter swan | <i>Cygnus buccinator</i> | TRUS | x | 3 | 2 | | | | | | | | L+ |
| Herpetofauna | | | | | | | | | | | | | |
| grey treefrog | <i>Hyla versicolor</i> | TGTF | 12 | 1 | 3 | 2 | 3 | 4 | 5 | 2 | 1 | 21 | L2 |

Appendix 3: Fauna List for Carruthers Watershed, showing all records from the period 2006 to 2016.

| Common Name | Scientific Name | Code | 2006 to 2016 | LO | PTn | PTt | AS | PIS | StD | HD | + | TS | L-Rank |
|-----------------------|-------------------------------------|------|--------------|----|-----|-----|----|-----|-----|----|---|----|--------|
| spring peeper | <i>Pseudacris crucifer crucifer</i> | SPPE | 21 | 1 | 2 | 2 | 3 | 4 | 5 | 3 | 1 | 21 | L2 |
| wood frog | <i>Lithobates sylvatica</i> | WOFR | 22 | 0 | 2 | 2 | 3 | 4 | 5 | 3 | 1 | 20 | L2 |
| northern leopard frog | <i>Lithobates pipiens</i> | LEFR | 14 | 0 | 3 | 2 | 1 | 4 | 5 | 2 | 1 | 18 | L3 |
| American toad | <i>Anaxyrus americanus</i> | AMTO | 16 | 0 | 3 | 2 | 1 | 4 | 4 | 0 | 0 | 14 | L4 |
| green frog | <i>Lithobates clamitans</i> | GRFR | 49 | 0 | 2 | 2 | 1 | 3 | 4 | 1 | 0 | 13 | L4 |

Incidental Species: species that are reported on as incidental to the TRCA protocol.

Mammals

| | | | | | | | | | | | | | |
|----------------------|--------------------------------|------|----|---|---|---|---|---|---|---|---|----|----|
| ermine | <i>Mustela erminea</i> | ERMI | 1 | 4 | 2 | 2 | 3 | 3 | 3 | 1 | 0 | 18 | L3 |
| hairy-tailed mole | <i>Parascalops breweri</i> | HTMO | 1 | 3 | 2 | 2 | 1 | 4 | 4 | 1 | 0 | 17 | L3 |
| meadow jumping mouse | <i>Zapus hudsonius</i> | MJMO | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 0 | 17 | L3 |
| star-nosed mole | <i>Condylura cristata</i> | SNMO | 1 | 4 | 2 | 2 | 1 | 4 | 4 | 1 | 0 | 18 | L3 |
| beaver | <i>Castor canadensis</i> | BEAV | 2 | 0 | 2 | 2 | 2 | 3 | 3 | 1 | 0 | 13 | L4 |
| coyote | <i>Canis latrans</i> | COYO | 6 | 1 | 2 | 2 | 1 | 3 | 1 | 0 | 0 | 10 | L4 |
| eastern chipmunk | <i>Tamias striatus</i> | EACH | 17 | 0 | 2 | 2 | 2 | 3 | 3 | 1 | 0 | 13 | L4 |
| eastern cottontail | <i>Sylvilagus floridanus</i> | EACO | 10 | 0 | 2 | 2 | 1 | 3 | 2 | 1 | 0 | 11 | L4 |
| meadow vole | <i>Microtus pennsylvanicus</i> | MEVO | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 0 | 11 | L4 |
| muskrat | <i>Ondatra zibethicus</i> | MUSK | 5 | 0 | 2 | 2 | 1 | 3 | 3 | 1 | 0 | 12 | L4 |
| red fox | <i>Vulpes vulpes</i> | REFO | 1 | 2 | 2 | 3 | 1 | 3 | 1 | 0 | 0 | 12 | L4 |
| red squirrel | <i>Tamiasciurus hudsonicus</i> | RESQ | 11 | 0 | 2 | 2 | 1 | 3 | 2 | 1 | 0 | 11 | L4 |
| white-tailed deer | <i>Odocoileus virginianus</i> | WTDE | 8 | 0 | 2 | 1 | 3 | 2 | 1 | 2 | 0 | 11 | L4 |
| grey squirrel | <i>Sciurus carolinensis</i> | GRSQ | x | 0 | 2 | 2 | 1 | 3 | 0 | 0 | 0 | 8 | L5 |
| raccoon | <i>Procyon lotor</i> | RACC | x | 0 | 2 | 2 | 1 | 3 | 0 | 1 | 0 | 9 | L5 |
| striped skunk | <i>Mephitis mephitis</i> | STSK | 1 | 1 | 2 | 2 | 1 | 3 | 0 | 0 | 0 | 9 | L5 |
| woodchuck | <i>Marmota monax</i> | WOOD | 1 | 1 | 2 | 2 | 1 | 3 | 1 | 0 | 0 | 9 | L5 |
| domestic cat | <i>Felis catus</i> | DOCA | x | 0 | | | | | | | | | L+ |

Herpetofauna

| | | | | | | | | | | | | | |
|------------------------|-------------------------------------|------|---|---|---|---|---|---|---|---|---|----|----|
| common snapping turtle | <i>Chelydra serpentina serpenti</i> | SNTU | 3 | 0 | 3 | 2 | 1 | 5 | 5 | 2 | 2 | 20 | L2 |
| midland painted turtle | <i>Chrysemys picta marginata</i> | MPTU | 5 | 0 | 2 | 2 | 1 | 5 | 4 | 1 | 1 | 16 | L3 |
| eastern gartersnake | <i>Thamnophis sirtalis sirtalis</i> | EAGA | 5 | 0 | 2 | 2 | 1 | 3 | 3 | 0 | 0 | 11 | L4 |

LEGEND

LO = local occurrence
 PTn = Continental population trend
 PTt = TRCA population trend
 HD = habitat dependence
 AS = area sensitivity

PIS = Patch Isolation Sensitivity
 STD = sensitivity to development
 + = additional points
 TS = total score
 L-rank = TRCA Rank, October, 2008

note: "count" is the cumulative total of territories, omitting duplicates from areas that were visited more than once.

Appendix 4: Comparison of Fauna Data for the Habitat Block north of Bayly St., east of Salem Rd., between 2003 and 2015.

| Common Name | Scientific Name | Code | 2003 | 2015 | LO | PTn | PTt | AS | PIS | StD | HD | + | TS | L-Rank |
|---|------------------------------------|------|------|------|----|-----|-----|----|-----|-----|----|---|----|--------|
| Survey Species: species for which the TRCA protocol effectively surveys. | | | | | | | | | | | | | | |
| Birds | | | | | | | | | | | | | | |
| American redstart | <i>Setophaga ruticilla</i> | AMRE | 7 | 16 | 0 | 3 | 2 | 3 | 1 | 4 | 2 | 0 | 15 | L3 |
| American woodcock | <i>Scolopax minor</i> | AMWO | 2 | 2 | 0 | 2 | 2 | 3 | 2 | 4 | 2 | 0 | 15 | L3 |
| brown creeper | <i>Certhia americana</i> | BRCR | 0 | 1 | 1 | 2 | 2 | 3 | 2 | 4 | 2 | 0 | 16 | L3 |
| brown thrasher | <i>Toxostoma rufum</i> | BRTH | 1 | 1 | 0 | 4 | 3 | 2 | 2 | 4 | 1 | 0 | 16 | L3 |
| mourning warbler | <i>Geothlypis philadelphia</i> | MOWA | 1 | 0 | 1 | 4 | 3 | 2 | 2 | 4 | 2 | 0 | 18 | L3 |
| sora | <i>Porzana carolina</i> | SORA | 1 | 0 | 2 | 1 | 2 | 2 | 3 | 4 | 3 | 0 | 17 | L3 |
| Virginia rail | <i>Rallus limicola</i> | VIRA | 0 | 1 | 1 | 2 | 2 | 2 | 3 | 4 | 3 | 0 | 17 | L3 |
| wood thrush | <i>Hylocichla mustelina</i> | WOTH | 4 | 0 | 0 | 4 | 2 | 3 | 2 | 4 | 2 | 0 | 17 | L3 |
| belted kingfisher | <i>Ceryle alcyon</i> | BEKI | 0 | 1 | 0 | 3 | 2 | 2 | 1 | 2 | 2 | 0 | 12 | L4 |
| blue-grey gnatcatcher | <i>Poliophtila caerulea</i> | BGGN | 2 | 6 | 0 | 1 | 1 | 3 | 1 | 3 | 1 | 0 | 10 | L4 |
| common yellowthroat | <i>Geothlypis trichas</i> | COYE | 8 | 1 | 0 | 3 | 2 | 1 | 2 | 4 | 1 | 0 | 13 | L4 |
| eastern kingbird | <i>Tyrannus tyrannus</i> | EAKI | 0 | 1 | 0 | 4 | 2 | 2 | 1 | 3 | 1 | 0 | 13 | L4 |
| eastern wood-pewee | <i>Contopus virens</i> | EAWP | 2 | 3 | 0 | 4 | 2 | 2 | 1 | 3 | 1 | 0 | 13 | L4 |
| great-crested flycatcher | <i>Myiarchus crinitus</i> | GCFL | 2 | 0 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| green heron | <i>Butorides virescens</i> | GRHE | 1 | 1 | 0 | 3 | 2 | 2 | 1 | 4 | 2 | 0 | 14 | L4 |
| grey catbird | <i>Dumetella carolinensis</i> | GRCA | 12 | 19 | 0 | 3 | 2 | 1 | 1 | 3 | 1 | 0 | 11 | L4 |
| hairy woodpecker | <i>Picoides villosus</i> | HAWO | 2 | 1 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| indigo bunting | <i>Passerina cyanea</i> | INBU | 1 | 0 | 0 | 3 | 2 | 1 | 1 | 4 | 2 | 0 | 13 | L4 |
| northern flicker | <i>Colaptes auratus</i> | NOFL | 4 | 1 | 0 | 4 | 2 | 1 | 1 | 3 | 2 | 0 | 13 | L4 |
| northern rough-winged swallow | <i>Stelgidoptery x serripennis</i> | NRWS | 2 | 2 | 0 | 3 | 2 | 1 | 1 | 2 | 3 | 0 | 12 | L4 |
| red-eyed vireo | <i>Vireo olivaceus</i> | REVI | 4 | 4 | 0 | 1 | 2 | 2 | 1 | 3 | 1 | 0 | 10 | L4 |
| rose-breasted grosbeak | <i>Pheucticus ludovicianus</i> | RBGR | 5 | 3 | 0 | 3 | 2 | 3 | 1 | 3 | 2 | 0 | 14 | L4 |
| ruby-throated hummingbird | <i>Archilochus colubris</i> | RTHU | 1 | 1 | 0 | 2 | 2 | 1 | 1 | 2 | 2 | 0 | 10 | L4 |
| savannah sparrow | <i>Passerculus sandwichensis</i> | SAVS | 0 | 1 | 0 | 4 | 2 | 1 | 1 | 4 | 1 | 0 | 13 | L4 |
| spotted sandpiper | <i>Actitis macularia</i> | SPSA | 2 | 1 | 0 | 3 | 2 | 1 | 2 | 4 | 1 | 0 | 13 | L4 |
| swamp sparrow | <i>Melospiza georgiana</i> | SWSP | 7 | 10 | 0 | 1 | 2 | 1 | 2 | 5 | 1 | 1 | 13 | L4 |
| tree swallow | <i>Tachycineta bicolor</i> | TRES | 0 | 3 | 0 | 4 | 2 | 1 | 1 | 2 | 2 | 0 | 12 | L4 |
| white-breasted nuthatch | <i>Sitta carolinensis</i> | WBNU | 0 | 1 | 0 | 2 | 2 | 3 | 1 | 2 | 2 | 0 | 12 | L4 |
| willow flycatcher | <i>Empidonax traillii</i> | WIFL | 6 | 7 | 0 | 4 | 2 | 1 | 1 | 3 | 1 | 0 | 12 | L4 |
| Herpetofauna | | | | | | | | | | | | | | |
| wood frog | <i>Lithobates sylvatica</i> | WOFR | 3 | 2 | 0 | 2 | 2 | 3 | 4 | 5 | 3 | 1 | 20 | L2 |
| northern leopard frog | <i>Lithobates pipiens</i> | LEFR | 1 | 2 | 0 | 3 | 2 | 1 | 4 | 5 | 2 | 1 | 18 | L3 |
| American toad | <i>Anaxyrus americanus</i> | AMTO | 2 | 1 | 0 | 3 | 2 | 1 | 4 | 4 | 0 | 0 | 14 | L4 |

Appendix 4: Comparison of Fauna Data for the Habitat Block north of Bayly St., east of Salem Rd., between 2003 and 2015.

| | | | | | | | | | | | | | | | | | | | |
|------------------------------------|--|--|--|--|-----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|--|--|
| | | | | | | | | | | | | | | | | | | | |
| LEGEND | | | | | | | | | | | | | | | | | | | |
| LO = local occurrence | | | | | PIS = Patch Isolation Sensitivity | | | | | | | | | | | | | | |
| PTn = Continental population trend | | | | | STD = sensitivity to development | | | | | | | | | | | | | | |
| PTt = TRCA population trend | | | | | + = additional points | | | | | | | | | | | | | | |
| HD = habitat dependence | | | | | TS = total score | | | | | | | | | | | | | | |
| AS = area sensitivity | | | | | L-rank = TRCA Rank, 2014 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |