Altona Forest

Terrestrial Biological Inventory and Assessment (Updated)

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Toronto and Region Conservation
for The Living City®

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1.0 Introduction

In 2012-2013 the Toronto Region Conservation Authority (TRCA) conducted a biological inventory of Altona Forest. An earlier draft of this report released in 2013 did not include the recent flora and vegetation data. The biological inventories were undertaken primarily to better inform imminent restoration projects envisioned for the property and also to assess if there has been a change in the overall health of the forest.

The fauna survey conducted in 2012 was the first survey done by the TRCA at Altona Forest but the site has a history of breeding bird surveys and monitoring projects initiated by Murray Speirs in 1949 and repeated most recently by Brian Henshaw in 2000/2001 (Henshaw, 2001). Such a rich history provides an opportunity to assess the current status of the nesting birds in comparison to local populations over the past 70 years even though the survey methods have varied somewhat. TRCA botanical work was done in 2013, updating earlier records from 2001. Coupled with this data, are historical flora records (Michalski, 1990), incidental TRCA observations from 2007 as well as long-term fixed plot monitoring data, collected on-site during 2008-2012. Please refer to Table 2 for details of survey times.

As the history of surveys at Altona Forest indicates, this site has been known to be of ecological interest for quite some time. It was designated an Environmentally-Significant Area (ESA) in 1982 (MTRCA 1982). The Michalski (1990) report was in fact triggered by contested proposals for subdivision development. The result of this controversy was that much of the forest was protected, though parts of the eastern side toward Rosebank Avenue were lost to development. Urbanization occurred in the early-to-mid 1990s. At the most local scale, our recent surveys can tell us how well Altona Forest has fared over the 20 or so years since urbanization. In particular, there are concerns that parts of Altona Forest appear to be deteriorating perhaps through the lowering of the local water table; one of the purposes of the survey was to address this question.

Altona Forest is also of conservation interest because it is part of the Rouge-Duffins Wildlife Corridor, a band of almost-continuous natural cover extending between the Rouge Park and Duffins Creek south of the glacial Lake Iroquois shoreline. This corridor includes Townline Swamp and a number of smaller natural heritage features along with Altona Forest and was designated in the Pickering Official Plan of 2008 (Durham Region 2010, Altona Forest Stewardship Committee 2011).

At the larger scale, the purpose of the work conducted by the TRCA during the 2012 and 2013 field seasons was to *characterize the terrestrial natural heritage features* of the Altona Forest Study Area. Once characterized, the site features can then be understood within the larger Petticoat Creek watershed and regional contexts of the Terrestrial Natural Heritage Program, enabling a better understanding of biodiversity across the jurisdiction, thereby helping to improve the Terrestrial Natural Heritage System Strategy (TNHSS) targets. The question that the inventory addresses is "*How does the area surveyed at Altona Forest Study Area fit within the regional and*

watershed natural system, and how should its contribution to this system be protected and maximized?" The important underlying message offered by this question is that the health of the natural system is measured at the regional scale and specific sites must be considered together for their benefits at all scales, from the site to the larger system.

1.1 TRCA's Terrestrial Natural Heritage Program

Rapid urban expansion in the TRCA jurisdiction has led to continuous and incremental loss of natural cover and species. In a landscape that probably supported 95% forest cover prior to European settlement, current mapping shows that only 17% forest and wetland cover remains. Agricultural and natural lands are increasingly being urbanized while species continue to disappear from a landscape that is less able to support them. This represents a substantial loss of ecological integrity and ecosystem function that will be exacerbated in the future according to current urbanization trends. With the loss of natural cover, diminishing proportions of various natural vegetation communities and reduced populations of native species remain. Unforeseen stresses are then exerted on the remaining flora and fauna in the natural heritage system. They become even rarer and may eventually be lost. This trend lowers the ability of the land to support biodiversity and to maintain or enhance human society (e.g. through increased pollution and decreased space for recreation). **The important issue is the *cumulative* loss of natural cover in the TRCA region that has resulted from innumerable site-specific decisions.**

In the late 1990s the TRCA initiated the Terrestrial Natural Heritage Program to address the loss of terrestrial biodiversity within the jurisdiction's nine watersheds. This work 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 in the long term is the goal of the Terrestrial Natural Heritage Systems Strategy by setting targets – both short- and long-term (100 years) – for the two landscape indicators in order to provide direction in planning at all scales (TRCA 2007a, TRCA 2007b).

A target system that identifies a land base where natural cover should be restored is a key component of the Strategy. Although the objectives of the Strategy are based on making positive changes at all scales, the evaluation models were developed at the landscape scale using a combination of digital land cover mapping and field-collected data. Field-collected data also provides ground-level information in the application of the landscape models at the site scale. The two indicators and the targets that have been set for them 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 achieves the desired condition of sustainable biodiversity and social benefits across the watershed.

2.0 Study Area Description

The TRCA study area in 2012-2013 incorporated the entire Altona Forest block, from the hydro corridor in the north (just south of Finch Avenue), to Stroud's Lane in the south, and from Altona Road in the west to the housing estate on the east side of the forest (Maps 1 and 2). A small patch of forest to the south of Stroud's Lane and north of Sheppard Avenue (including two small parcels of TRCA property and the storm water pond at the southwest corner of Autumn Crescent) was added to the larger forest block to complete the study area.

The site is situated in the middle reaches of the Petticoat Creek watershed, within the Municipality of Pickering, Durham Region, and covers a total of about 65 ha. It lies entirely within the eastern most portion of the Carolinian floristic region, a region which is composed primarily of deciduous forest; however, Altona Forest also includes many more northern elements of flora and fauna. At the coarse physiographic level, the site is situated on the Iroquois Sand Plain physiographic zone. Surface geology of the site is mainly sandy silt to sand glacial (till) deposits; the small, separate southern portion also contains an element of gravel sand river deposits.

The main forest block constitutes the largest continuous patch of forest in the watershed and this portion was deemed to be an Environmentally Significant Area in 1982 (MTRCA 1982). The northern half of the main forest block is dominated by coniferous forest (largely white cedar, *Thuja occidentalis*). This portion adjoins the varied natural cover of the Rouge-Duffins Wildlife Corridor which runs from southwest to northeast, incorporating the hydro line which borders Altona Fores to the north. The southern half of the main Altona Forest block holds a more diverse mature mixed forest habitat and it is in this section that Dr. Murray Speirs located his breeding bird monitoring plot in the middle of the last century. The remaining portion of the site to the south of Stroud's Lane (about 13 ha in size) consists of the riparian corridors of the 2 converging narrow ravines associated with Petticoat Creek and a tributary. It is this latter tributary which has its source in the south-east corner of the main Altona Forest block, with Petticoat Creek itself skirting the western edge of the forest as it flows south parallel to Altona Road. The section south of Stroud's Lane consists of younger, more deciduous forest with an admixture of more open habitats.

3.0 Inventory Methodology

A biological inventory of the Altona Forest Study Area was conducted at the levels of habitat patch (landscape analysis), vegetation community, and species (flora and fauna) according to the TRCA methodologies for landscape evaluation (TRCA 2007c) and field data collection (TRCA 2007d). Habitat patch mapping was taken from the regional 2007/08 mapping of broadly-defined patch categories (forest, wetland, meadow and coastal) and digitized using ArcView GIS software.

A key component of the field data collection is the scoring and ranking of vegetation communities and flora and fauna species to generate local "L" ranks (L1 to L5); this process was undertaken in 1996-2000 and ranks are reviewed regularly (TRCA 2010). 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 are scored based on 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 as one of many criteria that make up the L-ranks, making it possible to recognize communities or species of regional concern before they have 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 declines.

3.1 Landscape Analysis

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

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 the 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. The TRCA maps habitat according to four broad categories: *forest, wetland, meadow*, and *coastal* (beach, dune, or bluff). At the regional level, the TRCA jurisdiction is made up of thousands of habitat patches. This mapping of habitat patches in broad categories is conducted through remote–sensing and is used in the evaluation of quality, distribution and quantity of natural cover. It should not be confused with the more detailed mapping of vegetation communities obtained through field surveys and that is used to ground-truth the evaluation (see Section 3.2).

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. This 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 these 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 in the very long term a broad range of biodiversity, specifically a quality that would support the region's fauna Species of Conservation Concern (Table 1).

Table 1: Habitat patch quality, rank and species response

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

In addition to the three criteria that 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 m from the edge of the forest patch, using 100 m increments. A recognized distance for deep interior conditions occurs at 400 m from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

Quantity

The amount of natural cover needed in the landscape is based on the quantity required 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 region that needs to be maintained as natural cover in order to achieve the desired quality has been identified as 30%.

3.2 Vegetation Communities, Flora and Fauna Species

Vegetation community and flora and fauna species data were collected through field surveys. These 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. Vegetation communities and flora species were surveyed concurrently.

Botanical field-work was initially conducted in the spring and early summer of 2001; and a more comprehensive study was conducted from spring to fall 2013 (Table 2) with additional data available from a brief site visit in 2007. The 2001 data fits within the 15-year threshold of usable data regarded as reasonably current for vegetation communities and flora. However, the vegetation community data from 2001 were collected schematically and so needed to be updated in detail. Botanical data also includes incidental records (2008 to 2012) obtained from a terrestrial

long-term fixed monitoring plot that was established at the site in 2008. Historical site data from an environmental study conducted by Michael Michalski Associates (1990) was also utilized for comparative purposes. It should be noted that botanical data for the area south of Stroud's Lane was collected only in 2013.

Vegetation community designations were based on the Ecological Land Classification (ELC) and determined to the level of vegetation type (Lee *et al*. 1998). Community boundaries were outlined onto printouts of 2007/08 digital ortho-rectified photographs (ortho-photos) to a scale of 1:2000 and then digitized in ArcView. Flora regional species of concern (species ranked L1 to L3) were mapped as point data with approximate number of individuals seen. A list of all other species observed was documented for the site.

The most complete fauna survey of the site was conducted by the TRCA in March, May, June and July of 2012. The spring surveys searched primarily for frog species of regional concern but recorded incidentally the presence of any early-spring nocturnal bird species (owls and American woodcocks). Surveys in May to July were concerned primarily with the mapping of breeding bird species of regional concern. As per the TRCA data collection protocol, breeding bird surveys were carried out by visiting all parts of the site at least twice during the breeding season (last week of 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 to be organized so that by late June only repeat visits are being conducted. It is imperative that any visit made in the first half of June is subsequently validated by a second visit later in the season. Fauna species of regional and urban concern (species ranked L1 to L4) were mapped as point data with each point representing a possible breeding territory.

In addition to the 2012 data, this inventory considers the incidental observations mapped during the annual terrestrial long-term fixed monitoring plot counts initiated in 2008, together with observations made while attending to the salamander cover board array located within the old Murray Speirs study plot. Note that the fauna data management protocol imposes a 10 year threshold on use of historical data, and therefore observations made prior to 2003 are not included in the current fauna inventory.

Table 2. Schedule of TRCA biological surveys at the Altona Forest Study Area

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2007/08: ortho-photos	21 hours
Vegetation Communities and Flora Species	2001: May 26th, June 25th, 26th; Aug 28th. 2007: Oct 2nd. 2013: May 1st, 30th; June 21st; July 30th; Aug 12th, 21st; Sep 9th, 11th, 23rd, 25th.	~80 hours
Terrestrial Long-term Fixed Monitoring Plot	2008-2012: spring and summer (various)	~20.5 hours
Frogs and Nocturnal Spring Birds	2012: March 19th	1.5 hours
Breeding Songbirds	2012: May 29th, June 11th, 28th and July 4th	11 hours

4.0 Results and Discussion

Information pertaining to the Altona Forest Study Area was collected through both remote-sensing and ground-truthing surveys. This information contains three levels of detail: habitat patch, vegetation community, and species (flora and fauna). This section provides the information collected and its analysis in the context of the TNHS Strategy.

4.1 Regional Context

Based on 2007/08 ortho-photography, 25% of the land area in the TRCA jurisdiction consists of natural cover but this figure includes meadow and old field. Although historically, the region would have consisted of up to 95% forest cover, currently (i.e. 2007/08) only about 17% is covered by forest and wetland. Of the non-natural cover (i.e. the remaining 75%), 48% is urban and 27% is rural / agricultural.

The regional level analysis of habitat patches shows that the present average patch quality across the TRCA jurisdiction is “fair” (L3); forest and wetland cover is contained largely in the northern half of the TRCA jurisdiction, especially on the Oak Ridges Moraine; and the quantity is 16.7% of the surface area of the jurisdiction (Map 3). In addition, meadow cover stands at 8.1% of the region. Thus the existing natural system stands below the quantity target that has been set for the region (30%) and also has an unbalanced distribution. The distribution of fauna species of concern is also largely restricted to the northern part of the jurisdiction; fauna species of regional concern are generally absent from the urban matrix (Map 4). 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.

The Altona Forest Study Area provides an important node of habitat at the junction of the riparian corridor of the lower Petticoat Creek and the Rouge-Duffins Wildlife Corridor (here associated with the main hydro corridor connecting the Rouge and Duffins watersheds) (Altona Forest Stewardship Committee 2011). This natural route between the middle reaches of Petticoat Creek watershed and the Lake Ontario shoreline is important for migrating and dispersing birds, providing an alternative to the Rouge and the Duffins corridors (1.5 km to the west and 4.5 km to the east respectively).

4.2 Habitat Patch Findings for the Altona Forest Study Area

The following details the site according to the two natural system indicators used in designing the Terrestrial Natural Heritage System Strategy: the *quality distribution* and *quantity* of natural cover. Analysis was based on 2007/08 ortho-photos.

4.2.1 Quantity of Natural Cover

The area of the Petticoat watershed is approximately 2682 ha containing 28.4% natural cover (2007/08), including 441.5 ha as forest (16.5%, including successional), 296.8 ha as meadow (11.1%) and 24.1 ha as wetland (0.9%). The Altona Forest Study Area is 65.7 ha in size. Vegetation surveys indicated that 65.1 ha of it is natural cover; this is a significant portion (8%) of the total natural cover in the Petticoat watershed. The study area is predominantly forest (51.9 ha or 79% of the total site) with 5.4 ha of successional, 6.0 ha of wetland, 1.2 ha of aquatic habitat, 0.5 ha of dynamic habitat, and just 0.1 ha of meadow and (Table 3; Appendix 1).

4.2.2. Quality Distribution of Natural Cover

The results for quality distribution are reported below under the headings of habitat patch size and shape, matrix influence and total score.

Habitat Patch Size and Shape

The study area is almost entirely forest, the bulk of which is located to the north of Stroud's Lane where it is bound in both the east and west by extensive residential developments. The area to the south of Stroud's Lane is a "u-shaped" patch of forest and semi-open habitat which is enclosed by further residential housing developments. Using Stroud's Lane as a dividing line, it can be seen that the area to the north scores "good" for patch size and "fair" for patch shape while the area of the south scores lower in both categories ("fair" for patch size and "poor" for patch shape) (Map 5).

Related to an optimal configuration of patch size and patch shape is the concept of forest interior, a reflection of the distance of any point in the forest to the closest edge. Forest interior is measured at 100 metre increments from the forest edge. At Altona Forest there are two large areas of forest interior in the northern section of the 2012 study area; the more southerly of these two areas is large enough to incorporate even a small patch of 200 m interior (Map 6), implying

that edge effects are even more reduced at this location, thereby providing opportunities for sensitive forest fauna and flora species.

Habitat Patch Matrix Influence

The TRCA measures matrix influence at the landscape level by assigning set values; positive, neutral and negative, to the type of landscape use occurring within 2 km of the subject site. It is important, however, to also 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.

Analysis based on the 2007/08 ortho-photos shows that the matrix influence score for habitat in the study area is "fair" (Maps 7 and 8). These scores are as expected given that the study is bordered by residential housing developments to the east, west and south. Urban pressure exerts a definite negative matrix influence on the site, primarily through the fragmentation of the natural area and the alteration of habitat quality.

Habitat Patch Total Score

The combination of "fair" matrix influence on the site, and the mix of "good-fair" habitat patch size with "fair-poor" patch shape, results in a total score that ranges from "fair"- "poor" depending on the section of site. The patch to the north of Stroud's Lane scored "fair" and is considered to be L3 habitat patch quality while the patch to south scored "poor", the equivalent of L4 habitat patch quality (Map 9). Landscape scores are intended to be applied at the broader landscape level and therefore caution needs to be exercised when referring to such measures at the more refined site level. In this particular case, it appears that the L3 landscape score for the larger northern section slightly exaggerates the opportunities available for L3 species; very few L3 bird species were reported from the 2012 inventory. Considerably more L3 flora points were mapped but this is typical in an urban setting where sensitive flora populations persist longer than sensitive fauna populations – plant populations do not have the opportunity to vacate a deteriorating habitat in the same way that many fauna species do (for the same reason, less mobile taxa such as herpetofauna lag behind highly mobile birds in the exodus of sensitive fauna that occurs as urbanization encroaches).

4.3 Vegetation Community Findings for the Altona Forest Study Area

4.3.1 Vegetation Community Representation

The information discussed in this section replaces the original 2001 study and includes additional ELC data for the area south of Stroud's Lane. The more detailed survey protocol as well as increased land coverage yielded 43 different vegetation communities (18 were noted in 2001); falling under various community types within the class of forest, successional, wetland, aquatic, dynamic and meadow (Table 3). Meadow and open dynamic communities are virtually absent. In

addition, 4 of the 18 community types are found solely as inclusions or complexes within a larger community.

Table 3. Summary of Vegetation Communities, Altona Forest Study Area

Class	Number of Types 2013	Area 2013 (ha)
Forest	22	51.9
Successional	6	5.4
Meadow	1	0.1
Wetland	11	6.0
Aquatic	4	1.2
Dynamic (beach,bluff, barren)	3	0.5
Total	*43*	*65.1*

The site has 51.9 ha of forest. The northern extension of the forest block is largely coniferous or mixed in nature, and includes white cedar *(Thuja occidentalis)*, eastern hemlock *(Tsuga canadensis)*, white pine *(Pinus strobus)*, sugar maple *(Acer saccharum* ssp. *saccharum)*, and red ash *(Fraxinus pennsylvanica)* as dominants in the canopy. Occurring in the central region of the site and extending northwards is Fresh-Moist White Cedar Coniferous Forest (FOC 4-1), Fresh- and Fresh-Moist Cedar – White Pine Coniferous Forest (FOC4-A). These communities occur on tableland on cool, moist exposures; together they cover 15.7 ha. Species richness and shrub and herb cover is naturally lower in these community types; this is consistent with polygon data which showed ground and lower layer covers to be less than 10%. Also occurring on tableland in the northeast part of the main forest block (as well as in small areas of the Petticoat Creek ravine) is 9.3 ha of Fresh-Moist Sugar Maple-Hemlock Mixed Forest (FOM6-1). The quality and complex micro-topography of this community was reflected by the number of species of concern that were documented within it. Overall, the dominance of coniferous and mixed forest types (37.4 ha in total) makes the Altona Forest site unusual for the TRCA jurisdiction.

Deciduous forest occupies 14.6 ha of Altona Forest. Over half of this is Fresh-Moist Sugar Maple – Ash Deciduous Forest (FOD6-1) and Fresh-Moist Ash Deciduous Forest (FOD7-2). These occur in patches throughout the study area, including much of the ravine land south of Stroud's Lane. Although the site's poorly to imperfectly-drained soils mainly support fresh-to-moist forest communities, a few drier upland communities do exist mainly in the southeastern part of the main forest block north of Stroud's Lane. The largest of these is a Dry-fresh Sugar Maple - Ironwood Deciduous forest (FOD5-4) in three patches covering 2.1 ha. Of interest is a small area of drier oak-dominated forest: Dry-Fresh Oak – Hardwood Deciduous Forest (FOD2-4) and Dry-Fresh Sugar Maple – Oak Deciduous Forest (FOD5-3) at the extreme south end of the site near the railway track.

Successional communities are represented by six vegetation types covering 5.4 ha. They occur mostly along the periphery of the main forest block as well as around storm water ponds in the

southern ravine section of the study area. There is only a tiny area of meadow, in the ravine south of Stroud's Lane.

Wetlands account for 6.0 ha of the natural cover at the Altona Forest Study Area. A blend of coniferous, deciduous and mixed treed swamp communities that collectively cover 4.8 ha, are distributed in low-lying areas across the main forest block. The main constituents of the treed wetlands are red ash, white cedar, balsam poplar *(Populus balsamifera),* white elm (*Ulmus americana*), and black ash *(Fraxinus nigra).* White Cedar-Hardwood Mineral Mixed Swamp (SWM1-1) and Red (Green) Ash Mineral Deciduous Swamp (SWD2-2) provide the greatest amount of cover and contribute 3.1 and 0.7 ha respectively. Also of interest is Red Ash – Hemlock Mineral Mixed Swamp (SWMA-A) and Swamp Maple Mineral Deciduous Swamp (SWD3-3).

Marshlands are found to a lesser degree, covering just 1.2 ha. The largest is a Rice Cut-grass Mineral Shallow Marsh (MAS2-8) associated with a partly-drained beaver pond on Petticoat Creek at the south end of the site near the railway track. Other small marshes occur in wet clearings and along the fringes of storm water ponds. There are three very small patches of invasive Common Reed Mineral Meadow or Shallow Marsh (MAM2-a and MAS2-a).

Disturbance to the vegetation communities mainly result from invasives and hydrological changes. Shifts in the hydrology resulting from the surrounding development can lead to increased evaporation and run-off rates which may lower the water table causing a decline in those communities sensitive to water balance (i.e. conifer forest and conifer swamp communities). TRCA biologists have expressed concern about drying-out of Altona Forest over the past 10-15 years. The results of the current detailed vegetation survey do show that areas of treed swamp and vernal pools still exist in the forest. Soil sampling revealed that most of the wetter areas still have a moisture regime of 5 or 6 supporting wetland or near-wetland conditions. However, these concerns are not entirely unfounded. There is a lengthy drainage ditch running down much of the eastern side of the main forest block, which has clearly lowered the water retention capacity in this part of Altona Forest. The ditch appears to have been constructed in the 1970s based on accounts from local concerned citizens, thus pre-dates development by about 20 years (Altona Forest Stewardship Committee 2011). In addition it is expected that the fairly-recent urbanization would increase evapotranspirative demands on the vegetation through urban heat island effects as well as increased edge effects.

The prevalence of invasive plant species at the site is high. Exotics have entered the site through pathways such as trails and as these non-native species establish, they have the potential to suppress the regeneration rates of native species thus altering the structure of the understorey and canopy over time. Aggressive exotics such as European buckthorn *(Rhamnus cathartica*) and dog-strangling vine (*Cynanchum rossicum*) dominate the woody and ground regeneration vegetation wherever there has been a canopy gap and near the forest edge.

4.3.2 Vegetation Communities of Concern

The vegetation communities that occur in the TRCA jurisdiction are scored and given a local rank from L1 to L5 based on the two criteria mentioned in Section 3.2. Vegetation communities with a rank of L1 to L3 are considered of concern across the entire jurisdiction while L4 communities are considered of concern in the urban portion of the jurisdiction. The Altona Forest Study Area lies within the urban landscape and so L4 communities are considered along with L1 to L3 communities. In addition, 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 conservation concern at a particular site because of its age, intact native ground layer, or other considerations aside from rank. For example, an old-growth sugar maple forest may belong to a relatively common and adaptable vegetation type but should still be considered of high conservation concern.

There are eight vegetation communities at the Altona Forest Study Area with a rank of L1 to L3. The highest-ranking community is the Red Ash – Hemlock Mineral Mixed Swamp (SWMA-A), which is ranked L2. The only other known representation of this community in TRCA is at Guild Inn, where it occurs as an inclusion under similar geographic conditions (silty tableland below the Iroquois shoreline with moderately poor drainage and vernal pools). The L3 ranked communities are Dry-Fresh White Pine Coniferous Forest (FOC1-2), Fresh-Moist Hemlock – White Pine Coniferous Forest (FOC3-A), Fresh-Moist Cedar – White Pine Coniferous Forest (FOC4-A), Fresh-Moist Poplar Mixed Forest (FOM8-1), Fresh-Moist Paper Birch Mixed Forest (FOM8-2), Reed Canary Grass Riparian Bar (BBO1-3), and Deciduous Treed Bluff (BLT1-B). There are also 21 vegetation communities ranked L4 (communities are listed with ranks in Appendix 1; location and boundaries shown on Map 10). Coniferous cover makes up a large portion of the communities of conservation concern. As a whole, the communities of conservation concern (L1 to L4) occupy 48.6 ha, over three quarters of the site. The ground layers in these forest communities consist of forb, sedge and fern species such as Canada May-flower *(Maianthemum canadense),* helleborine *(Epipactis helleborine)*, early-flowering sedge *(Carex pedunculata)* and wood ferns *(Dryopteris* spp*)*. Ground species common in the wetland communities include: touch-me-not *(Impatiens capensis)*, dwarf raspberry *(Rubus pubescens)*, and sensitive fern *(Onoclea sensibilis).*

Areas of prairie planting south of Stroud's Lane are classified as Fresh-Moist Tallgrass Prairie Planting (TPO2-A). Because this is a planted vegetation type it ranks as L5 although its intention is to create a high quality community.

4.4 Flora Findings for the Altona Forest Study Area

4.4.1 Flora Species Representation

Floristic surveys conducted by TRCA in 2001 and 2013 in addition to supplementary data from incidental records (2007 site visit) and long-term fixed monitoring plot data (2008 to 2012) identified a total of 441 species of vascular plants (Table 4; Appendix 2). The vast majority were naturally-occurring; planted species were restricted to a few peripheral areas, mostly restoration

sites in the narrow ravine section south of Stroud's Lane. Of the naturally-occurring species recorded, 279 are native (66%). Biodiversity at this site is high given the study area size, and reflects the presence of intact forest and swampland communities; each with their own unique suite of species.

Table 4. Summary of Flora Species, Altona Forest Study Area

Total # of species	441
Naturally-occurring species	421
Planted species	20
Native (naturally-occurring) species	279
Number of L1 - L3 species	46
Number of L4 species	104
Exotic species (established)	142

4.4.2 Flora Species of Concern

There are 150 vascular plant species of regional and urban conservation concern (rank L1 to L4) at the Altona Forest Study Area; of these, 45 are ranked L3 and 1 is ranked L2. Appendix 2 lists plant species by ranks and locations are shown on Map 11 (the map shows L1-L3 species because of the large number of records of these species in spite of the urban matrix). The ranks are based on sensitivity to human disturbance associated with development; and habitat dependence, as well as on 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.

Three of the L1 to L4 ranked species are regionally rare (found in six or fewer of the forty-four 10x10 km UTM grid squares that cover the TRCA jurisdiction. Pointed broom sedge *(Carex scoparia)*, is typically associated with wetland communities preferring acidic, medium to fine textured soils (e.g. silt and clay). It was observed only in 2001 but is likely still present. Only a few isolated records for this species exist across the jurisdiction. Another sedge, Wood's sedge (*Carex woodii*) is a species of rich deciduous forests and was found in an oak stand in the southern section. The third regionally-rare plant, prickly-ash (*Zanthoxylum americanum*) occurs in the northeastern part of the main forest block.

The majority of the flora species of concern (including every single L1-L3 species) at the Altona Forest Study Area are sensitive to development, being vulnerable to at least one kind of disturbance that is associated with land use changes (see Map 7 for sensitivity to development scores). Some of these are vulnerable to hydrological changes. Their presence is indicative of the cool, moist, shaded, and sometimes wetland conditions at Altona Forest. Ferns such as oak fern (*Gymnocarpium dryopteris*) and bulblet fern (*Cystopteris bulbifera*) require cool, moist, sheltered conditions, often with groundwater close to the surface. Some of the wetland species, notably northern manna grass (*Glyceria borealis*) and hop sedge (*Carex lupulina*) require the seasonal inundation found in vernal pools. Increasing warmth and dryness will cause these species to

decline. The same is true of hemlock, one of the chief species of the mixed and coniferous forest communities at the study area. As noted in section 4.3.1, there has been some concern about drying-out of the habitat at Altona Forest, largely due to urbanization.

Hydrological and nutrient disturbances can in turn also encourage invasive species that displace some of the smaller and more sensitive forest species. Dog-strangling vine is one exotic that is invading the site; being listed as a dominant in the meadow communities to the west. Its ability to spread rapidly through disturbed habitats along various pathways such as trails can have dire consequence for the less aggressive natives that currently exist at the site. Likewise, buckthorn is invading the understorey, especially along the edge and in the southern ravine. Invasive plants at this site affect the less-competitive species such as sharp-lobed hepatica (*Anemone acutiloba*), wild columbine (*Aquilegia canadensis*), and maple-leaved viburnum (*Viburnum acerifolium*).

Increased human traffic into a natural area results in disturbance caused by trampling and also facilitates incursion of invasive species that compete with the existing native flora. A network of formal trails runs through designated areas of the site. The public is generally discouraged from going “off-trail”, however the presence of informal trails, garbage and the establishment of make-shift structures (i.e. rope swings) within the more remote and sensitive regions of the site clearly indicate travel beyond the permissible routes. This is of concern as the forest here includes sensitive species such as the rose-twisted stalk *(Streptopus lanceolatus* var. *lanceolatus)*, blue bead lily *(Clintonia borealis*) (which although likely still present, have not been seen since 2001); oak fern, and Solomon’s seal (*Polygonatum pubescens*). All have delicate root systems that are not resilient enough to withstand soil compaction resulting from constant treading.

Some species may be deliberately removed if they are seen. The three species most susceptible to manual removal at the site are red trillium *(Trillium erectum)*, smaller yellow lady’s slipper *(Cypripedium parviflorum* var*. makasin)*, and showy lady slipper *(Cyperidium reginae).* People often pick them for inclusion in their gardens and/or homes due to their attractive and showy nature (Figure 1). Edible species are also at risk of being taken from the wild. The unfurled fronds of the native ostrich fern (*Matteucia struthiopteris*) are edible and the pressure from wild collection (if intense) can result in a localized population decline.

Figure 1. Showy lady's slipper

Habitat fragmentation can lead to increased populations of herbivores such as white-tailed deer (*Odocoileus virginianus*); deer have had significant impacts in parts of the TRCA jurisdiction such as Rouge Park (TRCA 2011, TRCA 2013). Evidence of deer browse is present at the Altona Forest Study Area, but levels are not yet severe.

In addition to being sensitive to land-use impacts, most (71) of the species of concern can be considered habitat specialists, scoring relatively high in *habitat dependence*. Habitat dependence scores are shown on Map 12. Roughly, they are found in seven or fewer vegetation cohorts (groupings of vegetation types with similar floristic characteristics) (TRCA 2010). They will not readily recover when these habitats are lost or altered. The Altona Forest Study Area has habitat specialists corresponding to forest, successional and wetland habitats.

Forest wild flower species are particularly well-represented, especially those of mixed and deciduous forests. Permeating the site are species indicative of high-quality forest such as sharp-lobed hepatica, broad-leaved spring beauty *(Claytonia caroliniana)* and large-flowered bellwort *(Uvularia grandiflora*). Flora species such as sky-blue aster *(Aster oolentangiense),* blue-eyed

grass *(Sisyrinchium montanum)* and foxglove beard tongue *(Penstemon digitalis)* occur in open and semi-open regions of the site.

Wetland herbaceous species at the Altona Forest Study Area included turtlehead *(Chelone glabra)*, smaller enchanter's nightshade *(Circaea alpina)* and slender gerardia *(Agalinus tenuifolia)*. The coniferous and mixed swamps to the south-west supported a variety of sedge species and included habitat specialists: hop sedge *(Carex lupulina)*, two-seeded sedge *(Carex disperma)*, and porcupine sedge *(Carex hystericina)*. Others such as pointed broom sedge *(Carex scoparia)* and barber-pole bulrush *(Scirpus microcarpa)* were seen in more open meadow or shallow marsh wetland habitat.

4.4.3 Species Losses and Declines

Altona Forest appears to have lost a significant portion of its original sensitive flora over the past 25 years. A total of 22 species appear to have been lost (Table 5). One of these, fringed gentian (*Gentianopsis crinita*) was seen as recently as 2007; however, a diligent search of suitable habitat near the north end of the forest in September 2013 failed to locate any, so its loss from the site is virtually certain (Figure 2). This may have been due to droughts affecting this isolated population (not readily accessible to recolonization) in the early summer of 2011 and 2012.

Figure 2. Fringed gentian, apparently now longer present at Altona Forest

The remainder were last recorded in the environmental study conducted in 1990 by Michael Michalski Associates. If one counts species of regional conservation concern (L1-L3) in particular, 19 species have apparently been lost out of a total of 65 (all L1-L3 plants observed from 1990 to present). This amounts to 29% of the flora species of regional concern being lost over a period of 25 years.

Table 5. Summary of Extirpated Flora Species

Scientific Name	Common Name	L-rank	Recorded
Lilium philadelphicum	wood lily	L1	1990
Coptis trifolia	goldthread	L2	1990
Gentianopsis crinita	fringed gentian	L2	2007
Thelypteris noveboracensis	New York fern	L2	1990
Adiantum pedatum	northern maidenhair fern	L3	1990
Alopecurus aequalis	short-awned foxtail	L3	1990
Aralia racemosa ssp. *racemosa*	spikenard	L3	1990
Carex brunnescens ssp. *brunnescens*	brownish sedge	L3	1990
Carex interior	fen star sedge	L3	1990
Carex pallescens	pale sedge	L3	1990
Carex trisperma	three-seeded sedge	L3	1990
Carex utriculata	beaked sedge	L3	1990
Epilobium leptophyllum	narrow-leaved willow-herb	L3	1990
Gentiana andrewsii	bottle gentian	L3	1990
Iris versicolor	blue flag	L3	1990
Juniperus communis var. *depressa*	common juniper	L3	1990
Liparis loeselii	Loesel's twayblade	L3	1990
Phegopteris connectilis	northern beech fern	L3	1990
Ribes triste	swamp red currant	L3	1990
Sphenopholis intermedia	slender wedge grass	L4	1990
Spiraea alba	wild spiraea	L4	1990
Viola blanda	sweet white violet	L4	1990

This loss of biodiversity over the course of two decades is alarming. Part of the losses appears to be directly related to the clearing and removal of one-third of the forest area at the time of development; although it is not known which plant populations were eliminated by direct removal of habitat. Plant rescues were put in place for those species in the immediate development zone (i.e. those populations of yellow lady's slipper – still present in the intact part of Altona Forest, that were in the development footprint). Other factors that may have resulted in the disappearance of these species include hydrological changes and reduced forest interior. A number of species also have not been seen since 2001. Although they were not observed in 2013, they are often difficult-to-see and can be missed due to not being in flower or fruit, or hiding in dense brush. It is

assumed that they are likely still present, though perhaps in reduced numbers. Examples include rose-twisted stalk, blue-bead lily (*Clintonia borealis*), two-seeded sedge (*Carex disperma*), and pointed broom sedge. A high proportion of the species thought to be extirpated or otherwise not seen in the past decade are associated with conifer swamp communities. This suggests alterations in drainage, increased wind exposure or faster evaporation rates leading to habitat unfavourable to species with specific hydrological requirements. The urban effects also need to be seen against a background of broader climate change. If conditions persist then further species loss along with broader changes to the canopy structure and possible function are likely to continue.

Documented apparent declines in floristic diversity have also occurred in other urban and near-urban nature reserves and parks both nearby, for example, at Rouge Park (TRCA 2011, TRCA 2013) and in other cities such as Boston (Primack *et al*. 2009). This broader phenomenon does seem to be associated with climate change (at both local and global scales) and land-use issues such as trails, fire suppression, and proliferation of invasive species

4.4.4 Invasive Species

Invasive species are a serious challenge to the integrity of Altona Forest. However, only a few species are major threats.

Dog-strangling vine is abundant at the site. It is most prevalent in the open meadow areas to the west where it is a dominant in both the ground and lower layers. It is also seen along the south-eastern trails closest to St. Elizabeth Seton Catholic School, in canopy gaps throughout the forest, and in much of the ravine land south of Stroud's Lane. The trail system running through the site is regularly frequented, and acts as a pathway for which this aggressive exotic vine can easily spread into the interior reaches of the study area. This species is particularly problematic in the TRCA jurisdiction and other parts of the Lower Great Lakes (TRCA 2008). Garlic mustard (*Alliaria petiolata*) is also locally abundant in the forest ground layer near trails and roads.

There are a number of abundant invasive shrubs present at Altona Forest. European buckthorn and to some extent multiflora rose *(Rosa multiflora)*, and shrub honeysuckle (*Lonicera* x *bella*) are common associates in the understorey in many of the disturbed communities. Some control of the buckthorn was observed through cutting and basal bark treatment during the 2013 survey (Figure 3). Attempts at removing buckthorn date back to at least 2003 (Altona Forest Stewardship Committee 2011) but the observed work seemed much more recent. These areas were in the northeastern part of the study area. Japanese honeysuckle (*Lonicera japonica*) and periwinkle (*Vinca minor*) are spreading from plantings near the forest edge. Autumn-olive (*Elaeagnus umbellata*) is another exotic shrub that is fairly abundant in the more open areas.

Figure 3. Area of mixed swamp cleared of buckthorn

There are three patches of common reed (*Phragmites australis* ssp. *australis*) associated with storm water ponds and roadsides, identified as ELC communities (see section 4.3.1). This huge invasive grass is taking over many wetlands, especially open wetlands, in the TRCA jurisdiction.

Emerald ash borer (EAB) *(Agrilus planipennis* Fairmaire) is starting to kill the ash trees at Altona Forest as well as everywhere else in the TRCA jurisdiction. Mortality rate is expected to eventually approach 100%. Since ash make up a very large proportion of the trees at Altona Forest, currently ash-dominated areas will become open to sunlight and warmth. These areas will almost certainly be taken over by fast-growing invasive species and one or two species of aggressive native vine such as riverbank grape (*Vitis riparia*), not by native regeneration of conifers. Without an intensive invasive control and understorey replanting program, the character of much of Altona Forest will be rapidly and permanently altered to become an impenetrable thicket of low-to-medium height invasive deciduous species.

The best approach to reducing the spread of invasive species at the Altona Forest Study Area is to control sources of disturbance. Local populations, such as the common reed, patches of periwinkle, or small satellite populations of dog-strangling vine in wind-throw gaps may be removable. Attempts to remove buckthorn, in part as a pro-active measure against EAB disturbance, have met with some success; however, buckthorn is present extensively and full control will be a daunting task. Dog-strangling vine will need to await biological control, notably a leaf-eating moth (*Hypena opulenta*) (Hazlehurst *et al*. 2012). This moth has recently been released on a trial basis in the Ottawa area.

4.4.5 Plantings

Plantings have occurred at various times along the edge of Altona Forest. Most of these are commonly-planted trees and shrubs such as white spruce (*Picea glauca*) and nannyberry (*Viburnum lentago*). A brief attempt to establish meadow and prairie species was undertaken at St. Elizabeth Ann Seton School in the late 1990s, but this has since ceased.

However, there are more extensive and successful prairie plantings in open areas south of Stroud's Lane, especially around a storm water pond near Calvington Drive. These include prairie grasses such as big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), and little bluestem (*Schizachyrium scoparium*). Autumn willow (*Salix serissima*), a rare species of fen habitats, was planted near the storm water pond as well. Given the presence of small patches of upland oak forest on sandy loam in the area, the planting of prairie species is a plausible restoration strategy here.

4.5 Fauna Species Findings for the Altona Forest Study Area

4.5.1 Fauna Species Representation

The TRCA fauna surveys at the Altona Forest Study Area in 2012 documented a total of 38 bird species, 8 mammals, and 7 herpetofauna species, bringing the total number of possible breeding vertebrate fauna species identified by the TRCA to 53. Four additional bird species can be added from incidental observations made during the LTMP: northern waterthrush (*Parkesia noveboracensis*, a single sighting in 2011), pileated woodpecker (*Dryocopus pileatus*, individuals observed in 2010 and 2011), yellow-billed cuckoo (*Coccyzus americana*, an individual singing in mid-June, 2008), and great horned owl, (*Bubo virginianus*, observed in 2010, but reported as present in several years by Rosemary Speirs). An audio data recorder installed at Altona Forest by Larry Noonan documented the area's first spring peeper (*Pseudacris crucifer*) in May of 2012 (L. Noonan pers comm.). These additional records bring the total for the past decade to 58 species.

This total is similar to those from several other areas in the same urban-rural interface zone. For example, the fauna list for the Too Good Pond study area (34 ha), surveyed in 2012, is 60 species; Milne Park (formerly Milne Conservation Area) (121 ha) has a list of 66 vertebrate fauna species; and the considerably larger but more urban Morningside Park (164 ha) lists a total of 64 breeding

vertebrate fauna. Refer to Appendix 3 for a list of the fauna species and their corresponding L-ranks.

4.5.2 Fauna Species of Concern

Fauna species, like vegetation communities and flora species are considered of regional conservation concern if they rank L1 to L3 based on their scores for the seven criteria mentioned in Section 3.2. Since the subject site is situated within the urban zone this report also considers those species ranked as L4, i.e. those species that are of concern in urban landscapes. As with flora, this is a proactive, preventive approach, identifying where conservation efforts need to be made before a species becomes rare.

Fauna surveys at Altona Forest in 2012 reported 17 bird species of regional and urban concern (L1 to L4), including two L3 bird species: pine warbler (*Setophaga pinus*) and wild turkey (*Meleagris gallopavo*). In addition, there were seven herpetofauna and six mammal species of regional and urban concern. A further three L3 ranked bird species and one L4 species can be added from the incidental observations over the past decade, and a single L2 herp species (spring peeper) is added from Larry Noonan's documentation in 2012. These additional records bring the total to 35 fauna species of regional and urban concern (Table 6). Locations of these breeding fauna are depicted on Map 13.

Table 6. Summary of Fauna Species of Regional and Urban Concern, Altona Forest

Fauna	Number of Species	Number of Species of Regional and Urban Concern (L1 to L4 rank)
birds	42	21
herps	8	8
mammals	8	6
TOTALS	58	35

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 (OMNR) (NHIC 2008). Using local occurrence as a measure of regional rarity, any species that is reported as a probable or confirmed breeder in fewer than 10 of the forty-four 10x10 km UTM grid squares in the TRCA jurisdiction is considered regionally rare (i.e. scores three to five points for this criterion) (TRCA, 2010). The fauna surveys at Altona Forest did not document any fauna species that are considered regionally rare. However, it is worth noting that the 2012 record of spring peeper constitutes one of very few records for this species from within the urban zone across the region.

Sensitivity to development is another criterion used to determine the L-rank of fauna species. A large number of impacts that 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

urbanization that directly affect the breeding habitat of the species in question. These changes alter the composition and structure of the vegetation communities; for example, the clearing and manicuring of the habitat (e.g. by removal of dead wood and clearance of shrub understorey). 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 that thrive alongside human developments (e.g. blue jays, *Cyanocitta cristata;* American crows, *Corvus brachyrhynchos;* squirrels, *Sciuridae*; raccoons, *Procyon lotor*; and house cats, *Felis catus*); parasitism (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 nest) and, sensitivity to pesticides.

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. At the study area many of the species that are ranked L1 to L4 receive this score (23 of the 35 species) and are therefore considered sensitive to one or more of the impacts associated with development (Map 8).

Three of the L1 to L4 ranked bird species (wild turkey; indigo bunting, *Passerina cyanea*; and common yellowthroat, *Geothlypis trichas*) habitually nest on or near to the ground and as such are highly susceptible to ground-borne disturbance, e.g. off-leash dog-walking. These three species were represented at Altona Forest by just one territory or sighting each. Five of the species of regional concern that have been locally extirpated were ground-nesting species (ruffed grouse, *Bonasa umbellus*; veery, *Catharus fuscescens*; black-and-white warbler, *Mniotilta varia*; ovenbird, *Seiurus auracapilla*; and northern waterthrush), and as recently as the mid-1990s were represented by multiple territories in Murray Speirs' study plot at the southern end of the main forest block.

Ground-nesting birds are highly susceptible both to increased predation from ground-foraging predators that are subsidized by local residences (house cats, raccoons) and to repeated flushing from the nest (by pedestrians, off-trail bikers and dogs) resulting in abandonment and failed breeding attempts. Currently there is a large network of trails (informal and formal) throughout the study area and therefore it is not surprising that sensitive ground-nesting species have almost completely disappeared from the forest. Even if these trails were considerably reduced, it is likely that the impacts of subsidized predators associated with the adjacent urban landscape would continue to exert negative influences on these species.

Many of the 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 biking on the site. Similarly, clearing of forest understory to accommodate trails will displace such sensitive species.

Various studies have shown that many bird species react negatively to human intrusion (i.e. 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 (a ground-nesting/foraging species) in intruded sites than in the control sites (Gutzwiller and Anderson 1999). Elsewhere, a recent study reported that dog-walking in natural habitats caused a 35% reduction in bird diversity and a 41% reduction in abundance, with even higher impacts on ground-nesting species (Banks and Bryant 2007).

All eight herpetofauna species are considered sensitive to development. The sensitivity of these species varies considerably, but again, the majority of them can be impacted by ground-borne disturbances at some stage of their life cycles. In addition, the aquatic species are very sensitive to water quality in their native wetlands: run-off from gardens and roads can carry various pollutants along with road-salt and oils into the breeding habitats.

Area sensitivity is a scoring criterion that 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 that require large tracts of habitat (>100 ha in total) score the maximum five points, while species that either show no minimum habitat requirement, or require <1 ha in total, score one point. Species scoring three points or more (require ≥5 ha 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 within the landscape surrounding the site where those species are found (Rosenburg *et al.* 1999).

Fifteen of the fauna species of regional and urban concern that were identified at Altona Forest are considered area sensitive, including three L3 species (wild turkey, pileated woodpecker and pine warbler) that require at least 20 ha of habitat. All of these area sensitive species are forest and forest-edge species and as such most are well-accommodated by the continuous patch of forest which constitutes the bulk of the study area (Map 5). Three of the frog species which occur at Altona Forest are scored as area-sensitive due to their requirement for a combination of two habitat types - wetlands for breeding and forest habitat for foraging and over-wintering - a requirement which is more likely to be satisfied across larger habitat blocks. A substantial proportion of the northern section is considered forest interior (Map 6) and in a healthy forest ecosystem such habitat are important for many forest bird species since the interior conditions satisfy very specific habitat preferences, e.g. moisture, temperature and light. Unfortunately, such species are no longer present at Altona Forest as breeding species.

Species' patch-size constraints are due to a variety of factors including foraging requirements and the need for isolation within a habitat block during nesting. In the latter case, regardless of the provision of a habitat patch of sufficient size, if that block is seriously and frequently disturbed by human intrusion, such species will be liable to abandon the site. Such a variety of habitat requirements are more likely satisfied within a larger extent of natural cover. The amount of forest cover at the study area could potentially accommodate multiple territories of area-sensitive species and this is certainly the case for species that spend their time in the forest canopy – pine warbler (4 pairs), red-breasted nuthatch (*Sitta canadensis*, 4 pairs) and red-eyed vireo (*Vireo olivaceus*, 11 pairs).

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 that roads have on fauna species that 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 road-kill). One example of how this criterion affects species populations is the need for adult birds to forage for food during the nestling and fledgling stage of the breeding season. By maintaining and improving the connectivity of natural cover within the landscape (e.g. by reforestation of intervening lands) we are able to positively influence the populations of such species, improving their foraging and dispersal potential.

Fourteen fauna species of regional and urban concern reported from the study area are considered sensitive to patch isolation: one bird, eight herps and five mammals. Two L5 ranked species (raccoon and grey squirrel, *Sciurus carolinensis*) also score high for this criterion, however, for these latter two species the high occurrence of road-kill within their populations is compensated by the sheer abundance of the species. For the other species, particularly the frog (e.g. wood frog, *Lithobates sylvatica*; and leopard frog, *Lithobates pipiens*) and snake species (common gartersnake, *Thamnophis sirtalis*), the incidence of road-kill is compounded by their sensitivities to other matrix influences. As such, road-kill has the potential to gradually diminish local populations of these species and, if the species are to persist at the site, measures need to be taken to enable safe passage for these fauna elements throughout the site and also between this site and other habitat patches in the local landscape. In other parts of the Toronto region it has become clear that road-kill applies to paved and un-paved trails frequented by bicycles.

Fauna species that score greater than three points under the ***habitat dependence*** criterion are considered habitat specialists (Map 14). These species exhibit a combination of very specific habitat requirements that range from the microhabitat (e.g. decaying logs, aquatic vegetation) and requirements for particular moisture conditions, vegetation structure or spatial landscape structures, to preferences for certain community series and macro-habitat types. Twelve fauna species that occur in the study area are considered habitat specialists, all but one being forest specialists. The exception is northern rough-winged swallow (*Stelgidopteryx serripennis*), a cavity nester with very specific nest-site requirements.

Richness is essentially the presence or absence of species at a site. Beyond mere presence of individual species is the idea that a natural system can be considered a healthy functioning system if there is an association of several species thriving within that system. Each habitat type supports particular species associations. As the quality of the habitat patch improves so will the representation of flora and fauna species within that habitat. In this way representation biodiversity is an excellent measure of the health of a natural system. The presence of several forest habitat dependent species suggests that the forest habitat in the study area is still functioning but at a

somewhat reduced level. This is to be expected given the urban landscape in which the site is embedded.

4.5.3 Fauna Species: Comparison with Previous Decades

The monitoring plot in the southern section of the main Altona Forest initiated by Murray Speirs in 1949 presents an excellent opportunity to compare the breeding birds inventoried in 2012 with those reported in the middle of the last century, and with those reported in the more recent rerun of Speirs' original survey. In 1949, Speirs plotted nesting birds in a small 5 ha plot at the centre of the widest expanse of forest at Altona (thereby coinciding with the area of forest with the largest area of interior forest conditions). He repeated the survey in 1950 and then re-established the plot with Doug Lockrey in 1994 (surveys undertaken in 1995 and 1997) (Speirs, unpublished data; and Lockrey, unpublished data). In 2000/01 Brian Henshaw reran the same plot but increased its extent to 9.9 ha. In the subsequent analysis, Henshaw "normalized" the older data by extrapolating the numbers from Speirs' surveys to the 9.9 ha of the newer plot. Over 10 years later, the TRCA's inventory protocol does not immediately lend itself to comparison with the older data set: the TRCA inventory was conducted throughout the entire forest block, and L5 species' territories were not mapped. However, comparison between the more significant L3 and L4 species can be made since all territories of members of this suite of species were mapped and a species list with territory totals for the study plot used in the 2000/01 survey can be produced.

In his analysis of the comparison between Speirs' data and the more recent 2000/01 data, Henshaw concluded that resident bird species were increasing whereas neotropical migrant species were declining. Considering only L3 and L4 bird species, this trend can be seen to be persisting with 2012's data set. Indeed, it appears that the prediction given in the 2001 report - "the two least-affected species were red-eyed vireo and great-crested flycatcher .... it is possible that these two species will be the only regularly breeding neotropical migrants in the Altona Forest Reserve in the near future" - has been borne out by the more recent data with one notable exception, the recruitment of pine warbler into the local breeding avifauna. This latter development is completely in keeping with what is happening with this species across much of its range; once considered an area sensitive species, pine warblers are now regularly nesting in urban ravines and parks where ample mature conifers are available.

As encouraging as the addition of pine warbler to the breeding bird list might be, the real story told by this comparison is the dramatic loss of almost every other neotropical migrant species. Table 7 presents the number of territories counted or estimated for the section of forest covered by Speirs' original study plot.

It has been noted in recent seasons that even after having been subjected to the negative matrix influence associated with urban development for so many years, a few of these species are still occasionally encountered during the breeding season within Altona Forest but sadly all of these sightings pertain to non-breeding individuals – black-and-white warbler observed at the north end of the forest in late June, 2011; ovenbirds observed at the north end of the forest in late June 2011 and within the study plot in late June 2012. One migrant species that may just be lingering within

the forest is northern waterthrush, reported as a singing male within the study plot in late May in 2009, 2011 and 2012. However, it is suspected that the forest is now too dry to support this species, which nests in close proximity to swamps and forest pools.

Table 7: Comparison of the Number of Territories held by a Selection of Breeding Forest-associated Birds in the Speirs' Forest Plot at Altona Forest.

Species	*Scientific name*	L-rank	1949	1950	1994	1995	1997	2000	2001	2012
Cooper's hawk	*Accipiter cooperii*	L4	0	0	0	0	0	0	0.9	0
ruffed grouse	*Bonasa umbellus*	L2	0.5	2.5	0	1.0	0.8	0	0	0
hairy woodpecker	*Picoides villosus*	L4	0	0	0.4	1.0	1.0	1.0	0	0
red-breasted nuthatch	*Sitta canadensis*	L4	0	0	1.0	0	1.0	0.8	0.9	1
white-breasted nuthatch	*Sitta carolinensis*	L4	0	0	0	1.0	0	1.5	1.0	1
eastern wood-pewee	*Contopus virens*	L4	2.5	2.5	1.6	0	1.0	0	1.0	0
great-crested flycatcher	*Myiarchus crinitus*	L4	1.7	2.5	4.4	2.9	1.5	1.5	0.6	1
veery	*Catharus fuscescens*	L3	4.2	7.4	0	1.0	0	0	0	0
wood thrush	*Hylocichla mustelina*	L3	0	0	2.2	1.9	0	0	0	0
red-eyed vireo	*Vireo olivaceus*	L4	2.7	0	0	2.5	2.8	5.5	5.8	3
pine warbler	*Setophaga pinus*	L3	0	0	0	0	0	0	0	1
black-and-white warbler	*Mniotilta varia*	L2	2.0	6.1	0	0	0	0	0	0
ovenbird	*Seiurus auracapilla*	L3	6.0	7.8	9.2	3.9	2.6	0	0	0
northern waterthrush	*Parkesia noveboracensis*	L3	4.0	4.0	4.0	8.8	3.9	2.0	2.0	?
scarlet tanager	*Piranga olivacea*	L3	0	0	1.0	0	0	0	0	0

5.0 Summary and Recommendations

The recommendations for the Altona Forest Study Area are given in relation to the regional targets for natural heritage in the TRCA jurisdiction. To reach the regional targets for quality distribution and quantity of natural cover, every site will require its own individualized plan of action. Following is a short summary of the study area within the regional context, followed by specific recommendations.

5.1 Site Summary

1. The site is located in the lower middle reaches of the Petticoat Creek watershed where it creates an important natural link between the riparian corridor associated with the creek and the broader east-west link of natural cover associated with the Rouge-Duffins Wildlife Corridor.

2. Forty-three vegetation types were observed, ranging from mature mixed and deciduous forest to aquatic. The site includes 22 forest, 6 successional, 11 wetland, 4 aquatic, 3 dynamic and 1 meadow vegetation community. This represents a high diversity of forest communities with minimal open land.

3. Altona Forest has an unusually high proportion of coniferous and mixed forest and swamp for a location in the TRCA jurisdiction – especially for a location south of the Oak Ridges Moraine, with these communities occupying more than half of the study area.

4. Several small wetlands (natural and created) are located throughout the site providing breeding opportunities for small but persistent populations of six frog species – such populations are significant in this urbanizing landscape. The 2012 record of small numbers of spring peeper at the site is especially encouraging since this is a species that has disappeared in recent years from the urban landscape of the City of Toronto.

5. Botanical diversity at this site is moderately high given the study area size, and reflects the presence of intact forest and swampland communities; each with their own unique suite of species.

6. Four hundred twenty-one flora species were observed including 46 plants ranked L1 to L3 considered flora species of regional concern, plus an additional 104 species of concern in urban areas (L4). Many of these species are associated with the forest and wetland vegetation communities.

7. There are three regionally-rare plant species: pointed brome sedge, Wood's sedge, and prickly-ash. Pointed broom sedge was seen in 2001 and typically lives in marshes, sedge meadows and wet prairie type habitats. Wood's sedge is a species of rich hardwood forests and has a southern distribution, while prickly-ash is found in the forest understorey in the northeast part of the study area.

8. A steep decline in species of conservation concern has been noted, especially around the time of development in the 1990s. Nineteen L1-L3 flora species observed in 1990 could not be found in 2013. Many of these are plants of cool moist forests and mixed and conifer swamps. A significant decline has also been noted in neotropical bird species - particularly in sensitive ground-nesting birds.

9. The forest habitat at the site includes two large areas of interior forest which in a more rural landscape would accommodate multiple territories of sensitive forest-dependent bird species.

10. The 58 species of vertebrate fauna observed is a total which is to be expected for a medium sized forest patch embedded at the edge of the urban landscape within the Toronto region.

11. Despite the decline in breeding bird populations the site is potentially extremely important for migrating songbirds moving to and from migrant staging areas on the Lake Ontario shoreline.

5.2 Site Recommendations

The recommendations primarily address objectives of protecting regional biodiversity in the TRCA jurisdiction. In order to maintain or enhance the current level of biodiversity at the Altona Forest Study Area, the overall integrity of the natural heritage system that includes the site must be protected. Therefore, at the landscape scale, in keeping with the TNHSS, habitat patch size and shape need to be optimized so as to provide large enough habitat patches with interior habitat to support sensitive flora and fauna sustainably. In addition, connectivity between natural habitats within and beyond the study area must be improved.

Furthermore, the recommendations identify the issues that may occur with the increased public use of the Study Area through the development of the current trail system. The trail plan needs to address this potential increase in negative matrix influence and ensure that effective mitigation is included as part of the plan. This includes strategic placement of any interpretive signage, managing public use, allowing healthy dynamic natural processes to proceed, and controlling invasive species.

The following recommendations address the above natural heritage concerns, with an emphasis upon bolstering the existing natural features on site. Thus, we recommend overall that 1) existing habitats and features be protected and enhanced; 2) that public use be managed; and 3) that invasive species be controlled.

1. Protect and Enhance Existing Features

The first priority should be to focus on ***maintaining conditions that allow existing communities or species of conservation concern to thrive***. This is especially true regarding keeping Altona Forest connected to the larger natural system, as well as maintaining the integrity of the small wetlands located at the extreme north and south ends of the main forest block, and the pond that has been dammed at the extreme southern end of the study area.

a. It is of critical importance that connectivity to and along the Rouge-Duffins Wildlife Corridor, along with the riparian corridor extending along Petticoat Creek, be maintained and restored. Land-use planning and restoration projects should keep this goal in mind.

b. To prevent any future loss it is important to ensure that any management of the site strives to maintain and enhance the native vegetation communities.

c. An immediate benefit to the forest's hydrology would result from the blocking of the drainage ditch running inside the eastern margin of the main forest patch. The ditch would not need to be completely filled in. Filling in small sections with dams to slow drainage would be sufficient, and the blocked sections of ditch could then function as vernal pools.

d. Furthermore, it is recommended that the small wetland on the eastern edge of the forest block (Lacy's Pond) be restored to a condition that will support local frog populations.

e. Currently, the main trail in the larger forest block forms a loop, with just one formal trail crossing the centre of the forest block. Efforts should be made to ensure that this is the maximum extent of trails, and any informal trails should be removed as soon as they appear.

f. A considerable portion of the northern trail loop is currently maintained as a raised board-walk. In an area where there are significant populations of amphibians moving across the habitat this is the ideal trail option. This being the case, it is recommended that management extend the boardwalk where needed. Such a trail serves to reduce impact on the forest floor and to curb the tendency for hikers and dog-walkers to leave the trail.

g. Much of the forest cover in the northern half of the main forest block is a near monoculture of cedar. It is likely that the biodiversity of the site would benefit from

gap creation, producing a more varied vegetation structure in areas of the site that currently have very limited nesting and foraging opportunities for breeding and migrating birds. On the other hand, gaps are likely to be quickly colonized by invasive species and the death of ash trees from EAB will create many new gaps anyway. Gaps should be managed to encourage regeneration of native species only.

h. It should be noted that there is no expectation that sensitive low-nesting species will return to breed in the area but by enhancing the canopy there may be added opportunities for canopy-nesting species.

i. Areas selected for restoration should have soil and moisture assessments conducted in order to help determine suitable lists of species for planting. If soil conditions are suitable consideration should be given to adding additional vernal pool features. The vernal pools would need to be hydrologically separate from the Petticoat Creek tributary.

j. Where necessary ensure effective and adequate passage (e.g. tunnels and culverts) for frogs, snakes and small mammals across or under trails. Such passages will be unnecessary in areas where raised boardwalks have been installed.

k. Connections for such fauna (and flora) movement at a larger scale should also be provided to and along the Rouge-Duffins Wildlife corridor.

l. Given the management requirement to remove hazard trees, especially ash killed by emerald ash borer (EAB) in the vicinity of trails, providing properly constructed and fully-monitored nest-boxes would enhance opportunities for species such as great-crested flycatcher, and increase the likelihood of recruitment of other cavity-nesters such as eastern screech-owl (*Megascops asio*).

2. Manage Public Use

Landscape metrics indicate that the existing matrix influence at this urban-edge site is largely negative. The impact of these urban influences is undoubtedly exacerbated by the disturbance that occurs along the network of trails. Visitor pressure is likely to increase and ***it is important to pre-empt any potential increase in user pressure by managing the trail network to minimize negative impacts on sensitive forest habitat and species***.

a. Any trail management needs to consider the locations of flora and fauna species of concern and to direct visitor pressure away from these areas. Likewise, restoration activities should target non-sensitive areas.

b. Dogs should be either excluded from the site or, at the very least; the leash-by-law should be properly enforced, bolstered by effective interpretive signs.

c. Positive local stewardship influences should be encouraged and direction given where needed, e.g. responsible gardening practices; litter control; reductions in use of road salt.

d. Develop educational signage outlining the importance staying on the designated trail system.

e. Given the site's urban location and proximity to a public school, there is considerable potential to use the forest and small wetlands as interpretive and educational opportunities in this growing urban community.

3. Control Invasive Species

Several invasive plant species are threats to the native biodiversity at the Altona Forest Study Area. ***It is essential that well-planned and realistic measures be undertaken to control invasive species***. Management for invasive species will need to be tailored to the individual species in question, depending on how wide-spread and established they are.

a. Since most of the invasive species at the Altona Forest Study Area have large and/or diffuse populations, the best approach is to control disturbance that would aid their further spread rather than eradication efforts. For example, trailside plantings of competitive native ground covers such as bloodroot (*Sanguinaria canadensis*) and discouraging yard-waste dumping (particularly from properties that are directly adjacent the natural areas). This would reduce the disturbance that encourages garlic mustard and dog-strangling vine from spreading.

b. Invasive species control should be undertaken as a proactive measure along the trail corridor prior to construction as well as to any other areas targeted for restoration planting. This would include local removal of shrub honeysuckles, buckthorn, multiflora rose, and other species that are widespread across the site as a whole.

c. The presence of EAB has implications on existing and future management practices within the study area. All native ash trees are susceptible to EAB attack. Three ash species are found at Altona forest. Red ash is the most prevalent of the three; it is listed as a dominant canopy and sub-canopy species in the vast majority of vegetation communities found at Altona Forest. Early detection of this pest is difficult and often confounded by other factors compromising ash health. As

infestation reaches severe levels, extensive crown die back will be observed followed by tree mortality. Crown dieback is already being observed in 2013. Maintaining the integrity of Altona Forest amid the onslaught of EAB will be an urgent and demanding task. To facilitate a rapid response, ash trees at Altona Forest should be monitored regularly. The location of ash trees within the study area has implications for trail management. As infected trees pose a safety risk, any new or proposed trails should be carefully screened to ensure that they do not occur in ash communities. In addition, any existing trails running through ash-dominant communities may need to be closed and/or redirected if such hazard trees are present.

Areas with ash should be targeted for urgent pro-active invasive species control as per the preceding recommendation. Once the ash start to die, there should be extensive re-planting with native trees and shrubs such as American elm, basswood (*Tilia americana*), balsam fir, cedar, prickly-ash, and elderberry (*Sambucus* spp).

d. A search should be made for still-healthy ash trees, and these should be injected with an anti-borer treatment as has been done in parts of the City of Toronto that can preserve at least a remnant of the ash population until a better control can be found for EAB.

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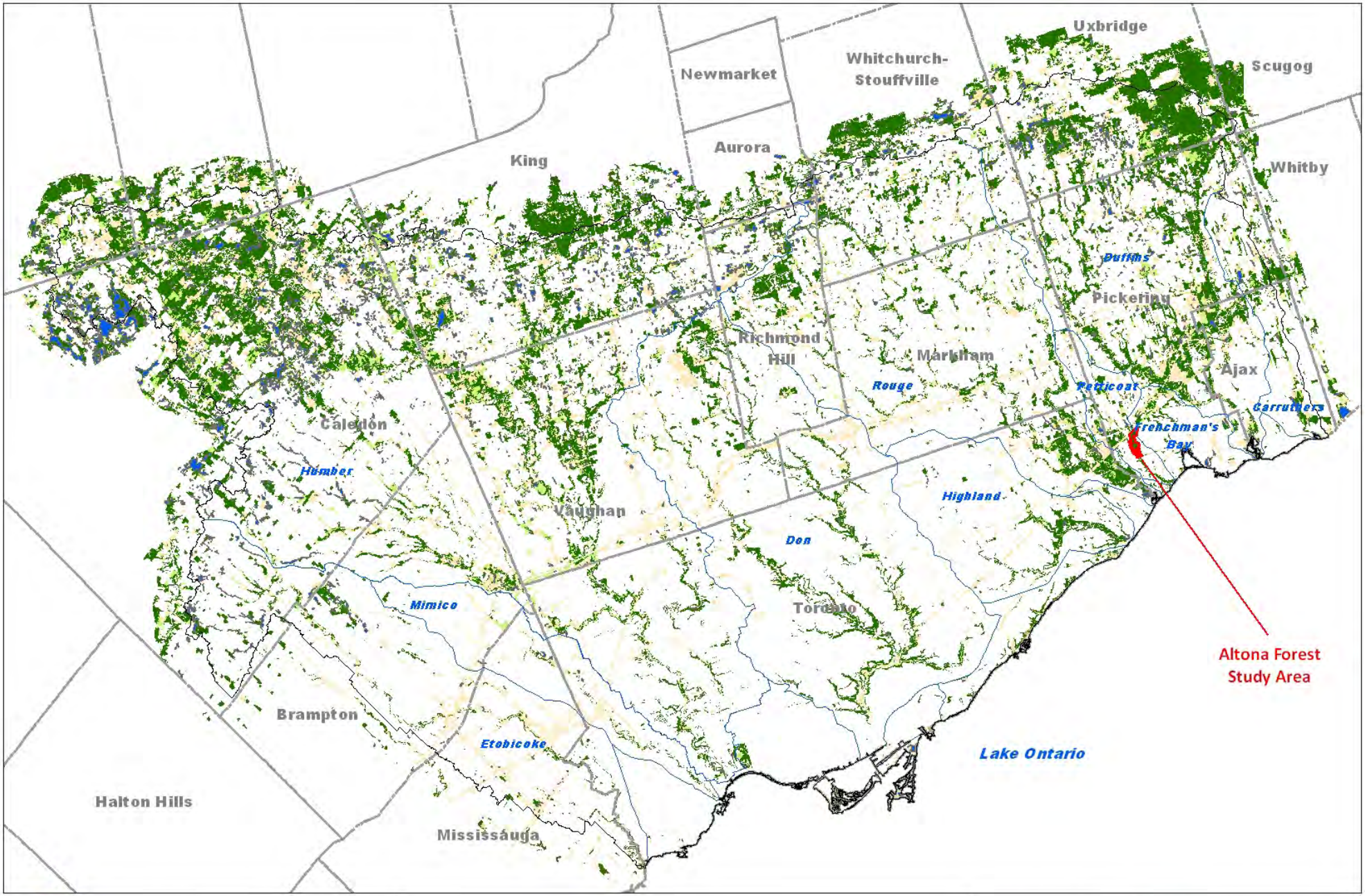


Toronto and Region Conservation
for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: January 2013

* Landscape analysis based on 2007/2008 Orthophotography

Map 1:
Altona Forest in the Context of Regional Natural Cover

Natural Cover *
- Forest
- Successional
- Meadow
- Wetland
- Beach/Bluff

Legend
- Altona Forest Study Area Boundary
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

Toronto and Region Conservation for The Living City

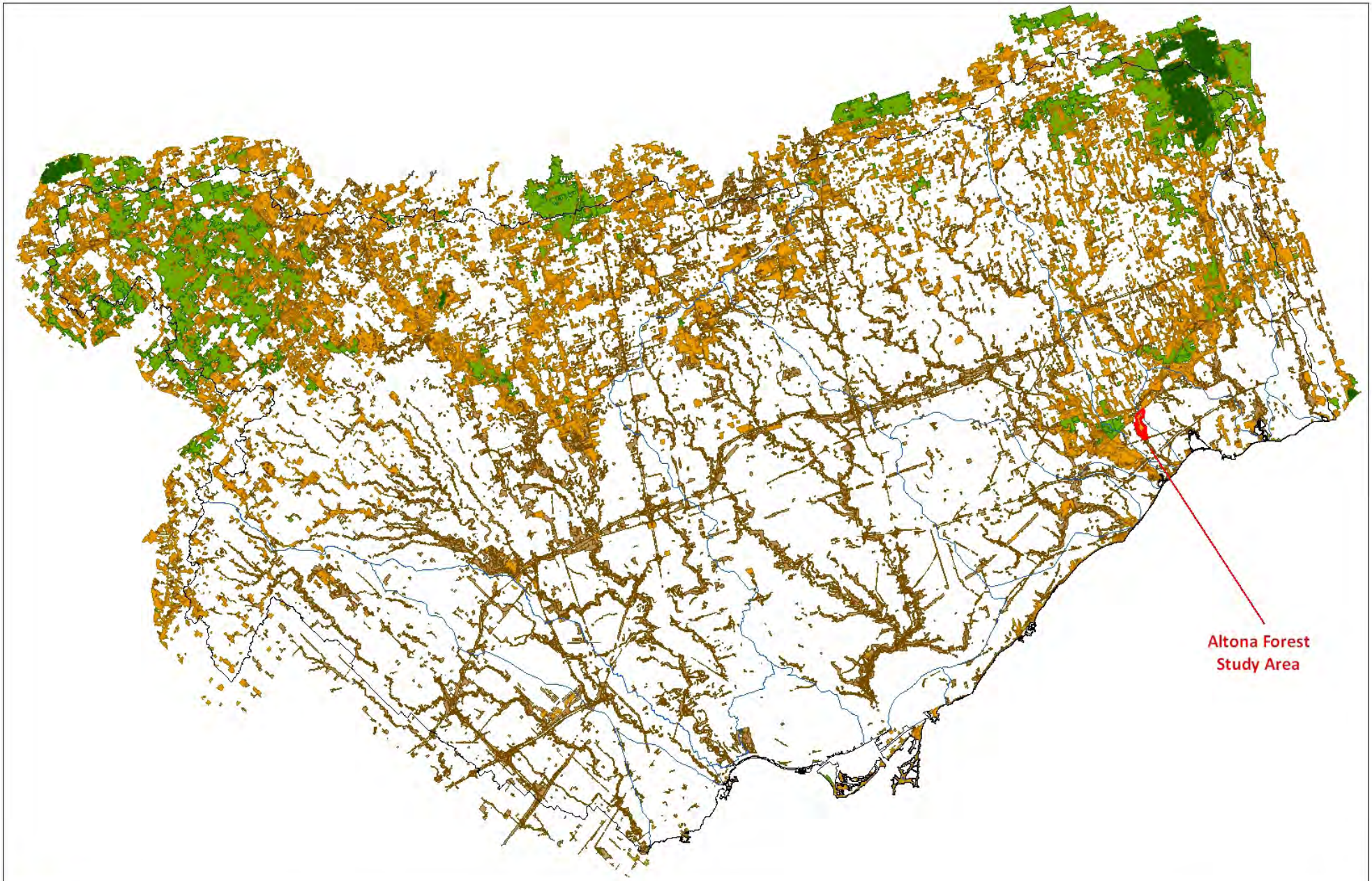
0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.

Map 2:
Altona Forest Study Area

Legend

Altona Forest Study Area Boundary



Toronto and Region Conservation
for The Living City

N

0 2.5 5 10 15 20
Kilometers

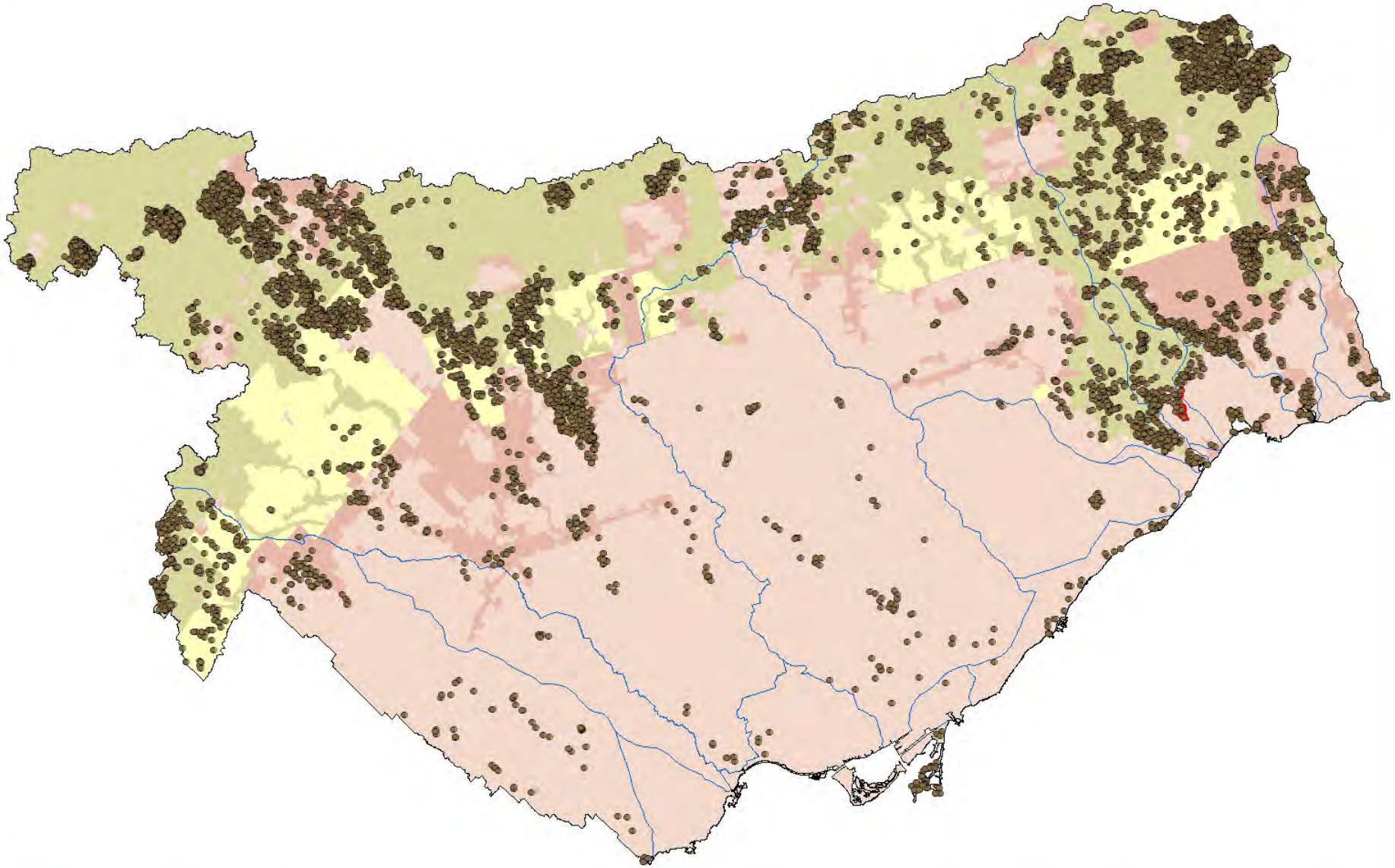
Date: January 2013
* Landscape analysis based on 20072008 Orthophotography

Map 3:
Regional Natural System
Habitat Patch Quality

Legend

Habitat Patch Quality *
- L1 - Excellent
- L2 - Good
- L3 - Fair
- L4 - Poor
- L5 - Very Poor

- Altona Forest Study Area Boundary
- TRCA Jurisdiction
- Watershed



Toronto and Region Conservation
for The Living City

0 2.5 5 10 15 20
Kilometers

Date: January 2013

Map 4:
Distribution of Fauna
Regional Species of Concern

Legend

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

Fauna Area Sensitivity Scores

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

- Fauna Species
- Frog Species

Habitat Patch Size Scores *

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

Toronto and Region Conservation for The Living City

N

0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.
* Landscape analysis based on 20072008 Orthophotography

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

Legend

Altona Forest Study Area Boundary

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

Toronto and Region Conservation for The Living City

0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

Map 6: Interior Forest at Altona Forest

Legend

- Altona Forest Study Area Boundary
- Forest

Forest Interior

- 100m-200m
- 200m-300m
- 300m-400m
- 400m-500m
- 500m-600m
- 600m-700m

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

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

○ Flora Species

Toronto and Region Conservation *for The Living City*

N

0 50 100 200 300 400 Meters

Date: January, 2014

Orthophoto: Spring 2012, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

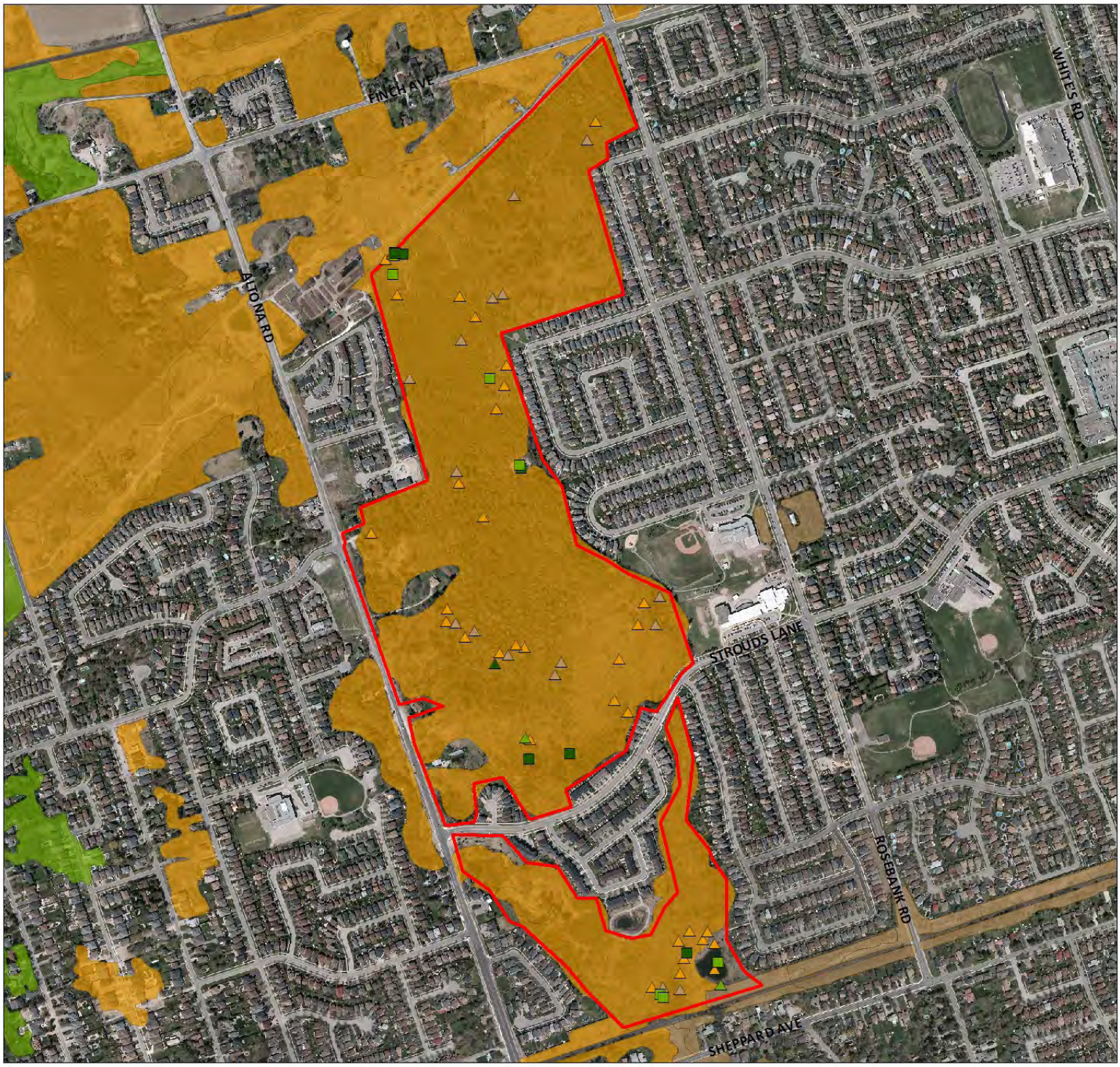
Map 7: Scores for Matrix Influence and Flora Sensitivity to Development

Legend

Habitat Matrix Influence Scores *

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

Altona Forest Study Area Boundary



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

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

△ Fauna Species

□ Frog Species

Toronto and Region Conservation for The Living City

N

0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.
* Landscape analysis based on 2007-2008 Orthophotography

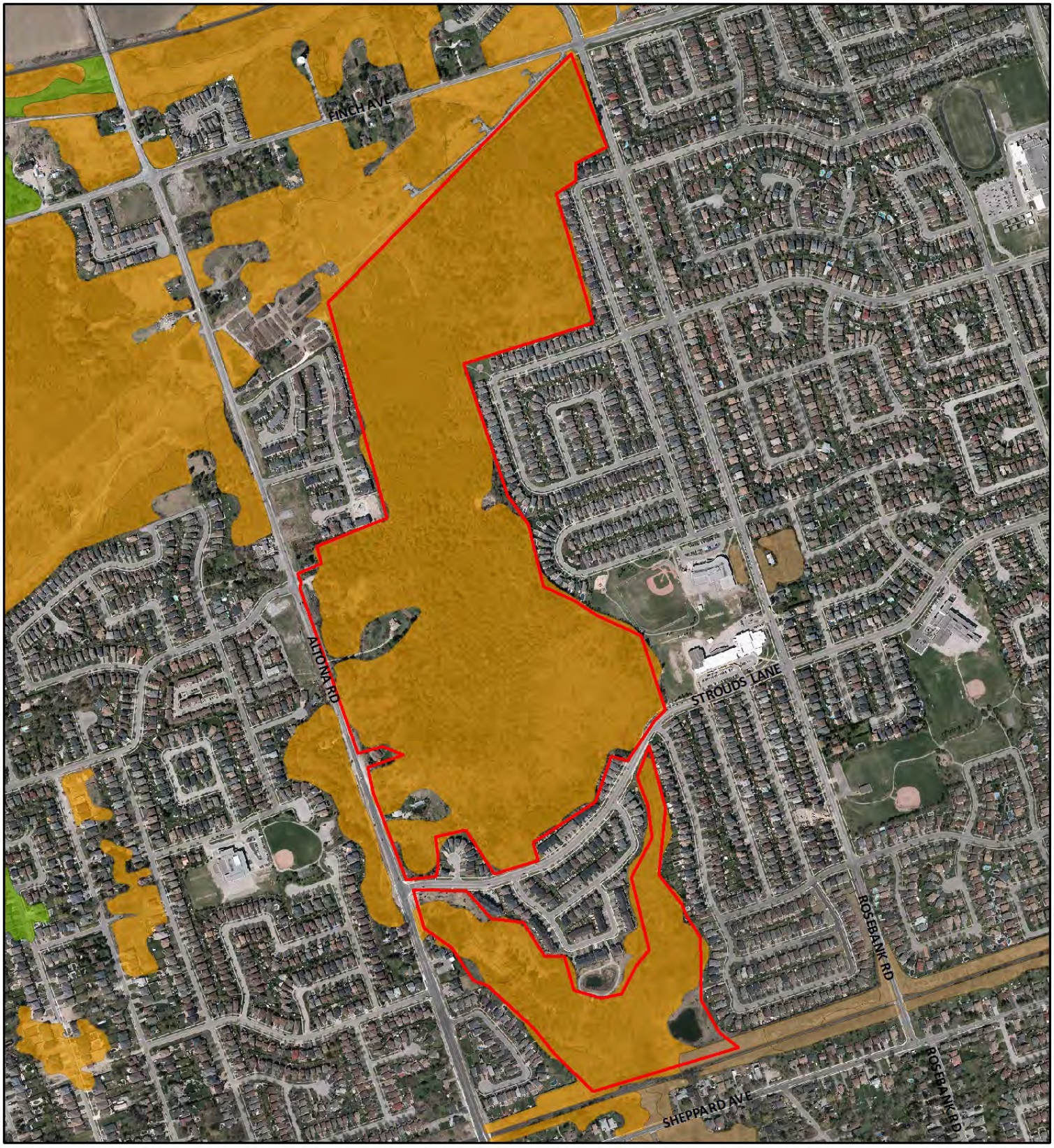
Map 8: Scores for Matrix Influence and Fauna Sensitivity to Development

Legend

Habitat Matrix Influence Scores *

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

Altona Forest Study Area Boundary



Toronto and Region Conservation for The Living City

N

0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

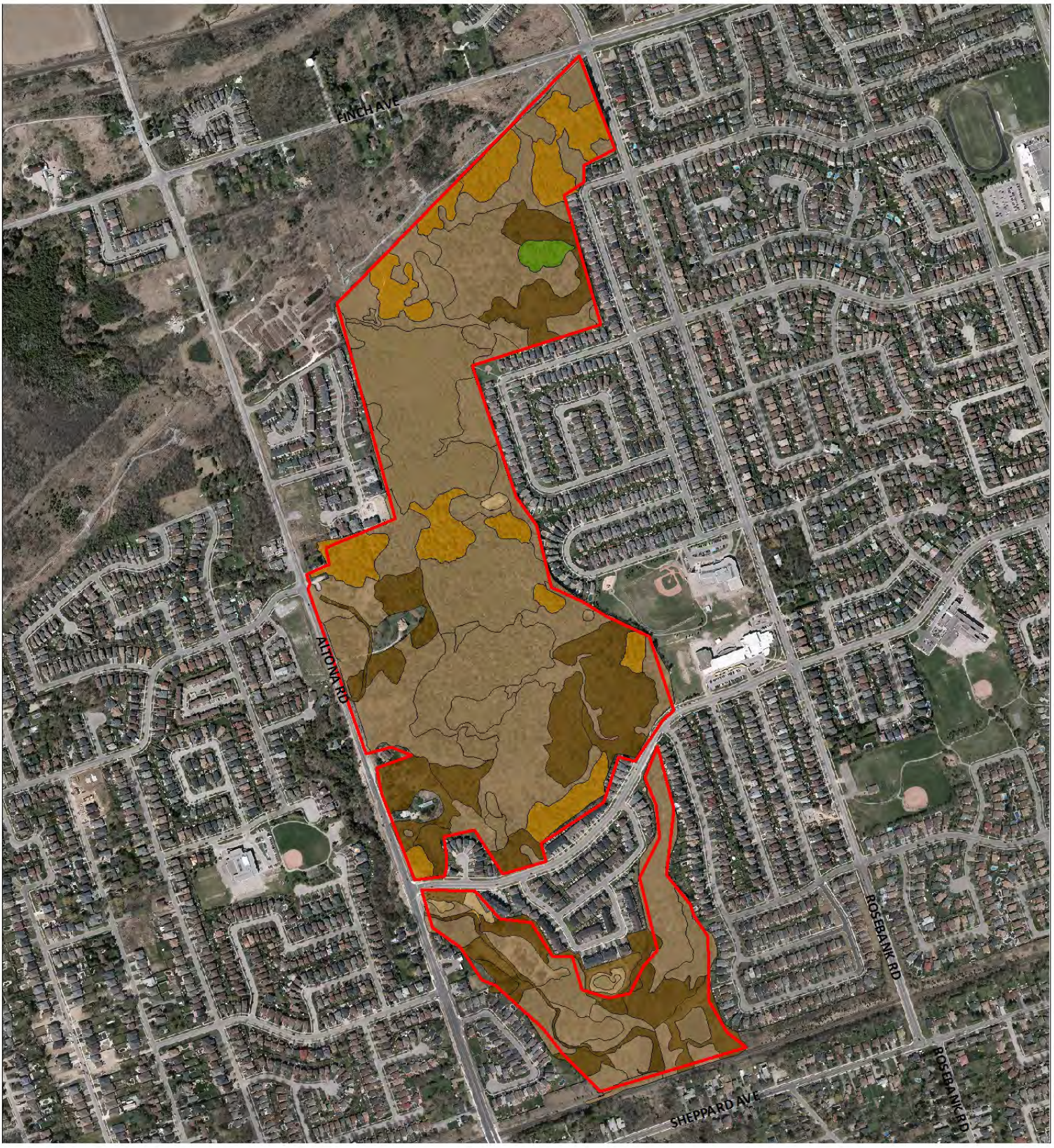
Map 9: Habitat Patch Quality

Legend

Habitat Patch Quality *

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

Altona Forest Study Area Boundary



Toronto and Region Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: January, 2014

Orthophoto: Spring 2012, First Base Solutions Inc.

Map 10: Vegetation Communities with their Associated Local Ranks

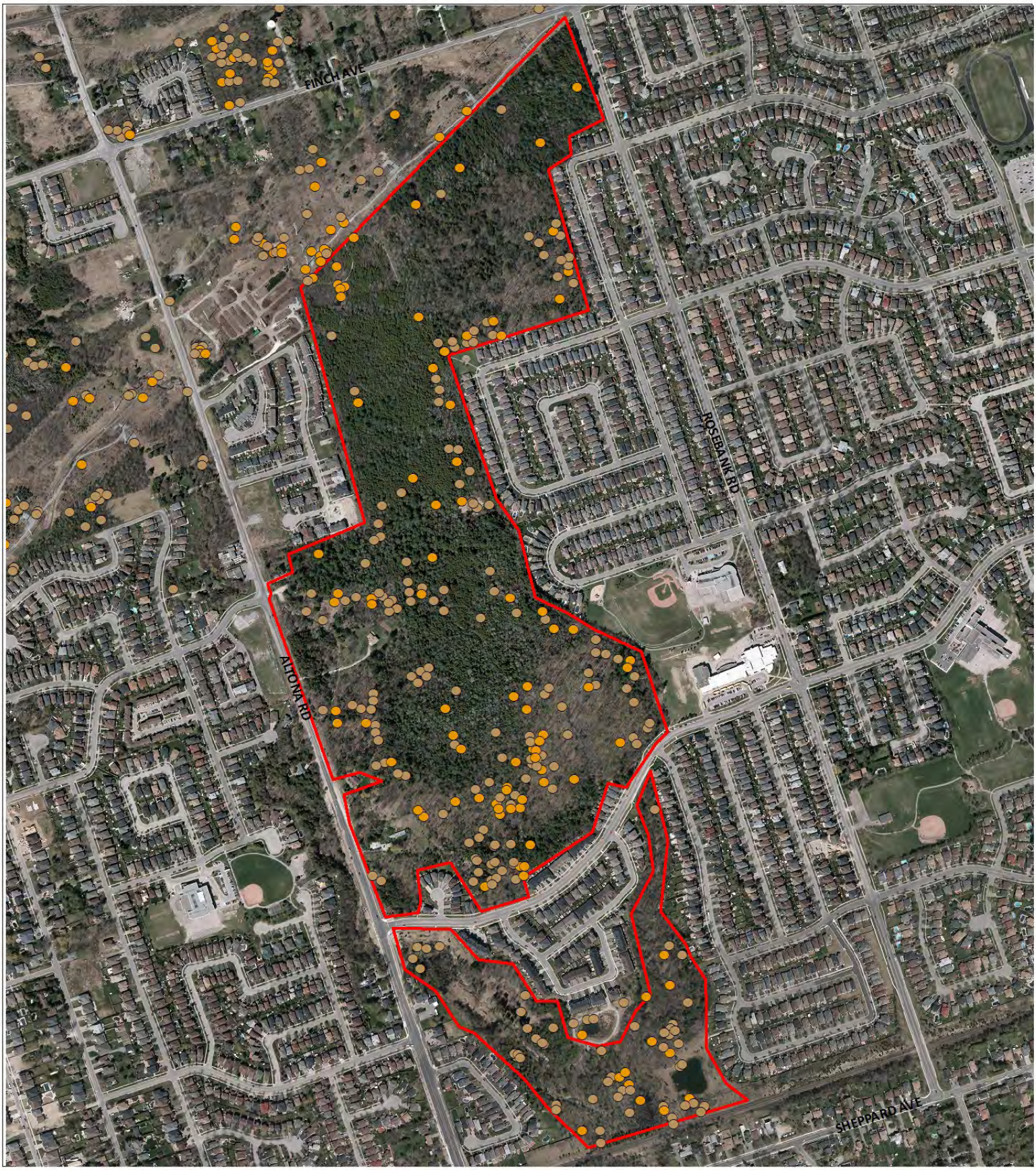
Legend

Vegetation Community Ranks

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

Altona Forest Study Area Boundary

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



Toronto and Region Conservation for The Living City

N

0 2550 100 150 200

Meters

Date: January, 2014

Orthophoto: Spring 2012, First Base Solutions Inc.

Map 11: Location of Flora Species of Concern

Legend

- Altona Forest Study Area Boundary
- Flora Species of Concern (L1-L4)
  - L1
  - L2
  - L3
  - L4

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

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

Toronto and Region Conservation *for* The Living City

N

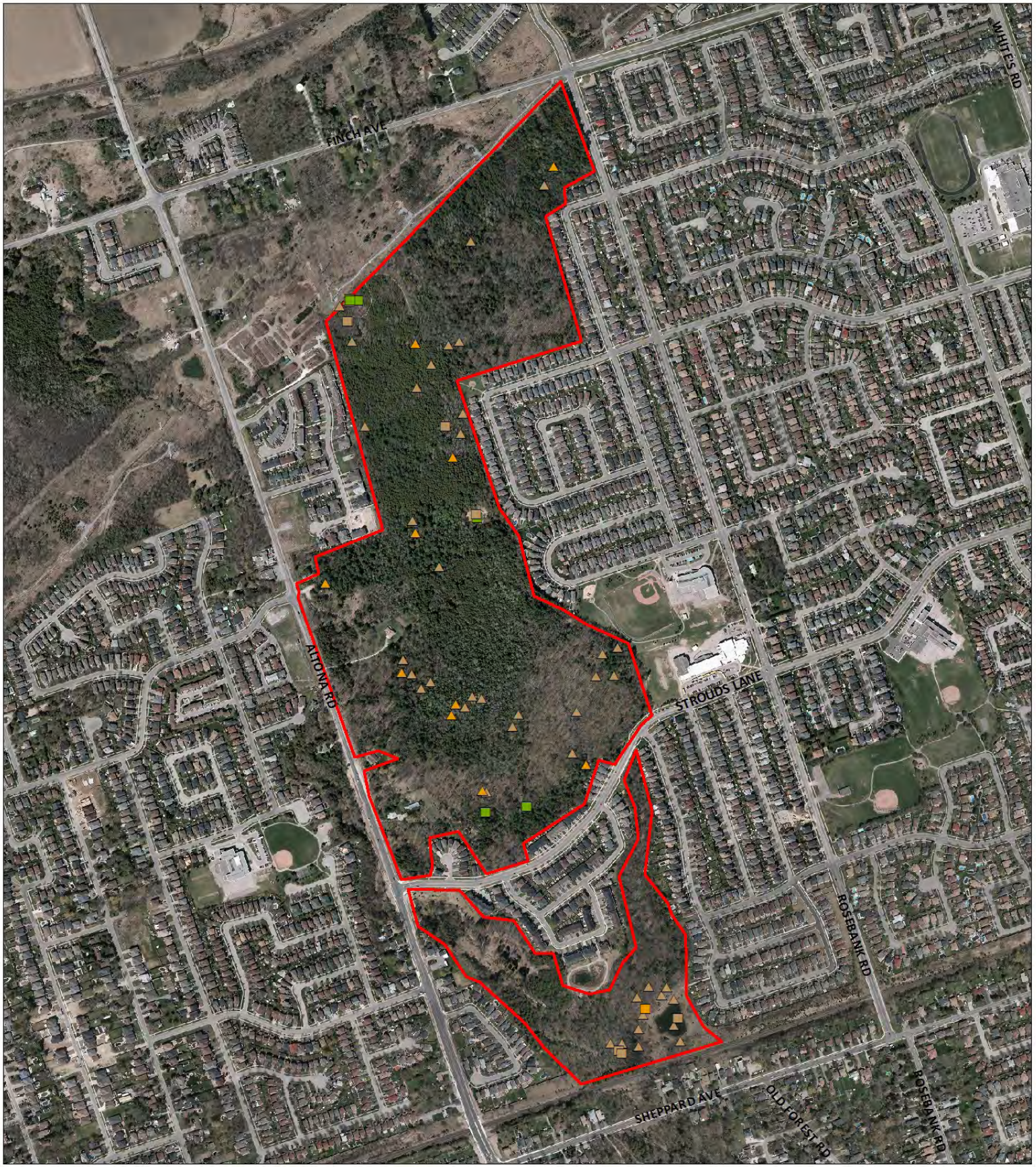
0 50 100 200 300 400 Meters

Date: January, 2014
Orthophoto: Spring 2012, First Base Solutions Inc.

Map 12: Flora Species Habitat Dependence Scores

Legend

Altona Forest Study Area Boundary



Toronto and Region Conservation for The Living City

N

0 50 100 200 300 400 Meters

Date: January 2014
Orthophoto: Spring 2012, First Base Solutions Inc.

Map 13: Locations of Fauna Species of Concern

Legend

Fauna Species of Concern				Frog Species of Concern			
L1	L2	L3	L4	L1	L2	L3	L4

Altona Forest Study Area Boundary

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

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

Toronto and Region Conservation for The Living City

N

0 50 100 200 300 400 Meters

Date: January 2013
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 14: Fauna Species Habitat Dependence Scores

Legend

- Altona Forest Study Area Boundary
- Fauna Species
- Frog Species

Appendix 1: Altona Forest Vegetation Communities (2013)

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	Tot. area # ha	Scores			Local Rank (2012-08)
			Local Occur.	Geophy. Requir.	Total Score	
	Forest					
FOC1-2	Dry-Fresh White Pine (- Red Pine) Coniferous Forest	0.3	3.5	2.0	5.5	L3
FOC3-1	Fresh-Moist Hemlock Coniferous Forest	0.3	2.5	2.0	4.5	L4
FOC3-A	Fresh-Moist Hemlock - White Pine Coniferous Forest	1.0	3.0	2.0	5.0	L3
FOC4-1	Fresh-Moist White Cedar Coniferous Forest	11.4	2.0	2.0	4.0	L4
FOC4-A	Fresh-Moist White Cedar - White Pine Coniferous Forest	4.3	3.0	2.0	5.0	L3
FOM3-2	Dry-Fresh Hemlock - Sugar Maple Mixed Forest	2.4	2.5	2.0	4.5	L4
FOM6-1	Fresh-Moist Sugar Maple - Hemlock Mixed Forest	9.3	2.0	2.0	4.0	L4
FOM7-1	Fresh-Moist White Cedar - Sugar Maple Mixed Forest	2.0	2.5	2.0	4.5	L4
FOM7-2	Fresh-Moist White Cedar - Hardwood Mixed Forest	4.4	1.5	2.0	3.5	L4
FOM8-1	Fresh-Moist Poplar Mixed Forest	1.7	3.5	2.0	5.5	L3
FOM8-2	Fresh-Moist Paper Birch Mixed Forest	0.3	3.5	2.0	5.5	L3
FOD2-4	Dry-Fresh Oak - Hardwood Deciduous Forest	0.2	2.5	2.0	4.5	L4
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest	0.3	1.5	0.0	1.5	L5
FOD5-3	Dry-Fresh Sugar Maple - Oak Deciduous Forest	0.3	1.5	2.0	3.5	L4
FOD5-4	Dry-Fresh Sugar Maple - Ironwood Deciduous Forest	2.1	2.5	0.0	2.5	L5
FOD5-8	Dry-Fresh Sugar Maple - White Ash Deciduous Forest	0.4	1.5	0.0	1.5	L5
FOD6-1	Fresh-Moist Sugar Maple - Ash Deciduous Forest	5.7	2.0	0.0	2.0	L5
FOD6-5	Fresh-Moist Sugar Maple - Hardwood Deciduous Forest	1.3	1.5	0.0	1.5	L5
FOD7-2	Fresh-Moist Ash Deciduous Forest	2.5	2.0	1.0	3.0	L4
FOD8-1	Fresh-Moist Poplar Deciduous Forest	0.9	1.0	0.0	1.0	L5
*CUP1-f	Siberian Elm Deciduous Plantation		4.0	0.0	4.0	L+
*CUP3-3	Scotch Pine Coniferous Plantation		2.0	0.0	2.0	L+
	Successional					
CUT1-1	Sumac Deciduous Thicket	1.1	2.0	0.0	2.0	L5
CUT1-A3	Coniferous Sapling Regeneration Thicket	0.2	2.5	1.0	3.5	L4
CUS1-A1	Native Deciduous Successional Savannah	0.4	1.5	0.0	1.5	L5
CUW1-A1	White Cedar Successional Woodland	1.2	2.5	1.0	3.5	L4
CUW1-A2	White Pine Successional Woodland	0.9	2.5	1.0	3.5	L4
CUW1-A3	Native Deciduous Successional Woodland	1.7	1.0	0.0	1.0	L5

Appendix 1: Altona Forest Vegetation Communities (2013)

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	Tot. area # ha	Scores			Local Rank (2012-08)
			Local Occur.	Geophy. Requir.	Total Score	
	Wetland					
SWM1-1	White Cedar - Hardwood Mineral Mixed Swamp	3.1	2.5	2.0	4.5	L4
SWMA-A	Red (Green) Ash - Hemlock Mineral Mixed Swamp	0.5	4.5	2.0	6.5	L2
*SWD2-1	*Black Ash Mineral Deciduous Swamp		2.5	2.0	4.5	L4
SWD2-2	Red (Green) Ash Mineral Deciduous Swamp	0.7	2.5	2.0	4.5	L4
SWD3-3	Swamp Maple Mineral Deciduous Swamp	0.5	2.5	2.0	4.5	L4
SWT2-5	Red-osier Mineral Thicket Swamp	0.04	2.0	2.0	4.0	L4
MAM2-10	Forb Mineral Meadow Marsh	0.4	2.0	1.0	3.0	L4
MAM2-a	Common Reed Mineral Meadow Marsh	0.1	3.0	0.0	3.0	L+
MAS2-1b	Narrow-Leaved Cattail Mineral Shallow Marsh	0.1	2.0	0.0	2.0	L+
MAS2-8	Rice Cut-grass Mineral Shallow Marsh	0.5	3.5	1.0	4.5	L4
MAS2-a	Common Reed Mineral Shallow Marsh	0.2	3.0	0.0	3.0	L+
	Aquatic					
SAS1-3	Stonewort Submerged Shallow Aquatic	0.3	2.5	1.0	3.5	L4
SAF1-3	Duckweed Floating-leaved Shallow Aquatic	0.1	2.5	1.0	3.5	L4
OAO1	Open Aquatic (deep or riverine unvegetated)	0.7	2.0	0.0	2.0	L5
OAO1-T	Turbid Open Aquatic (disturbed unvegetated)	0.1	2.0	0.0	2.0	L+
	Dynamic (Beach, Bluff, Barren, Prairie, Savannah)					
*BBO1-3	*Reed Canary Grass Riparian Bar		4.0	2.0	6.0	L3
BLT1-B	Deciduous Treed Bluff	0.02	3.0	2.0	5.0	L3
TPO2-A	Fresh-Moist Tallgrass Prairie Planting	0.5	4.0	1.0	5.0	L5
	Meadow					
CUM1-b	Exotic Cool-season Grass Graminoid Meadow	0.1	1.0	0.0	1.0	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Cypripedium reginae	showy lady's slipper	3	4	5	5	17	L2
Agalinis tenuifolia	slender gerardia	3	4	5	4	16	L3
Anemone acutiloba	sharp-lobed hepatica	1	4	4	5	14	L3
Carex albursina	white bear sedge	2	3	5	4	14	L3
Carex alopecoidea	foxtail wood sedge	2	3	5	4	14	L3
Carex cf. *leptonervia*	few-nerved wood sedge	2	4	4	4	14	L3
Carex crinita	fringed sedge	2	4	4	4	14	L3
Carex disperma	two-seeded sedge	2	3	5	4	14	L3
Carex flava	yellow sedge	3	3	5	4	15	L3
Carex plantaginea	plantain-leaved sedge	2	4	5	4	15	L3
Carex platyphylla	broad-leaved sedge	3	4	4	3	14	L3
Carex scoparia	pointed broom sedge	4	2	5	3	14	L3
Carex woodii	purple-tinged sedge	4	3	5	3	15	L3
Celastrus scandens	American bittersweet	2	4	3	5	14	L3
Chelone glabra	turtlehead	2	3	4	5	14	L3
Circaea alpina	smaller enchanter's nightshade	2	4	5	4	15	L3
Claytonia caroliniana	broad-leaved spring beauty	2	4	5	5	16	L3
Claytonia virginica	narrow-leaved spring beauty	2	4	4	5	15	L3
Clintonia borealis	bluebead lily	2	5	4	5	16	L3
Cornus amomum ssp. *obliqua*	silky dogwood	3	3	5	3	14	L3
Cypripedium parviflorum var. *makasin*	smaller yellow lady's slipper	2	4	4	5	15	L3
Doellingeria umbellata var. *umbellata*	flat-topped aster	3	4	3	4	14	L3
Equisetum fluviatile	water horsetail	2	4	5	4	15	L3
Equisetum scirpoides	dwarf scouring-rush	2	4	5	5	16	L3
Glyceria borealis	northern manna grass	2	3	5	5	15	L3
Gymnocarpium dryopteris	oak fern	1	3	5	5	14	L3
Hamamelis virginiana	witch-hazel	2	4	4	4	14	L3
Hypopitys monotropa	pinesap	2	4	5	5	16	L3
Juglans cinerea	butternut	1	5	4	4	14	L3
Lobelia siphilitica	great blue lobelia	2	3	4	5	14	L3
Lonicera canadensis	fly honeysuckle	2	4	4	4	14	L3
Menispermum canadense	moonseed	2	4	4	4	14	L3

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Mitchella repens	partridgeberry	2	4	4	5	15	L3
Mitella diphylla	mitrewort	2	3	4	5	14	L3
Monotropa uniflora	Indian-pipe	2	4	5	5	16	L3
Penstemon digitalis	foxglove beard-tongue	3	3	4	4	14	L3
Scirpus pendulus	drooping bulrush	3	4	5	4	16	L3
Sisyrinchium montanum	blue-eyed grass	2	3	4	5	14	L3
Sparganium eurycarpum	great bur-reed	2	4	5	4	15	L3
Spiranthes cernua	nodding ladies' tresses	3	3	5	4	15	L3
Streptopus lanceolatus var. *lanceolatus*	rose twisted-stalk	2	4	4	5	15	L3
Utricularia vulgaris	common bladderwort	3	4	5	4	16	L3
Uvularia grandiflora	large-flowered bellwort	1	4	5	5	15	L3
Viburnum acerifolium	maple-leaved viburnum	2	3	4	5	14	L3
Viola rostrata	long-spurred violet	2	4	4	4	14	L3
Zanthoxylum americanum	prickly-ash	4	4	4	3	15	L3
Abies balsamea	balsam fir	1	3	4	5	13	L4
Acer rubrum	red maple	2	4	1	5	12	L4
Acer saccharinum	silver maple	1	2	5	3	11	L4
Acer spicatum	mountain maple	2	3	4	4	13	L4
Acer x *freemanii*	hybrid swamp maple	3	3	5	2	13	L4
Actaea pachypoda	white baneberry	2	3	4	3	12	L4
Allium tricoccum	wild leek	1	3	4	4	12	L4
Amelanchier laevis	smooth serviceberry	2	2	4	3	11	L4
Apocynum androsaemifolium	spreading dogbane	2	3	2	4	11	L4
Aquilegia canadensis	wild columbine	1	4	3	5	13	L4
Asarum canadense	wild ginger	2	3	4	3	12	L4
Asclepias incarnata ssp. *incarnata*	swamp milkweed	2	3	4	4	13	L4
Betula alleghaniensis	yellow birch	1	4	3	5	13	L4
Betula papyrifera	paper birch	1	4	2	4	11	L4
Bidens vulgata	tall beggar's-ticks	3	2	3	4	12	L4
Boehmeria cylindrica	false nettle	2	4	4	3	13	L4
Cardamine diphylla	broad-leaved toothwort	2	3	4	4	13	L4
Carex arctata	nodding wood sedge	2	4	2	3	11	L4

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	**Common Name**	**1-5**	**1-5**	**0-5**	**0-5**	**2-20**	**(08/2012)**
Carex aurea	golden-fruited sedge	2	2	4	4	12	L4
Carex communis	fibrous-rooted sedge	2	4	3	3	12	L4
Carex deweyana	Dewey's sedge	2	4	3	3	12	L4
Carex gracillima	graceful sedge	2	3	4	2	11	L4
Carex hitchcockiana	Hitchcock's sedge	2	3	5	3	13	L4
Carex hystericina	porcupine sedge	2	3	2	5	12	L4
Carex intumescens	bladder sedge	2	4	4	2	12	L4
Carex laxiflora	loose-flowered sedge	2	3	4	3	12	L4
Carex lupulina	hop sedge	1	4	4	4	13	L4
Carex pedunculata	early-flowering sedge	2	3	3	3	11	L4
Carex pensylvanica	Pennsylvania sedge	2	4	3	4	13	L4
Carex projecta	necklace sedge	3	2	4	3	12	L4
Carex pseudocyperus	pseudocyperus sedge	2	3	3	4	12	L4
Carex retrorsa	retrorse sedge	1	3	3	4	11	L4
Carex tenera var. *echinodes*	marsh straw sedge	5	3	2	3	13	L4
Carpinus caroliniana ssp. *virginiana*	blue beech	1	3	4	3	11	L4
Carya cordiformis	bitternut hickory	1	4	4	2	11	L4
Caulophyllum giganteum	long-styled blue cohosh	1	3	4	4	12	L4
Cornus rugosa	round-leaved dogwood	2	4	4	3	13	L4
Corylus cornuta	beaked hazel	2	4	3	4	13	L4
Crataegus cf. *holmesiana*	Holmes' hawthorn	3	3	4	3	13	L4
Cuscuta gronovii	swamp dodder	2	3	3	3	11	L4
Cystopteris bulbifera	bulblet fern	1	3	4	4	12	L4
Desmodium canadense	showy tick-trefoil	3	2	3	3	11	L4
Dichanthelium acuminatum ssp. *acuminatum*	hairy panic grass	2	3	3	3	11	L4
Diervilla lonicera	bush honeysuckle	2	3	2	4	11	L4
Dryopteris intermedia	evergreen wood fern	2	4	4	3	13	L4
Dryopteris marginalis	marginal wood fern	1	3	3	4	11	L4
Dryopteris x *triploidea*	confusing hybrid wood fern	4	2	3	3	12	L4
Elodea canadensis	common water-weed	2	3	5	3	13	L4
Epilobium coloratum	purple-leaved willow-herb	2	3	4	2	11	L4
Eupatorium perfoliatum	boneset	1	3	4	3	11	L4

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Eurybia macrophylla	big-leaved aster	2	3	2	4	11	L4
Fagus grandifolia	American beech	1	4	3	4	12	L4
Fraxinus nigra	black ash	1	4	4	3	12	L4
Galium asprellum	rough bedstraw	3	2	4	2	11	L4
Geum aleppicum	yellow avens	3	3	3	2	11	L4
Geum fragarioides	barren strawberry	2	4	4	3	13	L4
Glyceria grandis	tall manna grass	2	3	4	2	11	L4
Juncus articulatus	jointed rush	3	2	4	2	11	L4
Juncus effusus	soft rush	1	4	4	3	12	L4
Juncus nodosus	knotted rush	2	2	5	3	12	L4
Juncus torreyi	Torrey's rush	2	3	4	2	11	L4
Lactuca biennis	tall blue lettuce	3	4	2	4	13	L4
Leersia virginica	white grass	3	2	5	3	13	L4
Lilium michiganense	Michigan lily	1	4	3	5	13	L4
Lycopus americanus	cut-leaved water-horehound	1	4	3	3	11	L4
Lycopus uniflorus	northern water-horehound	2	3	3	3	11	L4
Maianthemum canadense	Canada May-flower	1	4	1	5	11	L4
Mimulus ringens	square-stemmed monkey-flower	2	3	3	4	12	L4
Myosotis laxa	smaller forget-me-not	2	4	3	4	13	L4
Oryzopsis asperifolia	white-fruited mountain-rice	2	4	3	4	13	L4
Osmorhiza claytonii	woolly sweet cicely	2	3	4	3	12	L4
Persicaria pensylvanica	Pennsylvania smartweed	3	2	4	3	12	L4
Pinus strobus	white pine	1	4	3	4	12	L4
Polygonatum pubescens	downy Solomon's seal	1	4	2	5	12	L4
Polystichum acrostichoides	Christmas fern	1	3	5	4	13	L4
Populus grandidentata	large-toothed aspen	1	3	4	3	11	L4
Prunella vulgaris ssp. *lanceolata*	heal-all (native)	4	2	3	2	11	L4
Pteridium aquilinum var. *latiusculum*	eastern bracken	2	4	2	4	12	L4
Pyrola elliptica	shinleaf	1	4	4	4	13	L4
Quercus macrocarpa	bur oak	2	4	3	3	12	L4
Quercus rubra	red oak	1	4	2	4	11	L4
Ranunculus recurvatus var. *recurvatus*	hooked buttercup	3	3	2	3	11	L4

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Rorippa palustris ssp. *hispida*	hispid marsh cress	3	2	4	2	11	L4
Rosa blanda	smooth wild rose	2	3	3	4	12	L4
Rubus pubescens	dwarf raspberry	2	3	3	5	13	L4
Rudbeckia hirta	black-eyed Susan	1	4	4	3	12	L4
Sagittaria latifolia	common arrowhead	2	2	5	4	13	L4
Salix amygdaloides	peach-leaved willow	1	2	5	3	11	L4
Salix bebbiana	Bebb's willow	2	3	3	4	12	L4
Salix discolor	pussy willow	2	3	4	3	12	L4
Salix petiolaris	slender willow	2	3	5	3	13	L4
Sanicula marilandica	sanicle	3	3	3	3	12	L4
Scirpus cyperinus	woolly bulrush	1	3	4	5	13	L4
Sium suave	water-parsnip	2	2	4	4	12	L4
Solidago juncea	early goldenrod	3	3	4	2	12	L4
Symphyotrichum oolentangiense	sky-blue aster	3	1	4	3	11	L4
Thelypteris palustris var. *pubescens*	marsh fern	2	4	2	4	12	L4
Thuja occidentalis	white cedar	1	4	1	5	11	L4
Tiarella cordifolia	foam-flower	1	3	3	4	11	L4
Trillium erectum	red trillium	1	4	3	5	13	L4
Trillium grandiflorum	white trillium	1	3	4	5	13	L4
Tsuga canadensis	eastern hemlock	1	4	3	5	13	L4
Typha latifolia	broad-leaved cattail	1	4	4	4	13	L4
Viola pubescens var. *scabriuscula*	smooth yellow violet	5	4	1	2	12	L4
Acalypha rhomboidea	three-seeded mercury	4	1	2	0	7	L5
Acer saccharum	sugar maple	2	3	0	2	7	L5
Achillea millefolium ssp. *lanulosa*	woolly yarrow	3	2	0	1	6	L5
Actaea rubra ssp. *rubra*	red baneberry	2	3	1	3	9	L5
Ageratina altissima var. *altissima*	white snakeroot	2	2	2	1	7	L5
Agrimonia gryposepala	agrimony	2	2	0	2	6	L5
Alisma triviale	water-plantain	2	2	4	2	10	L5
Ambrosia artemisiifolia	common ragweed	2	1	3	0	6	L5
Amphicarpaea bracteata	hog-peanut	2	2	2	2	8	L5
Anemone canadensis	Canada anemone	2	2	2	2	8	L5

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Anemone virginiana	common thimbleweed	3	3	0	3	9	L5
Apocynum cannabinum	hemp dogbane (sensu lato)	3	2	2	2	9	L5
Aralia nudicaulis	wild sarsaparilla	2	3	1	4	10	L5
Arisaema triphyllum	Jack-in-the-pulpit	1	3	2	3	9	L5
Asclepias syriaca	common milkweed	2	2	0	2	6	L5
Athyrium filix-femina var. *angustum*	northeastern lady fern	2	3	1	3	9	L5
Bidens cernua	nodding bur-marigold	2	2	3	3	10	L5
Bidens frondosa	common beggar's-ticks	2	1	4	0	7	L5
Calystegia sepium	hedge bindweed (sensu lato)	3	2	3	2	10	L5
Carex bebbii	Bebb's sedge	2	2	3	3	10	L5
Carex blanda	common wood sedge	2	2	1	2	7	L5
Carex cristatella	crested sedge	2	2	4	1	9	L5
Carex granularis	meadow sedge	3	2	1	3	9	L5
Carex radiata	straight-styled sedge	2	2	2	2	8	L5
Carex rosea	curly-styled sedge	2	2	3	2	9	L5
Carex stipata	awl-fruited sedge	2	3	2	3	10	L5
Carex vulpinoidea	fox sedge	2	2	4	1	9	L5
Cicuta maculata	spotted water-hemlock	2	2	2	2	8	L5
Circaea canadensis ssp. *canadensis*	enchanter's nightshade	2	1	1	1	5	L5
Clematis virginiana	virgin's bower	2	2	2	3	9	L5
Clinopodium vulgare	wild basil	3	3	1	3	10	L5
Cornus alternifolia	alternate-leaved dogwood	2	2	1	2	7	L5
Cornus stolonifera	red osier dogwood	2	2	0	3	7	L5
Cryptotaenia canadensis	honewort	2	2	4	1	9	L5
Dryopteris carthusiana	spinulose wood fern	2	3	2	2	9	L5
Echinocystis lobata	wild cucumber	2	2	3	1	8	L5
Epilobium ciliatum ssp. *ciliatum*	sticky willow-herb	3	2	2	2	9	L5
Equisetum arvense	field horsetail	2	2	1	1	6	L5
Equisetum hyemale ssp. *affine*	scouring-rush	2	2	2	2	8	L5
Erigeron annuus	daisy fleabane	2	2	0	1	5	L5
Erigeron canadensis	horse-weed	3	1	2	0	6	L5
Erigeron philadelphicus var. *philadelphicus*	Philadelphia fleabane	3	2	0	1	6	L5

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Erythronium americanum ssp. *americanum*	yellow trout-lily	2	3	3	2	10	L5
Euthamia graminifolia	grass-leaved goldenrod	2	1	4	1	8	L5
Eutrochium maculatum var. *maculatum*	spotted Joe-Pye weed	2	2	3	3	10	L5
Fraxinus americana	white ash	2	2	0	3	7	L5
Fraxinus pennsylvanica	red ash	1	2	0	3	6	L5
Galium aparine	cleavers	3	1	3	2	9	L5
Galium palustre	marsh bedstraw	2	2	3	3	10	L5
Galium triflorum	sweet-scented bedstraw	2	2	2	2	8	L5
Geum canadense	white avens	2	2	1	2	7	L5
Glyceria striata	fowl manna grass	2	2	1	2	7	L5
Hackelia virginiana	Virginia stickseed	2	2	0	2	6	L5
Helianthus tuberosus	Jerusalem artichoke	3	1	2	0	6	L5
Hydrophyllum virginianum	Virginia waterleaf	2	2	1	2	7	L5
Impatiens capensis	orange touch-me-not	2	2	0	2	6	L5
Juglans nigra	black walnut	2	1	2	1	6	L5
Juncus dudleyi	Dudley's rush	2	2	3	1	8	L5
Juncus tenuis	path rush	3	2	1	1	7	L5
Juniperus virginiana	red cedar	2	2	4	2	10	L5
Leersia oryzoides	rice cut grass	2	2	3	2	9	L5
Lemna cf. *minor*	common duckweed	2	2	4	2	10	L5
Lysimachia ciliata	fringed loosestrife	2	2	2	2	8	L5
Maianthemum racemosum ssp. *racemosum*	false Solomon's seal	2	3	2	3	10	L5
Maianthemum stellatum	starry false Solomon's seal	2	2	1	3	8	L5
Matteuccia struthiopteris var. *pensylvanica*	ostrich fern	2	2	2	2	8	L5
Mentha arvensis ssp. *borealis*	wild mint	2	2	3	2	9	L5
Monarda fistulosa	wild bergamot	2	3	2	3	10	L5
Nabalus altissimus	tall wood lettuce	3	3	2	2	10	L5
Oenothera biennis	common evening-primrose	2	1	1	1	5	L5
Onoclea sensibilis	sensitive fern	2	3	1	3	9	L5
Ostrya virginiana	ironwood	2	3	2	2	9	L5
Oxalis stricta	common yellow wood-sorrel	5	1	1	1	8	L5
Panicum capillare	panic grass	3	1	4	1	9	L5

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	**Common Name**	**1-5**	**1-5**	**0-5**	**0-5**	**2-20**	**(08/2012)**
Parthenocissus inserta	thicket creeper	2	2	0	1	5	L5
Persicaria lapathifolia	pale smartweed	3	1	4	0	8	L5
Phryma leptostachya	lopseed	2	2	3	2	9	L5
Physalis heterophylla	clammy ground-cherry	2	2	3	3	10	L5
Pilea pumila	dwarf clearweed	2	2	1	1	6	L5
Plantago rugelii	red-stemmed plantain	3	2	0	1	6	L5
Poa palustris	fowl meadow-grass	2	2	3	2	9	L5
Podophyllum peltatum	May-apple	2	3	3	2	10	L5
Populus balsamifera	balsam poplar	2	2	3	2	9	L5
Populus deltoides	cottonwood	2	1	4	1	8	L5
Populus tremuloides	trembling aspen	2	3	1	3	9	L5
Prunus serotina	black cherry	2	2	0	2	6	L5
Prunus virginiana var. *virginiana*	choke cherry	2	2	0	1	5	L5
Ranunculus abortivus	kidney-leaved buttercup	2	3	1	2	8	L5
Ranunculus sceleratus	cursed crowfoot	3	2	3	2	10	L5
Rhus typhina	staghorn sumach	2	1	2	2	7	L5
Ribes americanum	wild black currant	2	3	2	2	9	L5
Ribes cynosbati	prickly gooseberry	2	3	2	2	9	L5
Rubus allegheniensis	common blackberry	2	3	0	1	6	L5
Rubus idaeus ssp. *strigosus*	wild red raspberry	1	1	0	1	3	L5
Rubus odoratus	purple-flowering raspberry	2	2	2	2	8	L5
Salix eriocephala	narrow heart-leaved willow	2	1	3	1	7	L5
Sambucus racemosa ssp. *pubens*	red-berried elder	2	3	2	2	9	L5
Sanguinaria canadensis	bloodroot	2	3	0	3	8	L5
Scirpus atrovirens	black-fruited bulrush	2	2	4	2	10	L5
Scirpus microcarpus	barber-pole bulrush	1	2	4	3	10	L5
Scutellaria lateriflora	mad-dog skullcap	2	2	3	3	10	L5
Smilax herbacea	carrion-flower	3	3	2	2	10	L5
Solanum ptychanthum	American black nightshade	4	1	4	0	9	L5
Solidago altissima	tall goldenrod	2	2	0	0	4	L5
Solidago caesia	blue-stemmed goldenrod	2	2	4	2	10	L5
Solidago canadensis var. *canadensis*	Canada goldenrod	2	2	0	1	5	L5

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	**Common Name**	**1-5**	**1-5**	**0-5**	**0-5**	**2-20**	**(08/2012)**
Solidago flexicaulis	zig-zag goldenrod	2	1	3	2	8	L5
Solidago gigantea	late goldenrod	3	1	1	1	6	L5
Solidago nemoralis ssp. *nemoralis*	grey goldenrod	3	2	2	2	9	L5
Symphyotrichum cordifolium	heart-leaved aster	2	1	0	2	5	L5
Symphyotrichum ericoides var. *ericoides*	heath aster	2	1	2	1	6	L5
Symphyotrichum lanceolatum var. *lanceolatum*	panicled aster	2	2	3	1	8	L5
Symphyotrichum lateriflorum var. *lateriflorum*	calico aster	2	2	3	2	9	L5
Symphyotrichum novae-angliae	New England aster	2	2	2	1	7	L5
Symphyotrichum puniceum var. *puniceum*	swamp aster	2	2	2	2	8	L5
Thalictrum dioicum	early meadow rue	2	3	3	2	10	L5
Thalictrum pubescens	tall meadow rue	2	3	2	2	9	L5
Tilia americana	basswood	2	3	2	3	10	L5
Toxicodendron radicans var. *radicans*	poison ivy (vine form)	2	2	4	2	10	L5
Toxicodendron radicans var. *rydbergii*	poison ivy (shrub form)	2	2	0	2	6	L5
Ulmus americana	white elm	2	4	0	2	8	L5
Urtica dioica ssp. *gracilis*	American stinging nettle	2	3	2	2	9	L5
Verbena hastata	blue vervain	2	2	4	2	10	L5
Verbena urticifolia	white vervain	2	2	2	2	8	L5
Viburnum lentago	nannyberry	2	3	1	2	8	L5
Viola labradorica	dog violet	3	2	0	2	7	L5
Viola sororia	common blue violet	2	2	0	2	6	L5
Vitis riparia	riverbank grape	2	1	0	0	3	L5
Fragaria virginiana ssp. *virginiana*	common wild strawberry	4		5	0	9	L5?
Acer platanoides	Norway maple	4				4	L+
Aegopodium podagraria	goutweed	5				5	L+
Aesculus hippocastanum	horse-chestnut	3				3	L+
Agastache foeniculum	fennel giant hyssop	5				5	L+
Agrostis gigantea	redtop	4				4	L+
Alliaria petiolata	garlic mustard	4				4	L+
Alnus glutinosa	European alder	5				5	L+
Arctium lappa	great burdock	4				4	L+
Arctium minus	common burdock	5				5	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Asparagus officinalis	asparagus	5				5	L+
Barbarea vulgaris	winter cress	4				4	L+
Berberis thunbergii	Japanese barberry	4				4	L+
Berberis vulgaris	common barberry	5				5	L+
Bromus inermis	smooth brome grass	4				4	L+
Campanula rapunculoides	creeping bellflower	4				4	L+
Carduus acanthoides	plumeless thistle	5				5	L+
Carex spicata	spiked sedge	5				5	L+
Celastrus orbiculatus	oriental bittersweet	3				3	L+
Centaurea stoebe ssp. *micranthos*	spotted knapweed	5				5	L+
Cerastium fontanum	mouse-ear chickweed	3				3	L+
Chenopodium album	lamb's quarters	5				5	L+
Chrysanthemum maximum	Shasta daisy						L+
Cichorium intybus	chicory	5				5	L+
Cirsium arvense	creeping thistle	4				4	L+
Cirsium vulgare	bull thistle	4				4	L+
Convallaria majalis	lily-of-the-valley	5				5	L+
Coreopsis lanceolata	lance-leaved coreopsis	5				5	L+
Crataegus monogyna	English hawthorn	4	1	4	0	9	L+
Cynanchum rossicum	dog-strangling vine	4				4	L+
Dactylis glomerata	orchard grass	4				4	L+
Daucus carota	Queen Anne's lace	4				4	L+
Digitaria ischaemum	smooth crab grass	5				5	L+
Echinacea purpurea	purple coneflower	5				5	L+
Echinochloa crus-galli	barnyard grass	5				5	L+
Echium vulgare	viper's bugloss	3				3	L+
Elaeagnus commutata	silver-berry	5				5	L+
Elaeagnus umbellata	autumn olive	5				5	L+
Elymus repens	quack grass	5				5	L+
Epilobium parviflorum	small-flowered willow-herb	5				5	L+
Epipactis helleborine	helleborine	5				5	L+
Fallopia convolvulus	black bindweed	5				5	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Festuca rubra ssp. *rubra*	red fescue	5				5	L+
Galium mollugo	white bedstraw	5				5	L+
Geum urbanum	urban avens	4				4	L+
Glechoma hederacea	creeping Charlie	4				4	L+
Hemerocallis fulva	orange day-lily	5				5	L+
Hesperis matronalis	dame's rocket	4				4	L+
Hippophae rhamnoides	sea-buckthorn	5				5	L+
Hydrocharis morsus-ranae	European frog-bit	5				5	L+
Hypericum perforatum	common St. John's-wort	4				4	L+
Inula helenium	elecampane	4				4	L+
Iris germanica	garden iris	4				4	L+
Iris cf. *pseudacorus*	yellow flag	5				5	L+
Juncus compressus	round-fruited rush	4				4	L+
Juniperus x *pfitzeriana*	pfitzer juniper	5				5	L+
Lactuca serriola	prickly lettuce	3				3	L+
Lamium maculatum	spotted dead-nettle	5				5	L+
Leonurus cardiaca ssp. *cardiaca*	motherwort	4				4	L+
Leucanthemum vulgare	ox-eye daisy	2				2	L+
Ligustrum vulgare	privet	5				5	L+
Linaria vulgaris	butter-and-eggs	5				5	L+
Lithospermum officinale	Eurasian gromwell	5				5	L+
Lonicera japonica	Japanese honeysuckle	5				5	L+
Lonicera morrowii	Morrow's honeysuckle	5				5	L+
Lonicera x *bella*	shrub honeysuckle	4				4	L+
Lonicera xylosteum	European fly honeysuckle	4				4	L+
Lotus corniculatus	bird's foot trefoil	4				4	L+
Lycopus americanus x *europaeus*	hybrid water-horehound	5				5	L+
Lycopus europaeus	European water-horehound	5				5	L+
Lysimachia nummularia	moneywort	4				4	L+
Lythrum salicaria	purple loosestrife	4				4	L+
Malus pumila	apple	4				4	L+
Medicago lupulina	black medick	5				5	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Medicago sativa ssp. *sativa*	alfalfa	5				5	L+
Melilotus albus	white sweet clover	4				4	L+
Melilotus officinalis	yellow sweet clover	5				5	L+
Mentha spicata	spear mint	4				4	L+
Miscanthus sinensis	miscanthus						L+
Morus alba	white mulberry	5				5	L+
Myosotis scorpioides	true forget-me-not	4				4	L+
Nasturtium microphyllum	small-leaved watercress	5				5	L+
Persicaria maculosa	lady's thumb	5				5	L+
Phleum pratense	Timothy grass	4				4	L+
Phragmites australis ssp. *australis*	common reed	4				4	L+
Picea abies	Norway spruce	5				5	L+
Pilosella caespitosa	yellow hawkweed	5				5	L+
Pinus sylvestris	Scots pine	4				4	L+
Plantago arenaria	sand plantain	5				5	L+
Plantago lanceolata	English plantain	5				5	L+
Plantago major	common plantain	2				2	L+
Poa compressa	flat-stemmed blue grass	4				4	L+
Poa pratensis ssp. *pratensis*	Kentucky blue grass	4				4	L+
Populus alba	white poplar	5				5	L+
Potentilla recta	sulphur cinquefoil	5				5	L+
Quercus robur	English oak	5				5	L+
Ranunculus acris	tall buttercup	4				4	L+
Ranunculus repens	creeping buttercup	4				4	L+
Rhamnus cathartica	common buckthorn	4				4	L+
Ribes rubrum	garden red currant	4				4	L+
Robinia pseudoacacia	black locust	3				3	L+
Rosa multiflora	multiflora rose	4				4	L+
Rudbeckia triloba	brown-eyed Susan	4				4	L+
Rumex crispus	curly dock	5				5	L+
Rumex dentatus	fiddle dock	5				5	L+
Rumex obtusifolius	bitter dock	4				4	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(08/2012)
Salix alba	white willow	5				5	L+
Salix x *fragilis*	crack willow	3				3	L+
Salix x *sepulcralis*	weeping willow	5				5	L+
Saponaria officinalis	bouncing Bet	5				5	L+
Schedonorus pratensis	meadow fescue	4				4	L+
Setaria viridis	green foxtail	3				3	L+
Silene latifolia	evening lychnis	4				4	L+
Silene vulgaris	bladder campion	3				3	L+
Solanum dulcamara	bittersweet nightshade	4				4	L+
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	5				5	L+
Sorbus aucuparia	European mountain-ash	5				5	L+
Stachys cf. *palustris*	marsh hedge-nettle	3	3	4	3	13	L+
Stellaria media	common chickweed	4				4	L+
Symphoricarpos albus var. *laevigatus*	western snowberry	5				5	L+
Syringa vulgaris	common lilac	4				4	L+
Taraxacum officinale	dandelion	4				4	L+
Tragopogon dubius	lemon-yellow goat's beard	3				3	L+
Tragopogon pratensis	meadow goat's beard	3				3	L+
Trifolium pratense	red clover	5				5	L+
Trifolium repens	white clover	5				5	L+
Tripleurospermum inodorum	scentless chamomile	5				5	L+
Tussilago farfara	coltsfoot	4				4	L+
Typha angustifolia	narrow-leaved cattail	3				3	L+
Typha x *glauca*	hybrid cattail	3				3	L+
Ulmus pumila	Siberian elm	4				4	L+
Verbascum thapsus	common mullein	4				4	L+
Veronica arvensis	corn speedwell	4				4	L+
Veronica officinalis	common speedwell	5				5	L+
Veronica serpyllifolia ssp. *serpyllifolia*	thyme-leaved speedwell	5				5	L+
Viburnum lantana	wayfaring tree	3				3	L+
Viburnum opulus	European highbush cranberry	4				4	L+
Vicia cracca	cow vetch	4				4	L+

Appendix 2: Altona Forest Flora Species, 2001-2013							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	**Common Name**	**1-5**	**1-5**	**0-5**	**0-5**	**2-20**	**(08/2012)**
Acer negundo	Manitoba maple	4	0	0	2	6	L+?
Agrostis stolonifera	creeping bent grass	5				5	L+?
Euphorbia maculata	spotted spurge	5				5	L+?
Geranium robertianum	herb Robert	4				4	L+?
Phalaris arundinacea	reed canary grass	3				3	L+?
Hypericum prolificum	shrubby St. John's-wort	5	5	5	4	19	pL1
Pinus resinosa	red pine	2	5	5	5	17	pL2
Salix serissima	autumn willow	4	3	5	5	17	pL2
Alnus incana ssp. *rugosa*	speckled alder	1	4	4	5	14	pL3
Larix laricina	tamarack	2	4	4	4	14	pL3
Physocarpus opulifolius	ninebark	3	2	5	4	14	pL3
Picea glauca	white spruce	1	5	4	4	14	pL3
Amelanchier arborea	downy serviceberry	3	2	4	3	12	pL4
Spiraea alba	wild spiraea	2	4	4	3	13	pL4
Cornus foemina ssp. *racemosa*	grey dogwood	3	2	3	2	10	pL5
Salix caprea	goat willow	5				5	pL+
Spiraea x *vanhouttei*	bridalwreath spiraea	5				5	pL+
Tilia x *flavescens*	hybrid linden	5				5	pL+
Viburnum recognitum	southern arrow-wood	5				5	pL+
Schizachyrium scoparium	little bluestem	4	4	5	5	18	prL2
Sorghastrum nutans	Indian grass	4	4	5	4	17	prL2
Andropogon gerardii	big bluestem	3	3	4	4	14	prL3
Panicum virgatum	switch grass	3	2	5	5	15	prL3
Elymus canadensis	Canada wild rye	3	2	5	3	13	prL4
Schoenoplectus tabernaemontani	soft-stemmed bulrush	1	2	5	3	11	prL4

Appendix 3: Breeding Fauna List for Altona Forest Study Area.

Common Name	Code	Scientific Name	count	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Survey Species: species for which the TRCA protocol effectively surveys.													
Birds													
black and white warbler	BAWW	*Mniotilta varia*	1950 - historic	1	3	2	4	2	2	5	1	20	**L2**
ruffed grouse	RUGR	*Bonasa umbellus*	1997 - historic	1	3	3	3	2	2	5	1	20	**L2**
northern waterthrush	NOWA	*Parkesia noveboracensis*	1 (2011)	1	2	2	3	1	4	5	1	19	**L3**
ovenbird	OVEN	*Seiurus aurocapillus*	1997 - historic	0	2	3	4	2	4	4	0	19	**L3**
pileated woodpecker	PIWO	*Dryocopus pileatus*	2 (2011)	0	2	2	4	1	3	3	0	15	**L3**
pine warbler	PIWA	*Setophaga pinus*	4	0	2	2	4	1	3	3	0	15	**L3**
scarlet tanager	SCTA	*Piranga olivacea*	1994 - historic	0	2	2	4	1	3	4	0	16	**L3**
veery	VEER	*Catharus fuscescens*	1995 - historic	2	3	2	3	1	2	5	1	19	**L3**
wood thrush	WOTH	*Hylocichla mustelina*	1995 - historic	0	3	2	3	2	2	4	0	16	**L3**
wild turkey	WITU	*Meleagris gallopavo*	1	0	1	0	4	3	4	3	0	15	**L3**
yellow-billed cuckoo	YBCU	*Coccyzus americanus*	1 (2008)	1	3	2	3	1	3	3	0	16	**L3**
belted kingfisher	BEKI	*Ceryle alcyon*	1	0	3	2	2	1	2	2	0	12	**L4**
common yellowthroat	COYE	*Geothlypis trichas*	1	0	2	2	1	2	1	4	0	12	**L4**
Cooper's hawk	COHA	*Accipiter cooperii*	2	0	2	1	4	1	3	2	0	13	**L4**
eastern kingbird	EAKI	*Tyrannus tyrannus*	1	0	4	2	2	1	1	3	0	13	**L4**
eastern screech-owl	EASO	*Megascops asio*	historic	0	2	2	1	2	3	3	0	13	**L4**
eastern wood-pewee	EAWP	*Contopus virens*	2	0	4	2	2	1	1	3	0	13	**L4**
great-crested flycatcher	GCFL	*Myiarchus crinitus*	2	0	2	2	3	1	2	2	0	12	**L4**
great-horned owl	GHOW	*Bubo virginianus*	1 (2010)	0	2	2	2	2	1	2	0	11	**L4**
grey catbird	GRCA	*Dumetella carolinensis*	3	0	2	2	1	1	1	3	0	10	**L4**
hairy woodpecker	HAWO	*Picoides villosus*	2	0	2	2	3	1	2	2	0	12	**L4**
indigo bunting	INBU	*Passerina cyanea*	1	0	2	2	1	1	2	4	0	12	**L4**
northern flicker	NOFL	*Colaptes auratus*	2	0	3	2	1	1	2	3	0	12	**L4**
northern rough-winged swallow	NRWS	*Stelgidoptery x serripennis*	1	0	1	2	1	1	3	2	0	10	**L4**
red-breasted nuthatch	RBNU	*Sitta canadensis*	4	0	1	2	3	1	1	2	0	10	**L4**
red-eyed vireo	REVI	*Vireo olivaceus*	11	0	2	2	2	1	1	3	0	11	**L4**
rose-breasted grosbeak	RBGR	*Pheucticus ludovicianus*	1	0	2	2	3	1	2	3	0	13	**L4**
white-breasted nuthatch	WBNU	*Sitta carolinensis*	2	0	2	2	3	1	2	2	0	12	**L4**
American Crow	AMCR	*Corvus brachyrhynchos*	x	0	1	2	1	1	0	0	0	5	**L5**
American goldfinch	AMGO	*Carduelis tristis*	x	0	2	2	1	1	0	1	0	7	**L5**
American robin	AMRO	*Turdus migratorius*	x	0	1	2	1	1	0	1	0	6	**L5**
Baltimore oriole	BAOR	*Icterus galbula*	x	0	2	2	1	1	0	1	0	7	**L5**

Appendix 3: Breeding Fauna List for Altona Forest Study Area.

Common Name	Code	Scientific Name	count	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
black-capped chickadee	BCCH	*Parus atricapillus*	x	0	1	2	1	1	0	1	0	6	**L5**
blue jay	BLJA	*Cyanocitta cristata*	x	0	4	2	1	1	0	1	0	9	**L5**
brown-headed cowbird	BHCO	*Molothrus ater*	x	0	2	2	1	1	0	1	0	7	**L5**
Canada goose	CANG	*Branta canadensis*	x	0	1	1	1	2	1	0	0	6	**L5**
cedar waxwing	CEDW	*Bombycilla cedrorum*	x	0	1	2	1	1	0	1	0	6	**L5**
chipping sparrow	CHSP	*Spizella passerina*	x	0	2	2	1	1	0	2	0	8	**L5**
common grackle	COGR	*Quiscalus quiscula*	x	0	3	2	1	1	0	1	0	8	**L5**
downy woodpecker	DOWO	*Picoides pubescens*	x	0	3	2	1	1	1	1	0	9	**L5**
eastern phoebe	EAPH	*Sayornis phoebe*	historic	0	2	2	1	1	2	1	0	9	**L5**
mallard	MALL	*Anas platyrhynchos*	x	0	2	2	1	2	0	1	0	8	**L5**
mourning dove	MODO	*Zenaida macroura*	x	0	2	2	1	1	0	0	0	6	**L5**
northern cardinal	NOCA	*Cardinalis cardinalis*	x	0	2	2	1	1	1	2	0	9	**L5**
red-tailed hawk	RTHA	*Buteo jamaicensis*	x	0	2	2	2	1	1	1	0	9	**L5**
red-winged blackbird	RWBL	*Agelaius phoeniceus*	x	0	2	2	1	1	0	2	0	8	**L5**
song sparrow	SOSP	*Melospiza melodia*	x	0	2	2	1	2	0	2	0	9	**L5**
warbling vireo	WAVI	*Vireo gilvus*	x	0	1	2	1	1	1	2	0	8	**L5**
yellow warbler	YWAR	*Setophaga petechia*	x	0	1	2	1	1	1	3	0	9	**L5**
European starling	EUST	*Sturnus vulgaris*	x										**L+**
Herpetofauna													
grey treefrog	TGTF	*Hyla versicolor*	2	0	3	3	3	4	2	5	1	21	**L2**
northern spring peeper	SPPE	*Pseudacris crucifer crucifer*	1	0	2	3	3	4	3	5	1	21	**L2**
wood frog	WOFR	*Lithobates sylvatica*	3	0	2	3	3	4	3	5	1	21	**L2**
eastern red-backed salamander	RBSA	*Plethodon cinereus*	x	0	2	2	1	4	3	4	0	16	**L3**
northern leopard frog	LEFR	*Lithobates pipiens*	1	0	3	2	1	4	2	5	1	18	**L3**
American toad	AMTO	*Anaxyrus americanus*	3	0	3	2	1	4	0	4	0	14	**L4**
green frog	GRFR	*Lithobates clamitans*	3	0	2	2	1	3	1	4	0	13	**L4**
Incidental Species: **species that are reported on as incidental to the TRCA protocol.**													
Mammals													
eastern chipmunk	EACH	*Tamias striatus*	x	0	2	2	2	3	1	3	0	13	**L4**
eastern cottontail	EACO	*Sylvilagus floridanus*	x	0	2	2	1	3	1	2	0	11	**L4**
muskrat	MUSK	*Ondatra zibethicus*	x	0	2	2	1	3	1	3	0	12	**L4**
red squirrel	RESQ	*Tamiasciurus hudsonicus*	x	0	2	2	1	3	1	2	0	11	**L4**

Appendix 3: Breeding Fauna List for Altona Forest Study Area.

Common Name	Code	Scientific Name	count	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
white-tailed deer	WTDE	*Odocoileus virginianus*	x	0	2	1	3	2	2	1	0	11	**L4**
woodchuck	WOOD	*Marmota monax*	x	1	2	2	1	3	0	1	0	10	**L4**
grey squirrel	GRSQ	*Sciurus carolinensis*	x	0	2	2	1	3	0	0	0	8	**L5**
raccoon	RACC	*Procyon lotor*	x	0	2	2	1	3	1	0	0	9	**L5**
Herpetofauna													
eastern gartersnake	EAGA	*Thamnophis sirtalis sirtalis*	x	0	2	2	1	3	0	3	0	11	**L4**

LEGEND

LO = local occurrence
PTn = population trend, continent-wide
PTt = population trend, TRCA
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
LX = extirpated
L+ = non-native/introduced