



East Duffins Headwaters

**Terrestrial Biological Inventory
and Assessment**

July 2010



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1.0 Introduction

Over the course of the past decade the Toronto Region Conservation Authority (TRCA) has conducted extensive biological fieldwork on lands within the East Duffins Headwaters (EDH) study area. Biological inventories of flora and fauna were conducted mainly for watershed planning purposes. The EDH study area is located in the upper reaches of Duffins Creek watershed (Maps 1 and 2), bordered to the north, east, south and west by Goodwood Road (Regional Road 21), Lake Ridge Road, Ninth Concession Road (Regional Road 5) and Brock Road (Regional Road 1) respectively. Inventories have been completed for TRCA properties within the headwaters area, and although data was also collected for non-TRCA properties, the scope of this report considers only those data from within the TRCA property boundaries.

The purpose of recent fieldwork at EDH was to *obtain a comprehensive inventory of terrestrial natural heritage features* on acquired and managed lands while *providing advice on an upcoming management plan*. In order to provide this advice, detailed field inventories of vegetation communities and flora and fauna species were undertaken to *characterize the terrestrial natural heritage features* of the EDH study area. Through the completion of this characterization, the site features can then be understood within the larger regional context provided by the Terrestrial Natural Heritage Program of the TRCA (see Section 1.1). This report addresses the question “*How does the area surveyed at the EDH site fit within the regional natural system, and how should its contribution to this system be protected and maximized?*” The important underlying message presented 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.

Flora species were inventoried in parts of the study area by the Ontario Ministry of Natural Resources (OMNR) in the late 1990’s and some of that data is included in Appendix 2. OMNR inventories were of provincially significant wetlands (PSW) and Areas of Natural and Scientific Interest (ANSI).

1.1 TRCA’s Terrestrial Natural Heritage Program

Rapid urban expansion in the TRCA jurisdiction has led to continuous incremental loss of natural cover and species. In a landscape that probably supported 95% forest cover prior to European settlement, current mapping (2002) shows that only 17% forest and wetland cover remains. Agricultural and natural lands are increasingly being urbanized while species continue to disappear. 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. Any loss in ecosystem function lowers the ability of the land to support biodiversity and to maintain or enhance human society (e.g. diminished ecosystem function may result in increased pollution or in decreased aesthetic value of the landscape). **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 (TNH) 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. These indicators summarize changes that occurred within the historical natural system. 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 (TNHSS) 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 2007).

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 EDH study area is located in the Town of Uxbridge in Durham Region. The site lies entirely within the Great Lakes – St. Lawrence floristic region, composed of mixed coniferous-deciduous forest, and is on the Oak Ridges Moraine. The topography is rolling to hilly and the surficial geology over a large portion is Pontypool sandy loam developed from irregularly stratified calcareous sands and gravels. The most northern property is classified sandy. These soil types are especially susceptible to wind and water erosion. To the south are Bondhead sandy loam soils that developed from loam and sandy loam calcareous till (Olding and Wicklund). Agriculture is typically more productive on Bondhead soils than the more droughty Pontypool series which is likely the reason it was abandoned in much of the study area. Historically, EDH was largely cleared for farmland, and gravel extraction; logging also occurred in the area (Walker Woods was

logged until 1991) (TRCA 2000). Tree-cover is now extensive, creating the largest block of continuous forest within the entire TRCA region.

Most of the naturally vegetated land is part of the Uxbridge-Glen Major Forest or Uxbridge Forest Kames Area's of Natural and Scientific Interest (ANSI). Much of the south-east quarter of the study area is designated as the Uxbridge Forest Kames Environmentally Significant Area (ESA). This ESA covers much of TRCA's Glen Major Forest property and the southern section of Walker Woods. The south-eastern quarter is also where part of the Glen Major Wetland Complex PSW is situated.

There is one part of the study area containing natural cover where inventories were not requested of TNH staff. It is in the northwest area of the site and can be located on Map 10 as lacking vegetation community ranks (shown in coloured shading).

3.0 Inventory Methodology

A biological inventory of the EDH Lands was conducted at the levels of habitat patch, vegetation community, and species (flora and fauna) according to the TRCA data collection methodology (TRCA 2010). Habitat patch mapping was excerpted from the regional 2002 mapping of broadly-defined patch categories (forest, wetland, meadow and coastal) and digitized using ArcView GIS software.

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 3.3).

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 2007). 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 three 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, more 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 meters from the edge of the forest patch, using 100 meter increments. A recognized distance for deep interior conditions occurs at 400 meters from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

Quantity

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

3.2 Ranking and Scoring Communities and Species

While the targets for the natural heritage system are derived from regional-scale information, the ground-truthing surveys at the site level provide important information that can be used in conjunction with the targets to plan decisions at the site level. A key component of the ground-truthing surveys is the scoring and ranking of vegetation communities and flora and fauna species to generate local “L” ranks (L1 to L5) (TRCA 2007). These roughly correspond to the habitat patch ranks. For example, a species ranked L4 may be expected in habitat patches with a quality of L4 or better.

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 but is now 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.

3.3 Field Work

A series of biological inventories of different portions of the EDH were conducted over the past decade at the levels of habitat patch, vegetation community, and species (flora and fauna) according to the TRCA data collection methodology (TRCA 2010). Habitat patch mapping was excerpted from the regional 2002 mapping of broadly-defined patch categories (forest, wetland, meadow and coastal) and digitized using ArcView GIS software.

Botanical field-work for the EDH was conducted by TRCA staff between 2001 and 2009, with a few incidental species recorded in 1999 (Table 2). Historical point data from the Ministry of Natural Resources (OMNR unpublished) was digitized from paper notes for the years 1997-1999. 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 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.

Over the course of the past decade, 2000 to 2009, the TRCA has collected terrestrial fauna data in the spring and summer months from various sections of the study area. Archival data exist from prior to 2000 but TNH protocol imposes a ten year “statute of limitations” upon data to be used in reporting and analysis of fauna records. The TRCA data collection protocol requires surveys to begin in the spring, searching primarily for frog species of regional concern but recording incidentally the presence of any early-spring nocturnal bird species (owls and American woodcocks, *Scolopax minor*). The summer surveys are concerned primarily with the mapping of breeding bird species of regional concern. Songbirds are surveyed from late May to mid-July in order to obtain breeding bird data and to exclude migrants. The methodology for identifying confirmed and possible breeding birds follows Cadman *et al.* (2007). Fauna species of regional concern (species ranked L1 to L3) were mapped as point data with each point representing a possible breeding bird.

Table 2: Schedule of the TRCA biological surveys at the East Duffins Headwaters

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2002 ortho-photos	21 hours
Vegetation Communities and Flora Species	(28 th July, 1999 – incidental records only) 7 th , 30 th May; 7 th , 27 th , 28 th June; eighteen dates in July and seven dates in August, 2001. 29 th April; 15 th , 17 th , 21 st May; 18-25 th and 28 th June; 19 th September; and six dates in October, 2002. 2 nd , 7 th , 8 th , May; 6 th , 7 th , 13 th , 18 th , 25 th June; 5 th August; 11 th , 16 th September, 2007. 6 th , 14 th , 23 rd , 26 th , 28 th of May; 8 th , 10 th of July; 4 th and 8 th September, 2008. 19 th -29 th May; nine dates in June; 10 th , 17 th July; 6 th , 10 th , 14 th , 20 th , 21 st August; 11 th , 17 th , 25 th September, 2009.	Approximately 125 hours
Frogs and Nocturnal Spring Birds	26 th , 30 th April, 2001. 15 th April, 2002. 2 nd , 19 th April, 2007. 17 th , 18 th , 20 th , 21 st April, 2008. 15 th – 18 th April, 2009.	37.25 hours
Breeding Songbirds	7 th , 8 th June, 2001. Five dates in June; 2 nd , 4 th July, 2002. 8 th , 12 th June; 3 rd , 7 th July, 2007. Nine dates in June; three dates in July, 2008. 25 th , 26 th , 28 th , 29 th May; eight dates in June; 2 nd , 7 th , 8 th July, 2009.	250.5 hours

4.0 Results and Discussion

Information pertaining to the EDH Lands 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. Percent cover values and analysis was based on 2002 orthophotography

4.1 Regional Context

Historically, the region would have consisted of up to 95% forest cover. The most recent values calculated based on 2002 orthophotography are 25% natural cover and 75% non-natural cover

(48% urban and 27% rural / agricultural). Natural cover was composed of 17% forest and wetland and 8% meadow and old field/successional.

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 17% of the TRCA jurisdiction and is largely in the northern half, especially on the Oak Ridges Moraine (Map 3). The existing natural system stands below the regional quantity target (30%) and 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 (see 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.

4.2 Habitat Patch Findings for EDH Lands

The following details the study area according to the two natural system indicators used in designing the Terrestrial Natural Heritage System Strategy: the *quality distribution* and *quantity* of natural cover.

4.2.1 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

In the EDH lands, the majority of the forest habitat patches receive an “excellent” score for patch size meaning that they score five out of a possible five points (i.e. forest patches are at least 250 ha) (Map 5). The few habitat patches within the site boundaries that receive only three points, giving them a ‘fair’ score, are all meadow/open habitat patches. These smaller patches are generally embedded in the larger ‘excellent’ patches and are probably still functioning effectively. It is only when such small patches are isolated in a non-natural landscape that their small size becomes particularly detrimental.

Forest interior provides shaded, moist, cool conditions, and some refuge from external effects; the conditions needed for numerous native plants and animals. Larger forests are more resilient to negative matrix influences accompanying urbanization or trail systems. The largest areas of interior forest for the TRCA jurisdiction are within the EDH lands, in the northern half of the Walker Woods Tract and in the north-east corner of the Glen Major Resource Management Tract. The forest interior in these two areas is beyond 600 metres from any forest edge (Map 6).

The majority of the habitat patches at the EDH Lands score just 1 point (“very poor”) for shape, including the largest forest blocks. Within these larger patches several of the small but compact

shaped meadows score three or four points for shape. It should be noted that this shape measure is not intended to work in isolation but rather as a component of the *Total Patch Score*.

Habitat Patch Matrix Influence

The matrix influence for most of the habitat in the study area is ranked “excellent” (i.e. scores five out of a possible five points, see Maps 7 and 8). This score can be attributed to the largely natural and agricultural landscape surrounding the site at the time of the landscape analysis (2002). North Walker Woods and Dagmar are the only two forest blocks that are shown as scoring slightly lower for matrix influence (scoring “good”, or four out of five points).

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 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.

Habitat Patch Total Score

The habitat patch total score (quality) is split between the “excellent” rating to the east of Concession 6 and the “good” rating to the west. The “excellent” matrix influence, overall “good” habitat patch size and “very poor” patch shape score contributed to the total score for EDH (Map 9). The implication of this patch ranking is that the forest habitat at the EDH Lands should accommodate a good population of L1 to L3 fauna and flora species.

4.2.2. Quantity of Natural Cover

The area of the Duffins watershed (based on 2002 orthophotos) is approximately 28,654 hectares (ha), containing 41% natural cover, including 7651 ha as forest/successional habitat (27%), 3604 ha as meadow (13%) and 506 ha as wetland (2%). The surveyed area is 1301 ha of which 1275 ha are identified ELC communities. This amounts to 11% of the total natural cover in the Duffins watershed.

4.3 Vegetation Community Findings for EDH

4.3.1 Vegetation Community Representation

A total of 117 different ELC vegetation community types were described for the site (Appendix 1). There were 49 forest communities (34 natural forests and 15 plantations), 17 successional communities, 41 wetlands (including non-vegetated aquatic), 7 dynamic communities and 3 meadows. Four communities were recorded solely as complexes and/or inclusions within other

communities. The range of community types reflects the size, topography and geology of the study area, as well as the extensive plantings of conifer trees.

The EDH is 993 ha forest (411 ha are plantation) – this is approximately three-quarters of the study area. Most of the study area is covered by upland deciduous forests and coniferous pine plantations. The natural forest communities are dominated by sugar maple (*Acer saccharum*) with red oak (*Quercus rubra*), beech (*Fagus grandiflora*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), white cedar (*Thuja occidentalis*) and eastern hemlock (*Tsuga canadensis*) secondary associates. There are also moist coniferous areas dominated by white cedar. Early successional deciduous forest communities are common throughout the area, dominated by trembling aspen (*Populus tremuloides*), large-tooth aspen (*Populus grandidentata*), white birch (*Betula papyrifera*) and white pine (*Pinus strobus*).

Plantations occur throughout the site covering large areas with red pine (CUP3-1), white pine (CUP 3-2), Scotch pine (CUP3-3), white spruce (CUP3-C), European larch (CUP3- 6) and Jack pine (CUP3-4). Red pine plantations cover more area (247 ha) than any other ELC community.

Native deciduous savannahs are the most common type of successional habitat in EDH. Non-native and staghorn sumac (*Rhus typhina*) thickets, and native woodlands are also throughout the study area as part of the 105 ha of successional habitat.

Native meadows dominated by goldenrod (*Solidago* spp.), non-native grasses (e.g. *Poa* spp., *Bromus inermis*, and *Phleum pratense*) and asters (*Aster* spp.), cover 113 ha. Some meadows are regenerating with white pine or white cedar. A few fallow fields appear to be meadows until they are harvested in late summer; these were not included in the inventories. The more dynamic communities are barrens, prairies and savannahs and cover almost 3 ha. They are dominated by sedges (*Carex* spp.) and grasses and the treed communities also have red oak (*Quercus rubra*). These communities tend to be either fairly small openings or gaps where two or more plantations meet or complexes within another vegetation community.

Wetlands occupy 61 ha and aquatic communities are an additional 1 ha. The different wetland types are listed in order of number of hectares: swamps (47.7 ha), meadow marshes (8.4 ha), thicket swamps (3.2 ha), shallow marshes (1.3 ha), aquatic communities (0.9 ha) and one fen (0.4 ha). Organic coniferous swamp is the wetland community most commonly encountered with white cedar as the dominant followed by eastern hemlock and balsam fir (*Abies balsamea*). Wetlands and aquatic areas occur in dug ponds or natural kettles, in low lying areas and also along headwater tributaries (typically where the swamps are found). Some ponds remain filled with water throughout the year, supporting communities of duckweed (*Lemna minor* and *Spirodela polyrrhiza*), pondweeds (*Potamogeton* spp.) and stonewort (*Chara* spp.). Wet areas that dry out in the summer sustain communities of broad-leaved cattail (*Typha latifolia*), water horsetail (*Equisetum fluviatile*), sedges, jewelweed (*Impatiens balsamifera*) and other forbs. Reed canary grass (*Phalaris arundinaceae*) dominates many of the mineral meadow marshes and rice cut grass

(*Leerzia oryzoides*) and narrow-leaved cattail are often found in organic and mineral shallow marshes along the stream or surrounding deeper ponds. There are 13 small mineral and organic thicket swamps of willows (*Salix* spp.), red-osier dogwood (*Cornus stolonifera*) or winterberry (*Ilex verticillata*). Some of the open wetlands and aquatic habitats occur in areas that were likely once swamps that were flooded when a damn was built.

4.3.2 Vegetation Communities of Concern

Vegetation communities ranked L1 to L3, as described in Section 3.2, are detailed below and can be found in Appendix 1 and Map 10.

Three communities at EDH are ranked L1: white cedar shrub fen (FES1-9), tall-grass prairie (TPO1-1) and shrub sand barren (SBS1). They are all less than 0.5 ha and the SBS1 only occurs as a complex. The fen is characterized by habitat dependent species (see section 4.4.2), constant water supply and deep organic soils. Twelve L2 communities were found including three forest communities with red oak as a dominant, seven organic wetlands and two barrens (one clay and one sand). There are 25 L3 communities: 8 forests, 15 wetlands and two red oak savannah types. Another way to consider communities of conservation concern is by the large area of land they cover – 124 ha, or almost 10% of the inventoried area. Approximately 72.4 ha of this is forest (early successional more than other forest types) and treed swamps (44.8 ha). The large expanses of high quality cedar and hemlock organic swamps are found on either side of cold water streams mainly in the southeast portion of EDH whereas the forests are found throughout the study area.

The communities of concern with the most restricted local occurrence (i.e. the highest scores) found at EDH are oak - red maple forest, tallgrass prairie and white cedar shrub fen. Following those are seven others including wetlands (MAM2-4, MAM3-5, MAM3-8, MAM3-10, SAM1-3), open clay barren, and red oak savannah. These habitat patches are less likely to be found in the jurisdiction than most other communities and are typically smaller. For example, the dry, sandy prairie and savannah community types are likely only found in three other locations in the TRCA jurisdiction (e.g. High Park and Lambton Prairie).

Vegetation communities develop under certain site conditions and may be restricted to particular locations based on slope, aspect, hydrology, soil character (e.g. structure and nutrient status), and dynamic processes (e.g. erosion and flooding). Community types with the highest scoring geophysical requirements (score of five) consist of the cedar shrub fen, tallgrass prairie and shrub sand barren. Communities scoring four are: white pine-oak forest, red oak forest, winterberry organic swamp and clay barren. Sixteen additional communities score three points and are also considered to have specific geophysical requirements. There are different reasons EDH communities score high. For example: organic and coniferous wetlands are typically associated with cool headwater streams and ground water seeps; prairies and sand barrens exist in dry, sandy soils and require some disturbance.

4.4 Flora Findings for the East Duffins Headwaters

4.4.1 Flora Species Representation

East Duffins Headwaters had a total of 702 species of vascular plants recorded including two planted tree species, Jack pine (*Pinus banksiana*) and Rocky Mountain Douglas-fir (*Pseudotsuga menziesii* var. *glauca*) that do not occur naturally in the study area. These species are ranked pL+ in Appendix 2. Native plant species total 477 (68%). The relatively high biodiversity at this site, even with the history of logging, aggregate extraction, and agriculture, is attributed to the presence of large, diverse, intact habitats. Thirteen of the species listed in Appendix 2 were found by OMNR between the years 1997-1999 and were not recorded again by TRCA in later years. It is highly possible that some or all of them are still there. None of these 13 species are of regional conservation concern.

Invasive Species

Invasive, non-native flora species are from another geographical region that out-compete and displace native species. Invasives are introduced and spread by trails, fauna and other means. They seem to thrive in almost every habitat type at EDH except for wet or dry, sandy areas and in some cases form dense monocultures displacing most other species.

Of the 225 non-native species present at EDH, 7 are invasive species that are commonly encountered: common buckthorn (*Rhamnus cathartica*), dog-strangling vine (*Cynanchum rossicum*), garlic mustard (*Alliaria petiolata*), Manitoba maple (*Acer negundo*), creeping thistle (*Cirsium arvense*), white sweet clover (*Melilotus alba*) and multiflora rose (*Rosa multiflora*). The first four species are considered to be the largest threat to native biodiversity at EDH from this list. For invasive species mapping on Glen Major property please refer to TRCA's report – Glen Major Study Area 2008 Terrestrial Biological Inventory (TRCA 2008).

Many invasive species such as garlic mustard, dog-strangling vine and common buckthorn seem to have an affinity for trails and other disturbances. Most of the garlic mustard and dog strangling vine were found on or besides the trails or in pine plantations although they were not restricted to these areas. Invasive alien plant species pose a serious threat to the stability and diversity of natural ecosystems worldwide (Ladd and Cappucino 2005). Disturbance caused by development and recreational use facilitates the spread of invasive species (Mack and D'Antonio 1998). Trail systems provide a corridor for the spread of invasives into other habitats and typically there are large seed banks that are near impossible to remove.

Invasive flora species threaten flora and fauna species. For example, dog-strangling vine is not currently a viable host for the monarch butterfly (*Danaus plexippus*) even though monarchs will oviposit eggs on it (DiTommaso and Losey 2003). Although they reportedly do not often use dog-

strangling vine, they may need to turn to it as populations of the native common milkweed are displaced. Native species that grow in EDH that are particularly vulnerable to localized extinction from garlic mustard invasion are: wild ginger (*Asarum canadense*), Jack-in-the-pulpit (*Arisaema triphyllum*), *Trillium* spp., trout lily (*Erythronium americanum*), hepatica (*Anemone acutiloba* and *americana*), toothworts (*Cardamine* spp.) and oak seedlings (Meekins and McCarthy 1999). Several native butterfly species lay eggs on garlic mustard but many or all of the larvae die (Nuzzo 2000). The West Virginia white butterfly (*Pieris virginiensis*), listed under SARO as special concern, will often use garlic mustard for oviposting in the absence of its native host plants, toothworts, although most die by the 4th instar.

4.4.2 Flora Species of Concern

There are 197 species of vascular plant at the East Duffins Headwaters study area that are of regional conservation concern (rank L1 to L3, Section 3.2) (Appendix 2; Map 11). The ranks are based on sensitivity to human disturbance associated with development; and habitat dependence, as well as on rarity and population trend (TRCA 2007). In most cases, the species are not currently rare but are at risk of long-term decline due to the other criteria. At EDH 63 species of concern are regionally rare (found in six or fewer of the 44 10 x 10 km grid squares that cover the TRCA jurisdiction). The following EDH species are provincially and/or globally rare: long-stalked panic grass (*Panicum perlongum*), American ginseng (*Panax quinquefolius*), butternut (*Juglans cinerea*) and Schweinitz' sedge (*Carex schweinitzii*). Ginseng and butternut are endangered species under the federal Species at Risk Act.

Creeping juniper (*Juniperus horizontalis*), hooked-spur violet (*Viola adunca*) and long-stalked panic grass were recently recorded for what is believed to be the first time in the TRCA jurisdiction. Other records that are unique to EDH are strawberry-blite (*Chenopodium capitatum*), northern slender ladies tresses (*Spiranthes lacera* var. *lacera*), long-stalked panic grass and golden corydalis (*Corydalis aurea* ssp. *aurea*).

All 197 flora species of concern are associated with specific vegetation communities; consequently, they are highly susceptible to changes in these communities and will not readily recolonize. They score relatively high in habitat dependence (Map 12). Roughly, they are found in seven or fewer vegetation cohorts (groupings of vegetation types with similar floristic characteristics). EDH is one of a few locations in the TRCA jurisdiction where many savannah and prairie species can still be found. Some of these habitat specialist species are: round-headed bush-clover (*Lespedeza capitata*), little and big bluestem (*Schizachyrium scoparium* and *Andropogon gerardii*), arrow-leaved violet (*Viola sagittata* var. *ovata*) and pinweed (*Lechea intermedia*). Specialists of successional habitat include hawthorns such as *Crataegus macrosperma* and *C. chrysocarpa* var. *aboriginum*, and Canada plum (*Prunus nigra*). Spotted coral-root (*Corallorhiza maculata*) and downy rattlesnake-plantain (*Goodyera pubescens*) are examples of locally rare species only found in mature forests. Organic swamps contain many habitat dependent species such as winterberry holly (*Ilex verticillata*), goldthread (*Coptis trifolia*),

and twin flower (*Linnaea borealis ssp. longiflora*). Schweinitz' sedge is dependant on cold spring-fed brooks and fens and has only been recorded in the TRCA jurisdiction at EDH and Goodwood Conservation Area thus far. Other species found that are typically restricted to fens (and kettle peatlands) are round-leaved sundew (*Drosera rotundifolia*) and thin-leaved cotton-grass (*Eriophorum viridi-carinatum*).

All 197 species of concern in EDH are affected by development-related impacts i.e. they are vulnerable to at least one kind of disturbance that is associated with land use changes (Map 7). Examples of especially sensitive forest species are one-sided pyrola (*Orthilia secunda*), wood betony (*Pedicularis canadensis*) and pipsissewa (*Chimaphila umbellata ssp. cisatlantica*). They are sensitive to trampling, invasive species, and contamination from surface water and air pollution; in addition, pipsissewa is sensitive to changes to natural dynamic processes and removal. These human led impacts exist in EDH and for now are much less intense than most other parts of the region.

Field observations indicate that there is a sizable deer population at this site as many of the forest species had noticeable deer browse. American ginseng, an endangered species in Canada, is adversely affected by deer browse, invasive species, and removal.

Broad-leaved panic grass (*Panicum latifolium*), white wild licorice (*Galium circaezans*), white adder's mouth (*Malaxis monophyllos ssp. brachypoda*) and green-flowered pyrola (*Pyrola chlorantha*) were found by TRCA within the Uxbridge Forest Kames ESA in 1980 (Bird and Hale 1990) but have not been recorded in the area since. All but the white wild licorice (L3) are L1 species. The exact record locations and abundances are not known. It is possible that these species were found outside of the EDH study area or they were missed in recent visits. Another possibility is that they have been extirpated from the study area. The approximate location of these species is likely to be in the block to the south of Chalk Lake Road, and to the east of Concession 7 based on the report by Bird and Hale (Bird and Hale 1990). These species are given the highest sensitivity scores, therefore they are more susceptible to population declines due to the negative impacts discussed above. In the case of white adder's mouth, the only record in the TRCA database is in the headwaters of the Humber watershed found over 10 years ago.

4.5 Fauna Findings for the East Duffins Headwaters

4.5.1 Fauna Species Representation

The TRCA fauna surveys on the TRCA properties within the EDH over the past decade have inventoried a total of 106 bird species, 15 mammals, and 10 herpetofauna species, bringing the total number of possible breeding fauna species identified by the TRCA to 131. Given the lack of any extensive wetland habitats, and the somewhat restricted extent of the meadow habitat on the TRCA properties at this location, this figure – particularly for birds - is exceptionally high and there are very few forest-bird species that occur in the region that are not represented at this site. Only

in the north-western corner of the region where there is extensive forest cover, and with the addition of more extensive wetland habitat, do any of the larger sites achieve the same species richness. Records from outside of the TRCA property boundaries – on local conservation easements, or on land abutting TRCA property – can add a further six species (four birds: Virginia rail *Rallus limicola*, osprey *Pandion haliaetus*, Canada warbler *Wilsonia canadensis*, and summer tanager *Piranga rubra*; and two herps: common snapping turtle *Chelydra serpentina*, and midland painted turtle *Chrysemys picta marginata*). Surveys prior to the current decade can also add a further species, sharp-shinned hawk, *Accipiter striatus*. Refer to Appendix 3 for a list of the fauna species in the EDH study area and their corresponding L-ranks.

4.5.2 Fauna Species of Concern

Fauna species, like vegetation communities and flora species are considered of regional concern if they rank L1 to L3 based on their scores for the seven criteria mentioned in Section 3.2. 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 the EDH study area reported a total of 49 L1 to L3 bird species including one L1 species (whip-poor-will, *Caprimulgus vociferous*), and ten L2 species (including four large raptor species: red-shouldered hawk *Buteo lineatus*, broad-winged hawk *Buteo platypterus*, northern goshawk *Accipiter gentilis*, and barred owl *Strix varia*). In addition, there were seven herpetofauna and three mammal species ranked L1 to L3, bringing the total to 59 fauna species of regional concern. Locations of these breeding fauna are depicted on Map 13.

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 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 44 10x10 km grid squares in the TRCA jurisdiction is considered regionally rare (i.e. scores three to five points for this criterion). At the EDH study area the inventories conducted between 2000 and 2009 reported 26 species of regional concern that are also considered regionally rare. The majority of these species (23 in total) are birds, a taxonomic group which is relatively easy to assess and as such the TRCA has a good understanding of their real population status in the jurisdiction. The remaining three species – northern flying squirrel *Glaucomys sabrinus*, spotted salamander *Ambystoma maculatum* and eastern newt *Notophthalmus viridescens* – are taxa that are somewhat more difficult to survey. It is possible that these species occur more widely in the region than is currently known. However, for a similar reason, it is highly likely that additional herpetofauna and mammal species occur – e.g. snake species or bat species - within the current study area but have not been captured by the TRCA inventory method which is based largely on the registering of vocalizing individuals (i.e. birds and frogs). As is the case with flora, most regionally rare fauna species have other associated factors that explain their vulnerability and need to be taken into account in conservation strategies.

Many of the bird species that are considered regionally rare are represented at EDH by their highest regional population. This includes several species that are listed either under the federal Species At Risk Act (Environment Canada 2010), Ontario's Species at Risk legislation (SARO) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC): whip-poor-will (listed as "threatened" by COSEWIC and SARO, holds two territories on TRCA property, another three on adjacent land), golden-winged warbler (*Vermivora chrysoptera*, six territories all on TRCA land), and hooded warbler (*Wilsonia citrina*, eleven territories on TRCA land, a further two territories located on adjacent property). The EDH area can properly be considered a stronghold for all three of these significant species, with more than half of the regional populations of these species occurring here.

Of particular interest is the high number of pairs of large raptor species that were inventoried in the EDH study area. TRCA surveys identified a total of eight broad-winged hawk territories, with an additional territory registered on an adjacent property. Although it can be difficult to define territorial boundaries for this wide-ranging species, particularly when the totals are comprised of data from different portions of the study area in different years, the TRCA mapping shows these territories as being fairly evenly and widely spaced across the entire study area. The regional total for this species is 28 territories; forest habitat at EDH holds almost a third of the regional population. Similarly, red-shouldered hawk has almost half its regional population in the EDH area (although only three of the five territories are located on TRCA property). The situation for barred owl is even more extreme with five pairs on TRCA property at EDH and an additional four pairs on adjacent properties; meanwhile the TRCA inventories have reported this species at just two other locations throughout the region. Glen Major can certainly be considered likewise the regional stronghold for this L2 species, a species that is considered indicative of high quality forest habitat.

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, raccoons and house cats); parasitism (from facilitating the access of brown-headed cowbirds, *Molothrus ater*, a species which prefers more open, edge-type habitat); competition (for nest-cavities with bird species such as house sparrows, *Passer domesticus*; and European starlings, *Sturnus vulgaris*); flushing (causing disturbance and abandonment of 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 EDH, all but three of the 59 species that are ranked L1 to L3 receive this score and are therefore considered sensitive to one or more of the impacts associated with development (see Map 8). These species are at this site because the largely natural and agricultural matrix does not produce any of the negative impacts associated with more urban or suburban matrices. However, as Toronto's urban centre and suburban edge inch further out towards the northern reaches of the region, areas such as EDH become subject to ever greater visitor pressure, as city residents search for opportunities for outdoor recreation.

For this reason it is important to understand that negative matrix influences are not solely associated with the proximity of urban and suburban developments; 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. The TRCA lands at EDH are already used extensively by a thriving local community, whose numbers are greatly augmented, at weekends and throughout the summer, by bikers and hikers from further afield. Fortunately, the area in question is very extensive and should be able to accommodate responsible use by human visitors.

Many of the bird species that might be expected to occur in such an extensive patch of forest nest low in the ground vegetation and as such 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. Such sensitive bird species include ovenbird (*Seiurus aurocapillus*), veery (*Catharus fuscescens*), whip-poor-will, ruffed grouse (*Bonasa umbellus*) and American woodcock (*Scolopax minor*) all of which were reported as holding territories in the forest block at EDH. Ovenbird (a ground-nesting and ground-foraging species) was reported to have a total of 316 territories at the site, with a further 106 territories on adjacent non-TRCA properties: this constitutes over a third of the regional total inventoried by the TRCA over the past decade. This is extremely significant since the implication is that EDH, along with a large area in the north-west Humber watershed, is a potential major population source for many other ovenbird populations across the region. The same is true for several other forest bird species of regional concern including another ground-nesting species, the hermit thrush (*Catharus guttatus*): 47 territories have been identified on TRCA property at EDH over the past decade, i.e. 58.75% of all hermit thrush territories identified across the region by TRCA inventories over the past decade.

The results of the series of inventories conducted at EDH indicate that the area is regionally very significant for many sensitive forest-bird populations. This should be considered in any proposals to increase or alter public use of the properties at EDH. 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 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).

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 on and varying inversely with the overall percentage forest cover within the landscape surrounding the site where those species are found (Rosenburg *et al.* 1999).

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 needs are more likely satisfied within a larger extent of natural cover.

A total of 45 of the fauna species of regional concern that were identified at EDH are considered area sensitive (Map 5); of these all four of the aforementioned large raptors require in excess of 100 ha. The *area sensitivity* of the large raptor species is partly a result of these species' low tolerance of disturbance at the nest-site, such species are very prone to abandonment of nests if disturbed, especially in the early stages (e.g. through nest-building and brooding).

A further 11 species of regional concern occur that require in excess of 20 ha of natural habitat, including: whip-poor-will, black-and-white warbler (*Mniotilta varia*), hooded warbler and porcupine (*Erethizon dorsatum*). All four of the latter species are ground-borne fauna and part of their requirement for large tracts of land has to do with the fact that they are highly susceptible to ground-borne disturbances (e.g. off-leash dogs) which become somewhat less of a problem over larger areas.

Area sensitivity for species such as eastern newt and spotted salamander – together with several other herpetofauna - is also closely associated with these species' requirement for a habitat matrix which includes both habitat elements that are equally essential for the completion of their annual life-cycle. Several amphibian species require wetlands in which to breed, and upland forest habitat in which to forage and hibernate.

It should be noted here that the concept of interior forest is tied very closely to *area sensitivity*. Referring to Map 6, it is clear that the forest at EDH has large tracts of interior forest habitat in fact the forest complex is recognized as having the most extensive patches of interior forest in the region. Such patches are identified by distances to edges created by roads and buildings but does not take into account the presence of trails, even some of the quite large trails that run through the forest at EDH. The large proportion of forest identified as interior-type no doubt plays a large part in explaining why the diversity and population of sensitive forest fauna is so much higher in the forest blocks at EDH than just about anywhere else in the region.

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 roadkill). 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.

Twelve of the species of regional concern that were inventoried for the study area scored three or more points for this criterion. Seven of these species are herpetofauna, including the L1 ranked spotted salamander. These species are particularly mobile during the course of their life-cycle: wood frogs (*Rana sylvatica*), eastern newt and spotted salamanders undertake annual migrations to and from local breeding ponds. They are therefore particularly susceptible to fragmentation of the various habitat types that they require for completing their life-cycles. Likewise the three L1 to L3 ranked mammal species are sensitive to fragmentation of forest habitat. Care should be taken to maintain safe passages and habitat corridors between habitat patches. The extensive area of continuous forest cover, with very little fragmentation by roads and other artificial barriers, is no doubt a major reason why such species are persisting so successfully at EDH. The study area is surrounded by relatively busy roads which create barriers between the forest system at EDH and other neighbouring forest systems, but the sheer size of the EDH forest seems to be adequately compensating - species are persisting because the species' habitat needs are met within the EDH block.

Fauna species that score greater than three points under the **habitat dependence** criterion are considered habitat specialists (see Map 14). These species exhibit a combination of very specific habitat requirements that range from their 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. Almost half (29 species) of the fauna species of regional concern that occur at EDH are considered habitat specialists. Most of these species are forest-dependent bird species, and the list includes all four of the aforementioned large raptors. A requirement for extensive mature forests with a substantial element of interior-type forest conditions is dominant for many of the species, but alongside this rather general requirement are specific needs for smaller scale structural qualities within the habitat. Such micro-habitat and structural requirements occur in many species that otherwise are not considered habitat dependent. Thus a species such as whip-poor-will can breed in a wide variety of forest habitats as long as its requirement for occasional gaps in canopy cover (occurring naturally through wind-throw, for example) forest edges, and presence of downed logs providing nesting sites is met.

In an extensive natural system such as exists at EDH, the occurrence of a diverse range of micro-habitats and vegetation structural elements provides a high number of nesting opportunities for a diverse array of forest and shrub-habitat species. It is primarily the large extent of the natural habitat at EDH that increases the probability of the occurrence of a wide variety of habitat-niches. This variety in turn provides plenty of opportunities for the natural system to be exploited by a very rich diversity of fauna.

Representation is essentially the presence or absence of a species at a site. However, beyond mere representation of single species is the idea that a natural system can be considered as 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 high numbers (certainly when put in the regional context) of many habitat dependent species (the four large raptor species, yellow-bellied sapsucker *Sphyrapicus varius*, ovenbird, Blackburnian warbler *Dendroica fusca*, black-throated green warbler *Dendroica virens*) implies that the forest habitat at EDH is functioning at a high level providing ample nesting opportunities for a diverse avifauna.

Within the system there are also areas of open habitat which provide further variation in nesting opportunities for species such as golden-winged warbler, blue-winged warbler (*Vermivora pinus*), Nashville warbler (*Vermivora ruficapilla*) and eastern towhee (*Pipilo erythrophthalmus*). Such open habitat is a dwindling commodity in the eastern North American landscape (Askins 2000) as land managers strive to increase forest cover, and too often such open habitats have been considered wasted opportunities better served by agriculture and other non-natural uses. Natural open habitat has never been a major landscape feature in what is now the TRCA region, but has often existed as a temporary result of natural events such as wind-throw, fire and, more recently, abandoned farmland. Many of the species associated with such areas are consequently showing significant declines across the eastern portion of their range, e.g. golden-winged warbler (listed as

threatened under the Species At Risk Act) and blue-winged warbler. Both of the latter species are well-represented on the TRCA property at EDH.

5.0 Highlights and Recommendations

The recommendations for the EDH 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 site highlights, followed by specific recommendations for the lands as a whole.

5.1 Site Highlights

- The site contains the largest patches of natural habitat in the TRCA jurisdiction
- The habitat patch total score for the site ranks as a mix of “excellent” and “good”
- The entire study area should be considered of conservation concern because of the high biodiversity and considerable range of vegetation communities covering the largest natural expanse in the TRCA jurisdiction.
- The site contains significant headwater wetlands including seepage swamps, especially in the southeast portion
- The natural system at EDH acts as a healthy source of native seed and a source population of breeding fauna species for less extensive natural systems within the region.
- TRCA inventories reported a total of 131 vertebrate fauna species with a total of 59 species of regional concern – among the highest totals for the entire region
- The EDH area accommodates the highest concentration of large raptor species for the region
- The natural system at EDH also includes prairie and savannah remnants together with the associated species, some of which are very scarce and declining within the region.
- Seven species listed either as federal or provincial Species At Risk are found in the study area: hooded warbler, golden-winged warbler, whip-poor-will, common nighthawk, red-headed woodpecker, ginseng and butternut.
- There is a relatively large amount of naturally-occurring flora species - 702, and an equally impressive number of species of regional conservation concern - 197
- Seven flora species of concern in the EDH study area have not been recorded anywhere else in the TRCA jurisdiction within the last 25 years including pinweed (thought to be extirpated) and long-stalked panic grass (new record for the jurisdiction)
- Invasive non-native flora are displacing native species in many parts of the study area. The most troubling invasive species are: Manitoba maple, dog-strangling vine, garlic mustard, and common buckthorn
- There are a few areas within the forest system where trail density is low, such areas present opportunities for a significant breeding population of large raptor species.

5.2 Site Recommendations

From a terrestrial natural heritage point of view, EDH would benefit most by improving the quality of natural cover. Habitat quality is currently limited by the presence of invasive species and by the current trail density (and thereby the absence of any extensive undisturbed areas). Minimizing the negative matrix influences as explained below is essential for achieving a higher quality natural system at EDH.

Minimize Negative Matrix Influence

Negative matrix influence is not strictly associated with close proximity to an urbanized landscape. Influences associated with distant urbanization can be transferred deep within an otherwise natural landscape by means of a trail system. The effects of urbanization on natural areas within EDH will be seen as the populations of communities such as Markham and Seaton grow and more people visit the EDH area for recreational purposes. A well designed trail system can help to mitigate many of the negative influences that could be transferred from such urban areas.

The trail system at EDH is extensive and in places very dense with many stretches of trails running close and parallel to each other, crossing and re-crossing at short intervals, and generally winding through the natural habitat. There are several opportunities to create large areas of undisturbed habitat (“sanctuaries”) within the study area by decommissioning sections of trail.

Such sanctuary areas would provide habitat for more sensitive fauna species such as hawks, larger mammals, ground-nesting birds and for sensitive flora such as American ginseng. They would also provide a source of individuals (both flora and fauna) for recruitment into and beyond the larger EDH forest block. A network of sanctuaries will provide opportunities for sensitive species to thrive, undisturbed by off-leash dogs, bikers and hikers.

The selection of sanctuary areas should be made by considering the combination of criteria below. TRCA staff expertise and knowledge should also be used to finalize the selection.

- The presence of Species at Risk
- The presence of L1 and L2 ranked vegetation communities
- Areas that already have a relatively low density of trails
- Within existing forest interior habitat
- The presence of fauna and flora species that score between three and five points for sensitivity to development
- The presence of good numbers of low-nesting sensitive bird species (e.g. ruffed grouse, hermit thrush)

The following points are recommendations for minimizing negative matrix influence:

- A series of habitat blocks of at least 25 ha in size should be designated as sanctuaries (inaccessible to visitors by trail) to maintain populations of sensitive species and the current high level of biodiversity
- Keep trails well away from Provincially Significant Wetlands (PSW) as these are extremely sensitive habitats
- Continue the education and awareness campaign, seeking to instil values of responsible natural heritage stewardship in the visitors to the forest
- Signage at trail heads can warn users that slow moving animals such as salamanders may be on trails (particularly during and after rain events)
- Continue removal of invasive species with focus given to those areas becoming newly colonized (as opposed to areas where invasives are established). Immediately planting these areas with competitive native species will help prevent re-colonization of invasives
- Inform neighbouring residents of the importance of using non-invasive flora, and consider offering incentives for using native species
- Tree cutting should only occur in fall or early winter to avoid bird nesting periods (owls nest mid to late winter).

Improve Habitat Quality

Habitat quality can be improved through the provision of a varied and dynamic landscape (e.g. mature forests, meadows, wetlands), the management of current and potential invasive species, and by making the following especially sensitive areas inaccessible: designated sanctuaries, areas of high concentrations of species of concern, PSWs, and any other areas where Species at Risk or particularly rare species occur.

Management of invasive species, especially dog-strangling vine, garlic mustard and common buckthorn, is imperative to maintaining the current level of native biodiversity at EDH; newly invaded areas are the priority. Management practices recommended are species removal and decreasing the disturbances that allow for invasive species (as long as the level of disturbance exists, invasives will continue to spread even if removal is occurring). Decreasing trail density is one way to lower disturbance levels.

There are habitat dynamics that exist at EDH today that have created opportunities for a broad range of flora species and nesting bird species. At EDH there are several Species at Risk. It is important to enhance and protect these populations by understanding and meeting their specific habitat requirements. Three of these species, hooded warbler, whip-poor-will and American ginseng, are dependent on forest habitat, while two other species, golden-winged warbler and common nighthawk, prefer more open, forest-edge type habitat.

It is important that the EDH property is seen as more than simply an impressively large tract of mature forest. Transitional early-succession scrub habitat, occurring when open habitat begins to revert to closed forest, accommodates a wide variety of fauna and flora species that subsequently

disappear as the habitat closes. There are flora species such as round-headed bush-clover and hooked-spur violet that only occur in sandy forest edge type habitat and are found in just two or three sites in the TRCA jurisdiction.

For managers of large tracts of land who are mandated to enhance and maintain a rich biodiversity, one of the main issues is in the provision of a variety of habitats that accommodate seemingly incompatible species, for example, open-habitat species versus closed canopy species. However, research has shown that populations of one such open-habitat species, golden-winged warbler, can be sustained in forested landscapes which incorporate small natural or man-made openings (Hamel *et al.* 2005). There are two different strategies that the TRCA could implement at EDH to reconcile the needs of early-successional species with those of closed canopy species.

1. Identify existing golden-winged warbler habitat; sand barrens, prairie remnants and savannahs to maintain as such. Manage these areas aggressively and repeatedly using techniques such as rotating controlled burns.
2. Pursue easements and acquisition of land that contain open and early-successional habitat patches in addition to those currently owned and managed by TRCA.

Early-successional habitats (such as regenerating clear-cuts) have been identified as providing significant nesting habitat for golden-winged warblers and considerable foraging opportunities for many otherwise forest-dependent species (including both hooded warbler and especially whip-poor-will). Fringed black bindweed (*Polygonum cilinode*) and golden corydalis (*Corydalis aurea*) are two of the many flora species of concern that also seem to prefer early-successional habitat.

The first strategy from the list should be applied only if it would not negatively impact the vast majority of the habitat at EDH (e.g. through invasive species colonization or introduction). It is important to ensure that such management occurs in areas where human traffic is minimal so that ground-nesting species associated with such habitat are able to be as productive as possible. The desired result is an increase in the local populations of golden-winged warbler. Invasive plants such as dog-strangling vine and common buckthorn are opportunistic and may colonize the managed openings. Areas being managed as early-successional habitat need to be monitored and invasive flora removed swiftly.

Finally, on this point, it needs to be understood that one of the potential causes for the persistent decline observed in the eastern North American population of golden-winged warbler is the competition with the closely related blue-winged warbler. Typically this species had a more southerly distribution than the golden-winged warbler but in recent decades the more southern species has been moving into golden-winged habitat and displacing that species (primarily through interbreeding and hybridisation). This is of considerable concern, but may be seen as a relatively natural course of events. By providing more habitat options for these two species a buffer

may be provided that will help to maintain golden-winged warbler. Furthermore, such early-successional habitat is important for many other species that are likewise declining in eastern North America. The key point really is simply the provision of a varied and dynamic landscape.

Optimize Patch Size & Shape, Forest Interior

Fauna and flora communities are more resilient to impacts from development and increased user pressure when they are in larger habitat blocks. Patch size and forest interior in the EDH study area do not appear to be limiting factors as they are in most other parts of the TRCA jurisdiction. In fact, these two habitat qualities are regionally best represented here. However, the EDH faces both increasing matrix influences (growing human population) and a requirement to meet the habitat needs of displaced fauna. To better withstand these pressures, an increase in natural cover is recommended for EDH. The increase of natural cover in and around EDH through strategic easements, acquisitions and stewardship, can improve the patch size, shape and help to reduce negative matrix influences.

Improve Connectivity to Nearby Habitat

The potential for larger mammal species, such as fisher (*Martes pennanti*), to occur in EDH is quite real and will be much improved if connections with other habitat patches are maintained. With this in mind the TRCA should try to liaise with managers of forested properties beyond the jurisdictional boundary (e.g. the neighbouring Durham Forest) to maximize the potential for fauna dispersal and recruitment. Seed dispersal ranges can also be increased when habitat patches are connected that in turn strengthen populations.

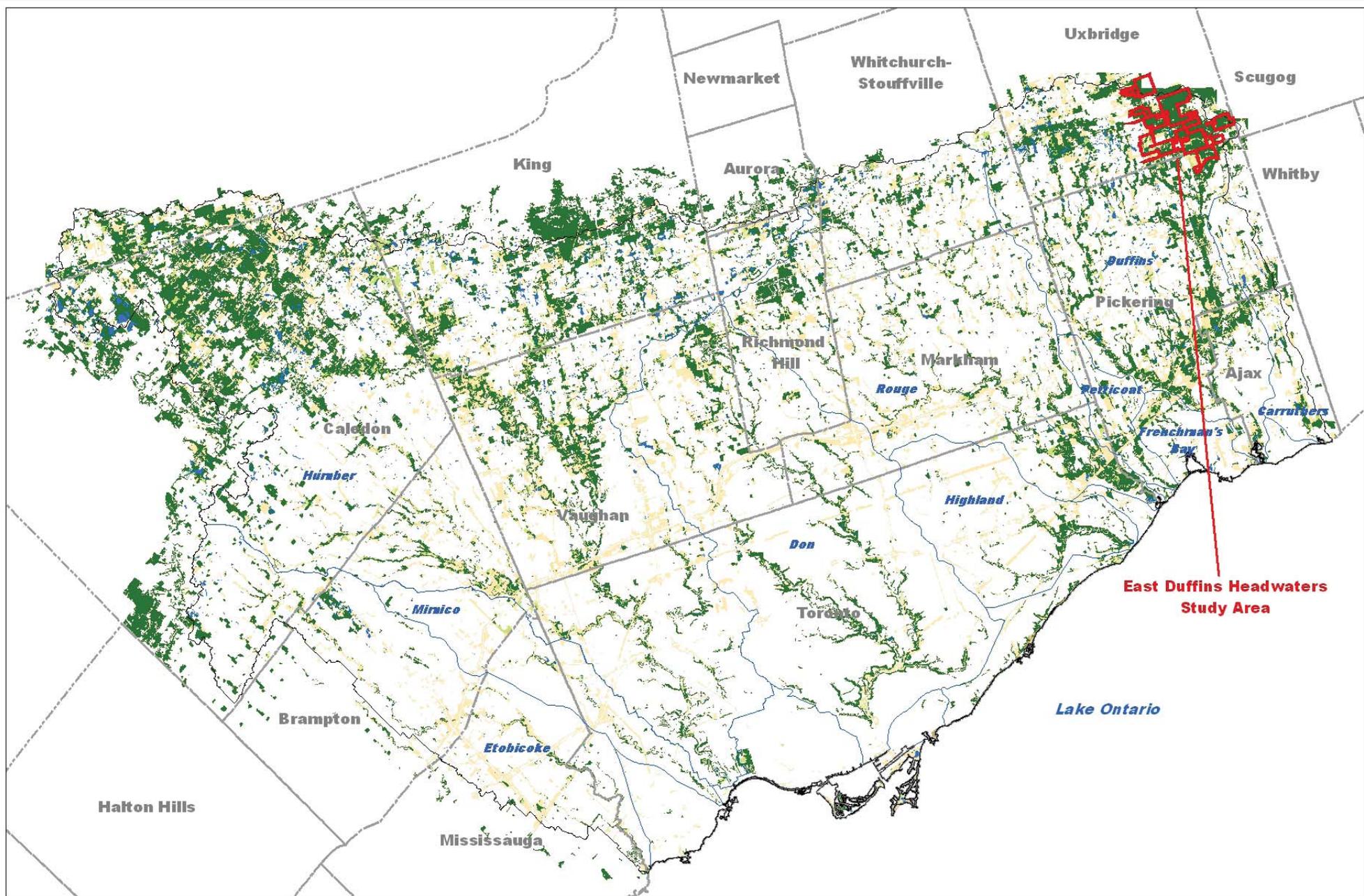
- Identify any road kill “hotspots” on local roads, both within and beyond jurisdictional boundaries and then work with local stakeholders to find ways of mitigating any identified problems.
- Be proactive in the monitoring of any proposed road changes in the vicinity – both those roads that cut across the EDH forest and those that border the area. Any signs of increasing traffic density and increasing traffic speed should be investigated and mitigated.

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Date: April 2010

* Landscape analysis based on 2002 Orthophotography

Map 1: East Duffins Headwaters Study Area in the Context of Regional Natural Cover

Natural Cover *		Legend	
	Forest		East Duffins Headwaters Study Area
	Successional		TRCA Jurisdiction
	Meadow		Watershed
	Wetland		Municipal Boundary
	Beach/Bluff		



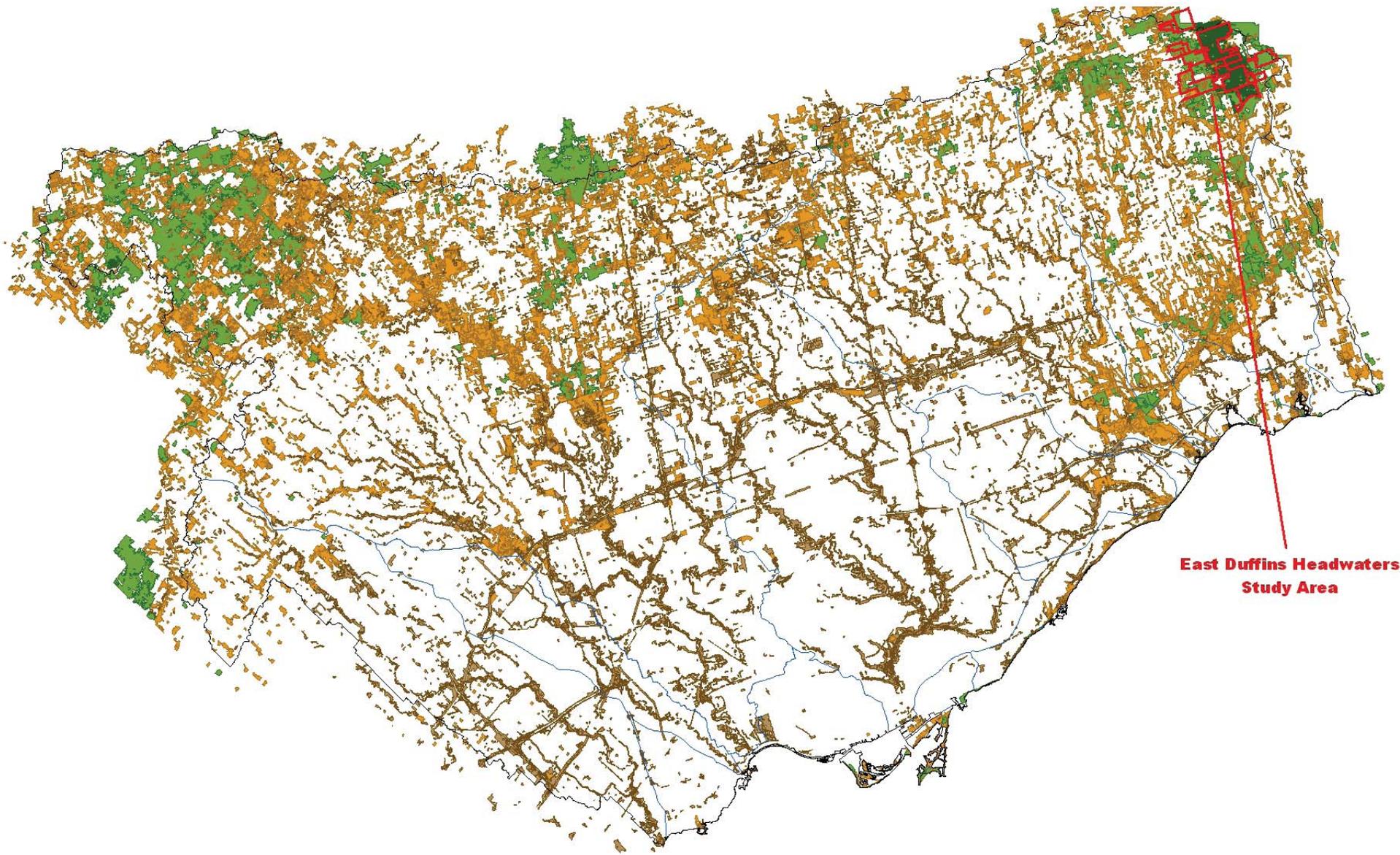
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Map 2:
East Duffins Headwaters
Study Area

Legend



Study Area



East Duffins Headwaters Study Area

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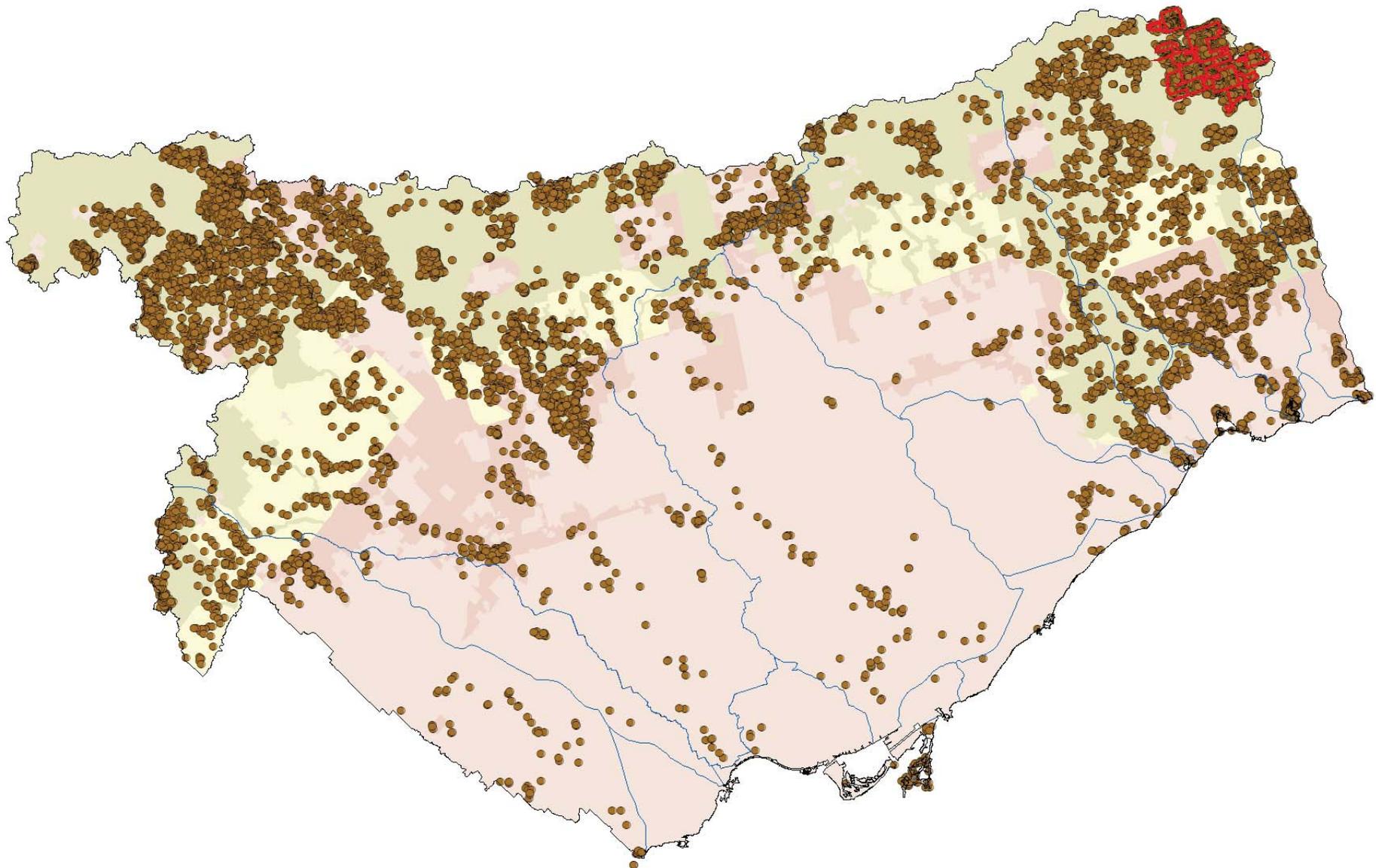


0 2.5 5 10 15 20 Kilometers

Date: April 2010
 * Landscape analysis based on
 2002 Orthophotography

Map 3:
Regional Natural System
Habitat Patch Quality

Habitat Patch Quality *		Legend	
	L1 - Excellent		East Duffins Headwaters Study Area
	L2 - Good		TRCA Jurisdiction
	L3 - Fair		Watershed
	L4 - Poor		
	L5 - Very Poor		

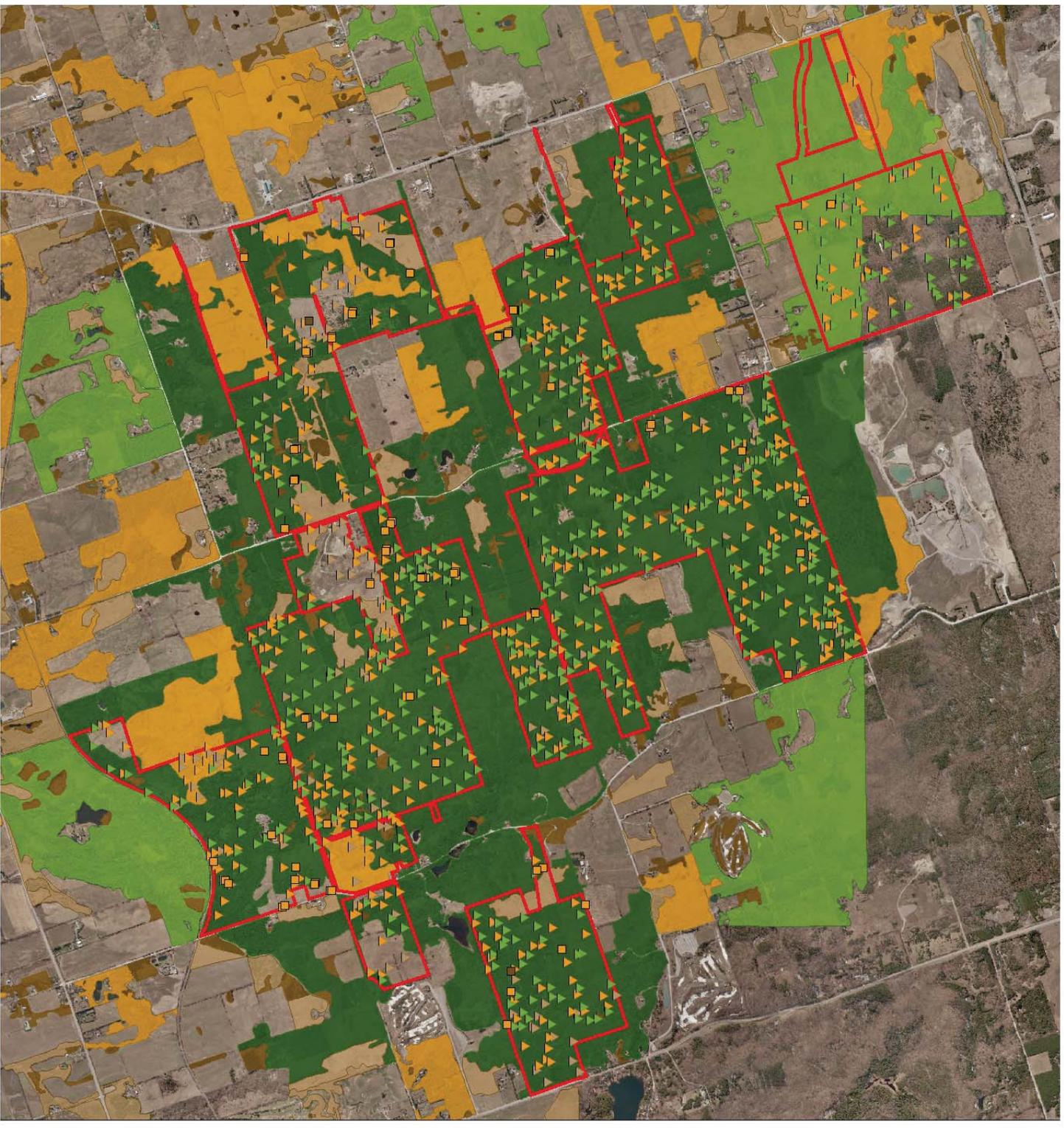


Date: April 2010

Map 4: Distribution of Fauna Regional Species of Concern

Legend

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



- Fauna Area Sensitivity Scores**
- ▲ 5 - >100ha
 - ▲ 4 - >20ha
 - ▲ 3 - > 5ha
 - ▲ 2 - > 1ha
 - ▲ 1 - < 1ha

- △ Fauna Species
- (□ Frog Species)

- Habitat Patch Size Scores ***
- 5 - Excellent
 - 4 - Good
 - 3 - Fair
 - 2 - Poor
 - 1 - Very Poor



0 250 500 1,000 1,500 Meters

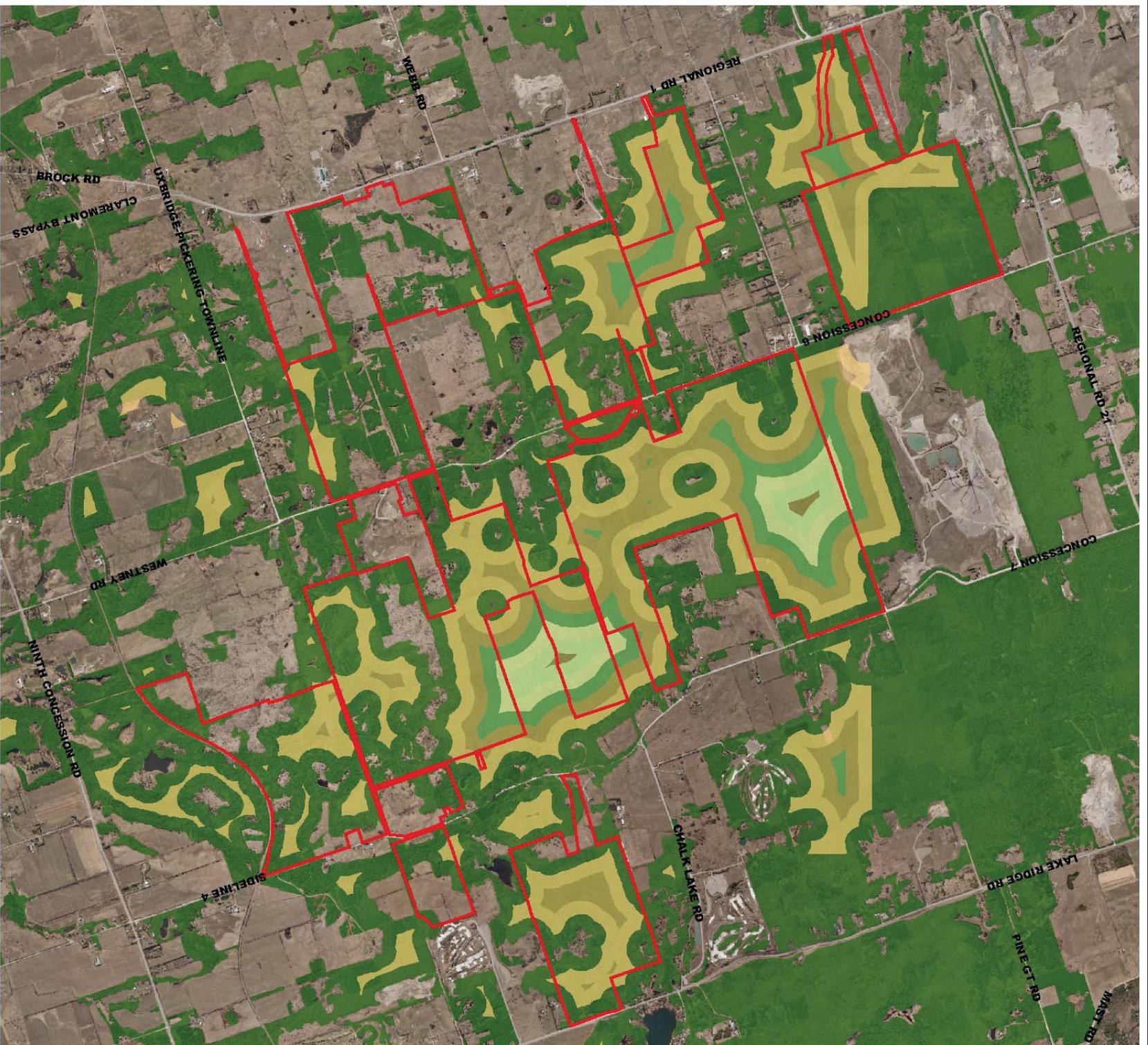
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 Orthophoto: Spring 2008, First Base Solutions Inc.
 * Landscape analysis based on 2002
 Orthophotography

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

Legend

□ East Duffins Headwaters Study Area

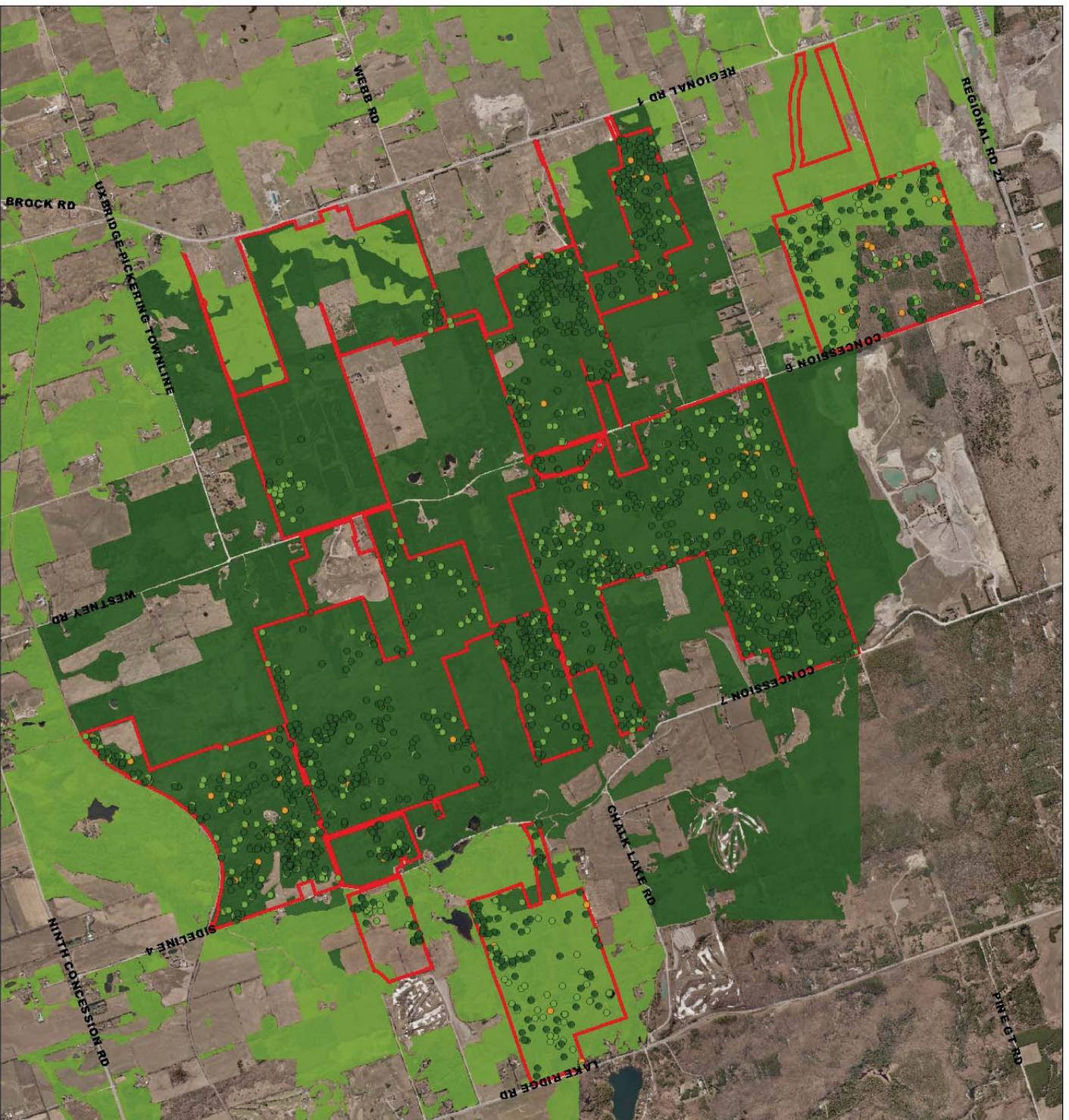
NOTE: All fauna species with their associated scores for area sensitivity can be found in Appendix #3.



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Map 6:
Interior Forest at
East Duffins Headwaters

Legend	
	East Duffins Headwaters Study Area
	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

Legend

- | | |
|-----------------------------------|------------------------------------|
| Habitat Matrix Influence Scores * | East Duffins Headwaters Study Area |
| 5 - Excellent | East Duffins Headwaters Study Area |
| 4 - Good | |
| 3 - Fair | |
| 2 - Poor | |
| 1 - Very Poor | |

Map 7:

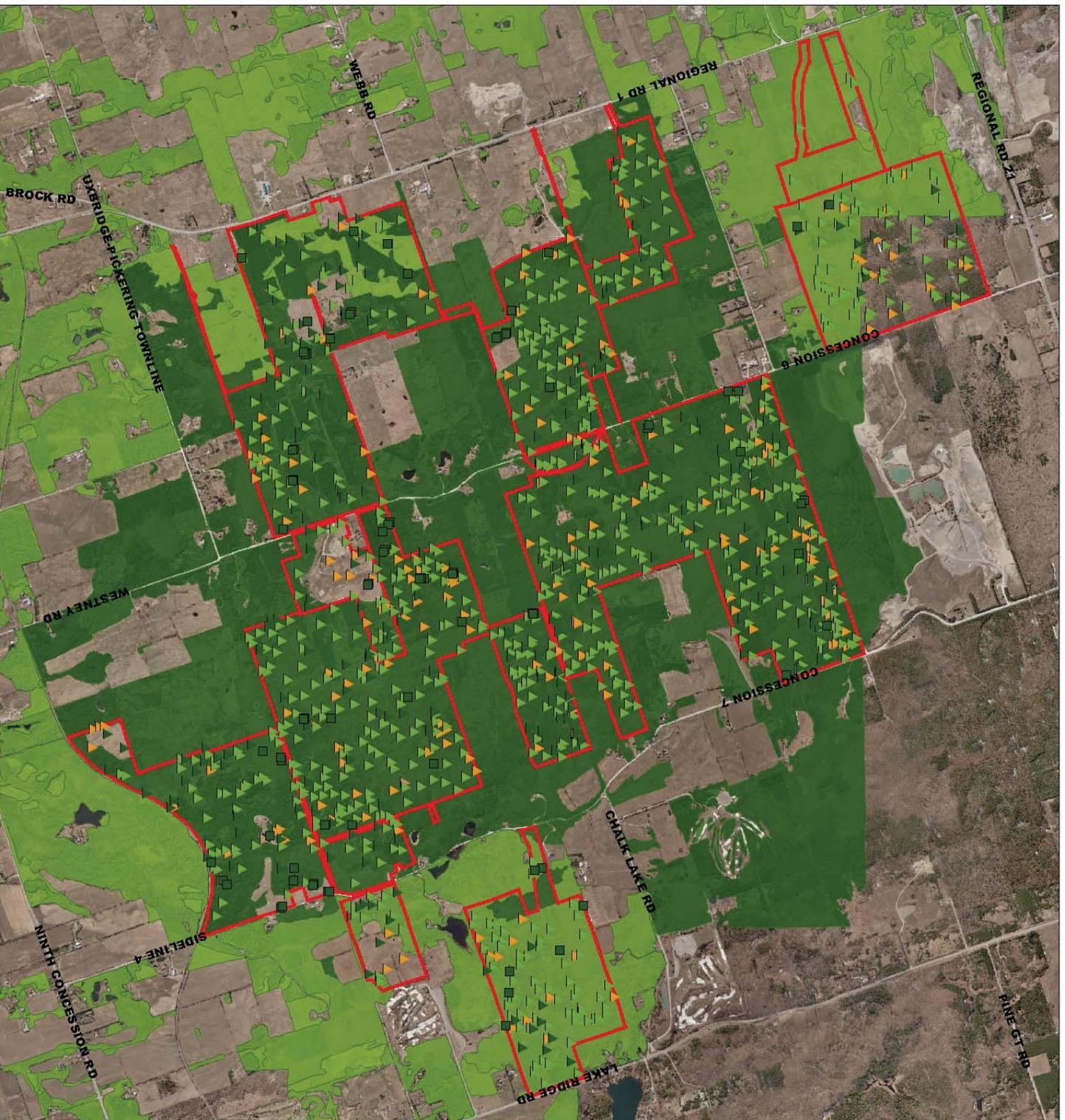
Scores for Matrix Influence and Flora Sensitivity to Development



0 250 500 1,000 1,500 Meters

Date: April 2010

Orthophoto: Spring 2008, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography



- 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

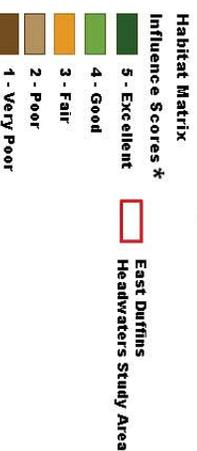
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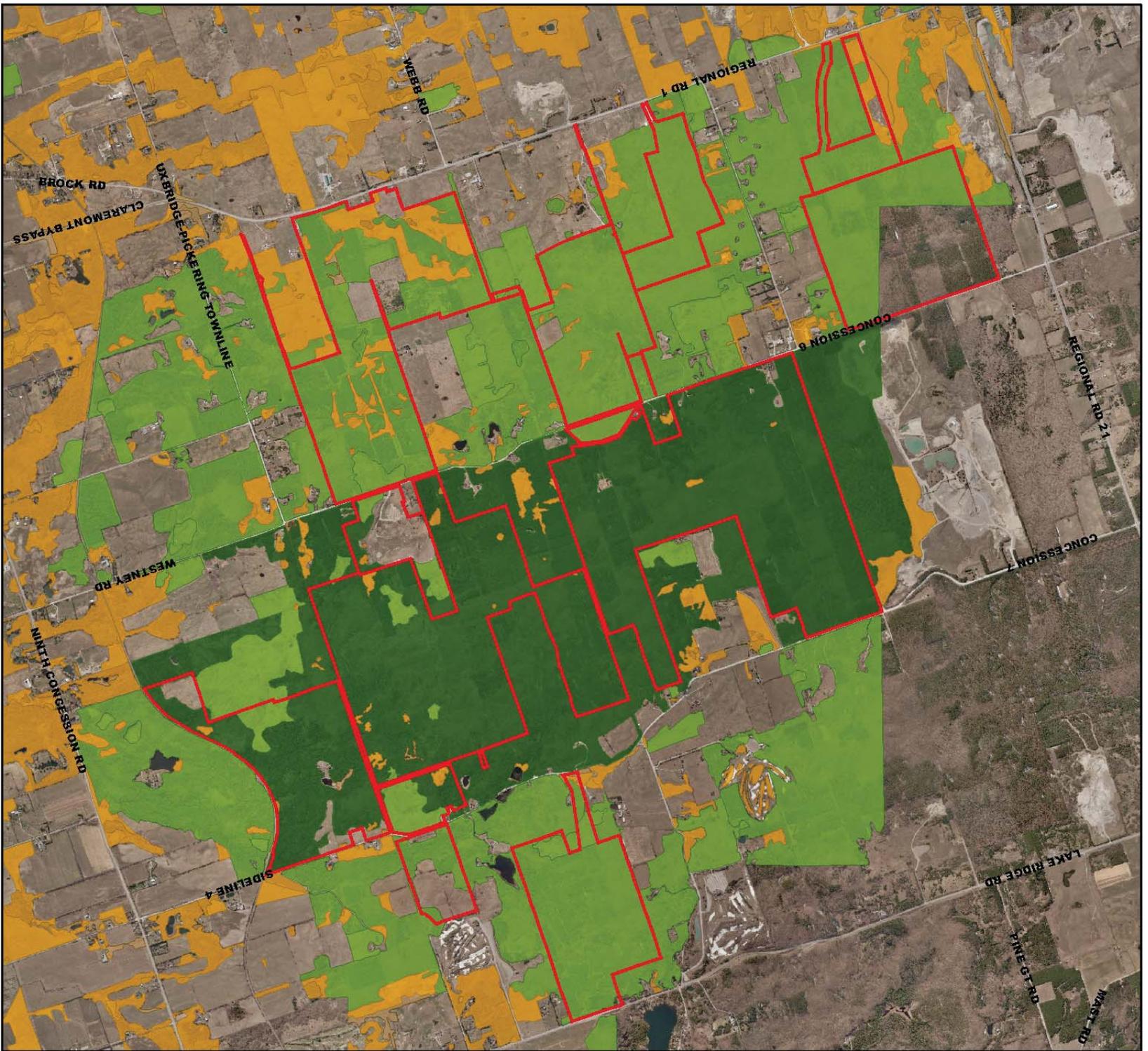


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Meters

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Orthophoto: Spring 2008, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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



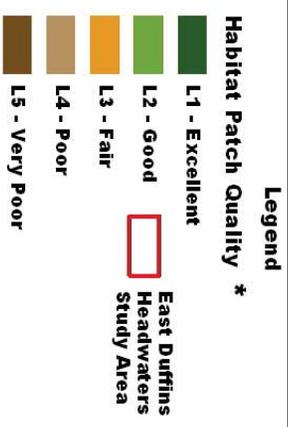


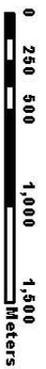
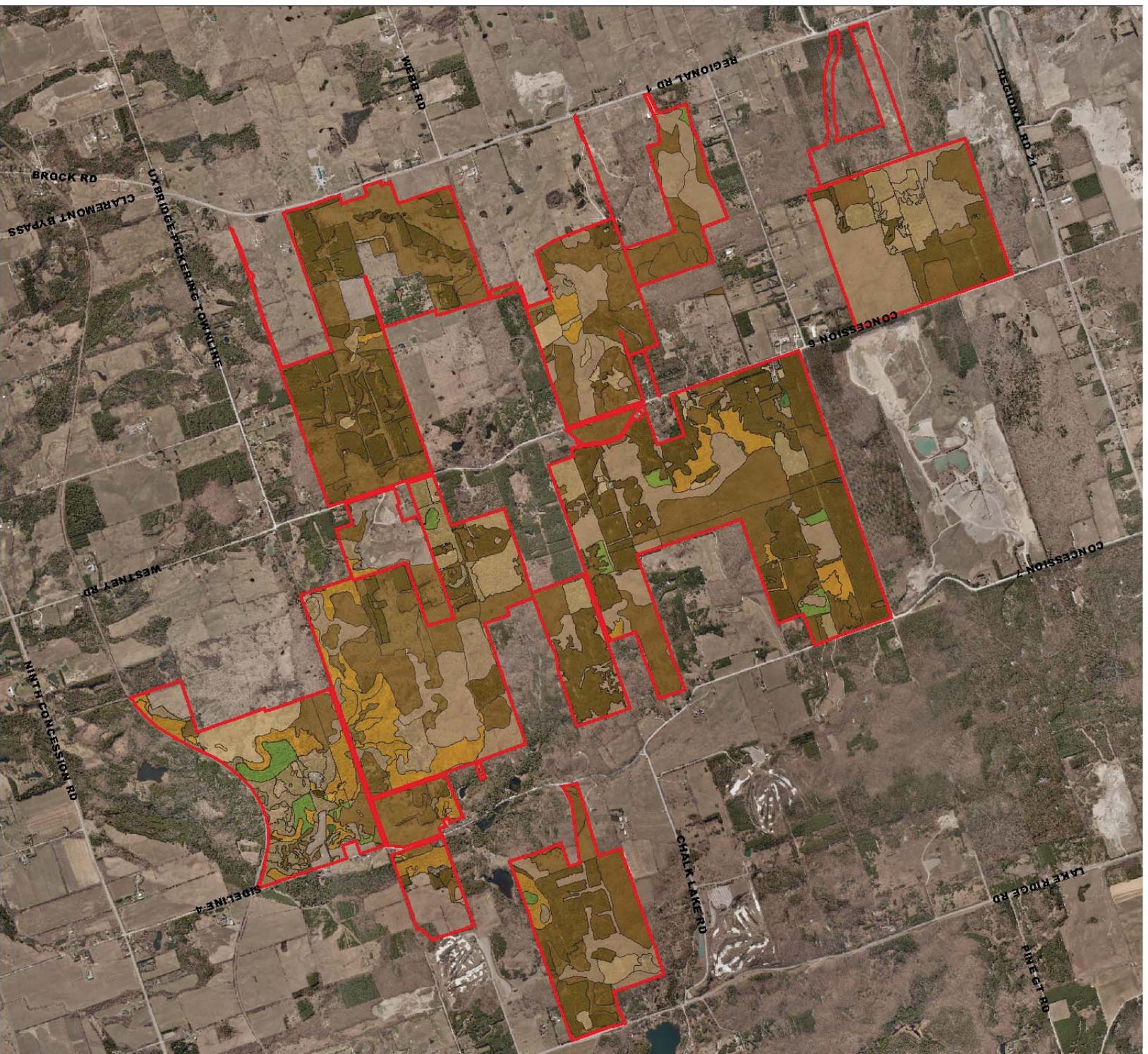
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 Meters

Date: April 2010

Orthophoto: Spring 2008, First Base Solutions Inc.
 * Landscape analysis based on 2002
 Orthophotography

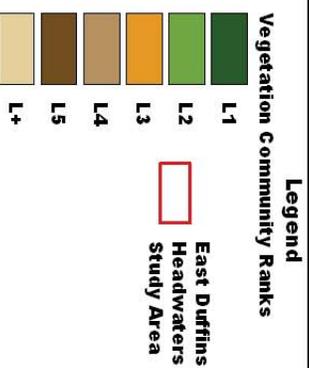
Map 9: Habitat Patch Quality

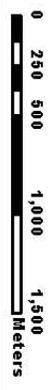
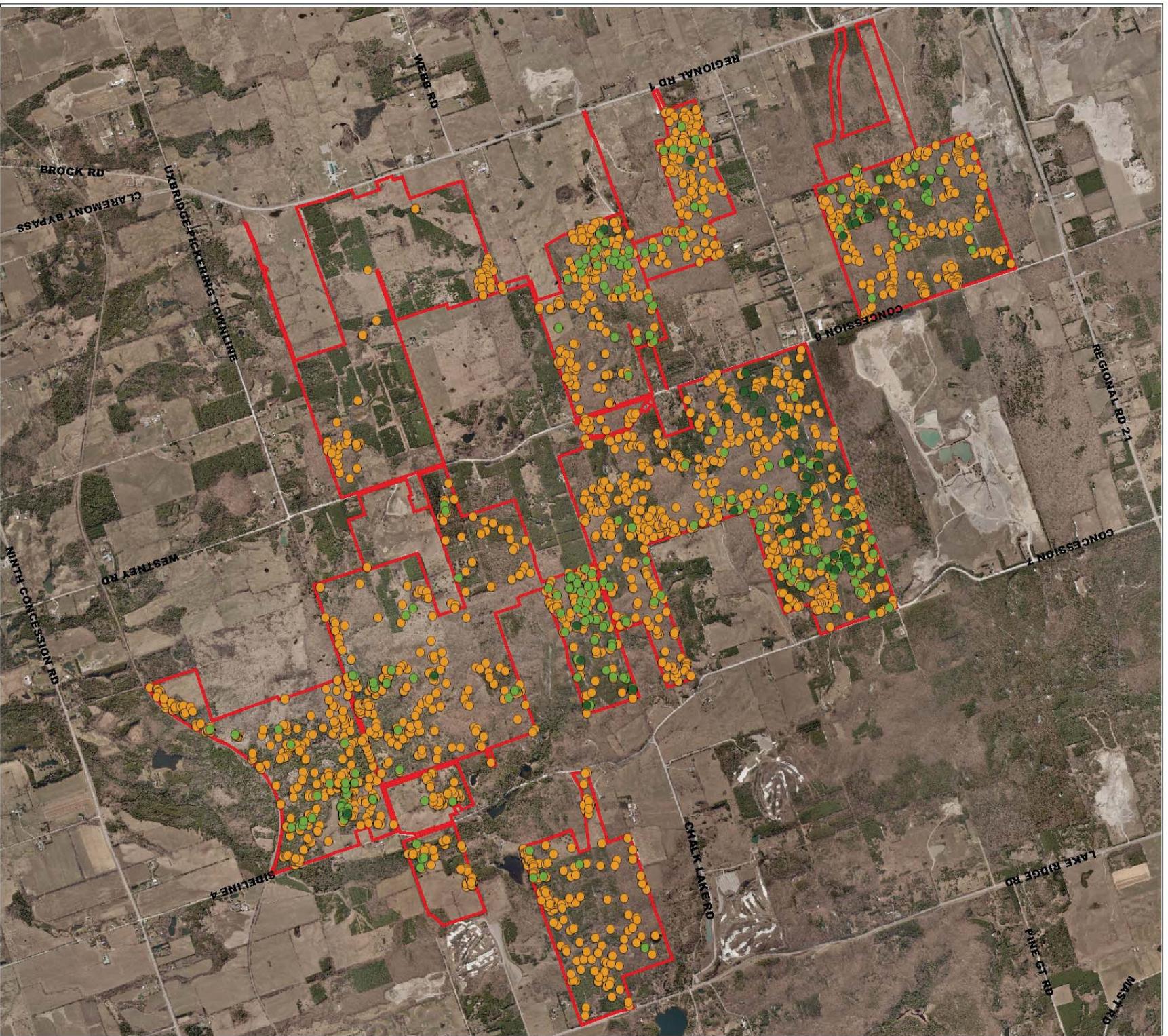




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Map 10:
Vegetation Communities
with their Associated
Local Ranks

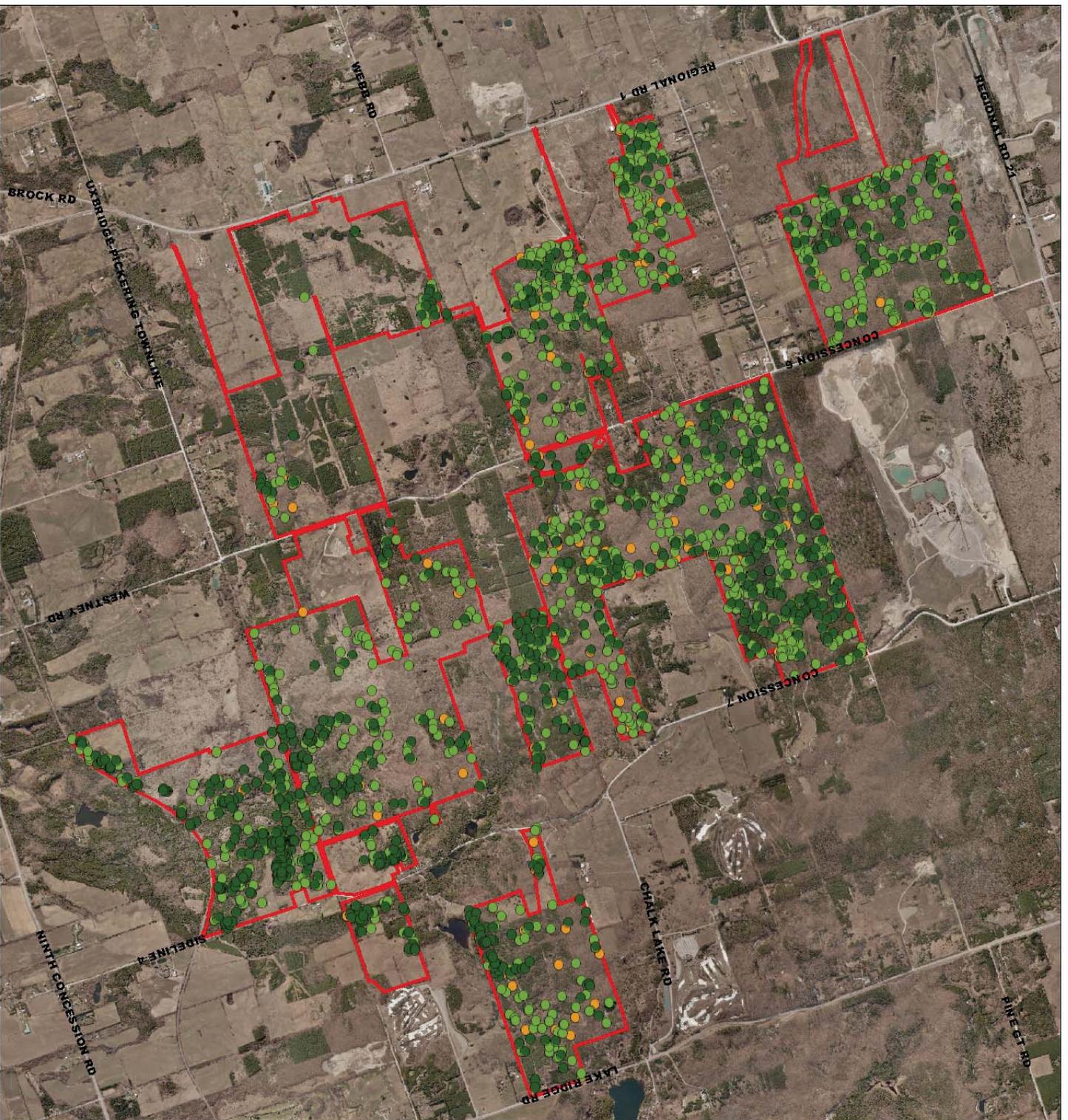




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Map 11:
Location of Flora
Species of Concern

- Legend**
- L1 Flora Species of Concern (L1-L3)
 - L2
 - L3
 - East Duffins Headwaters Study Area



- Flora Habitat Dependence Scores**
- 5 - Extreme habitat specialist
 - 4 - Strong habitat specialist
 - 3 - Moderate habitat specialist
 - 2 - Moderate habitat generalist
 - 1 - Strong habitat generalist
 - 0 - Extreme habitat generalist

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

○ Flora Species

Legend

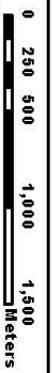
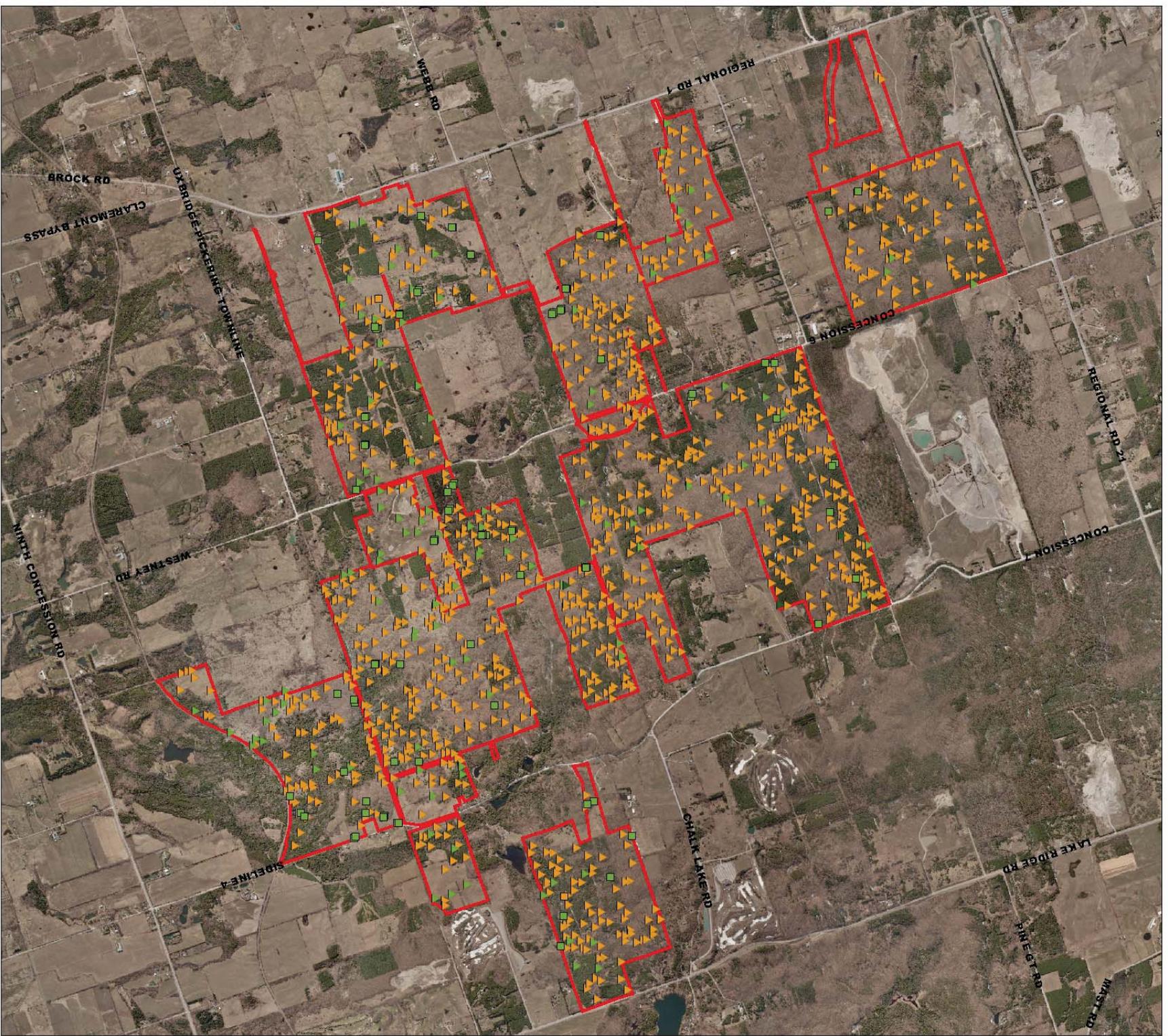
□ East Duffins Headwaters Study Area



0 250 500 1,000 1,500 Meters

Date: April 2010
 Orthophoto: Spring 2008, First Base
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**Map 12:
 Flora Species of Concern
 Habitat Dependence Scores**

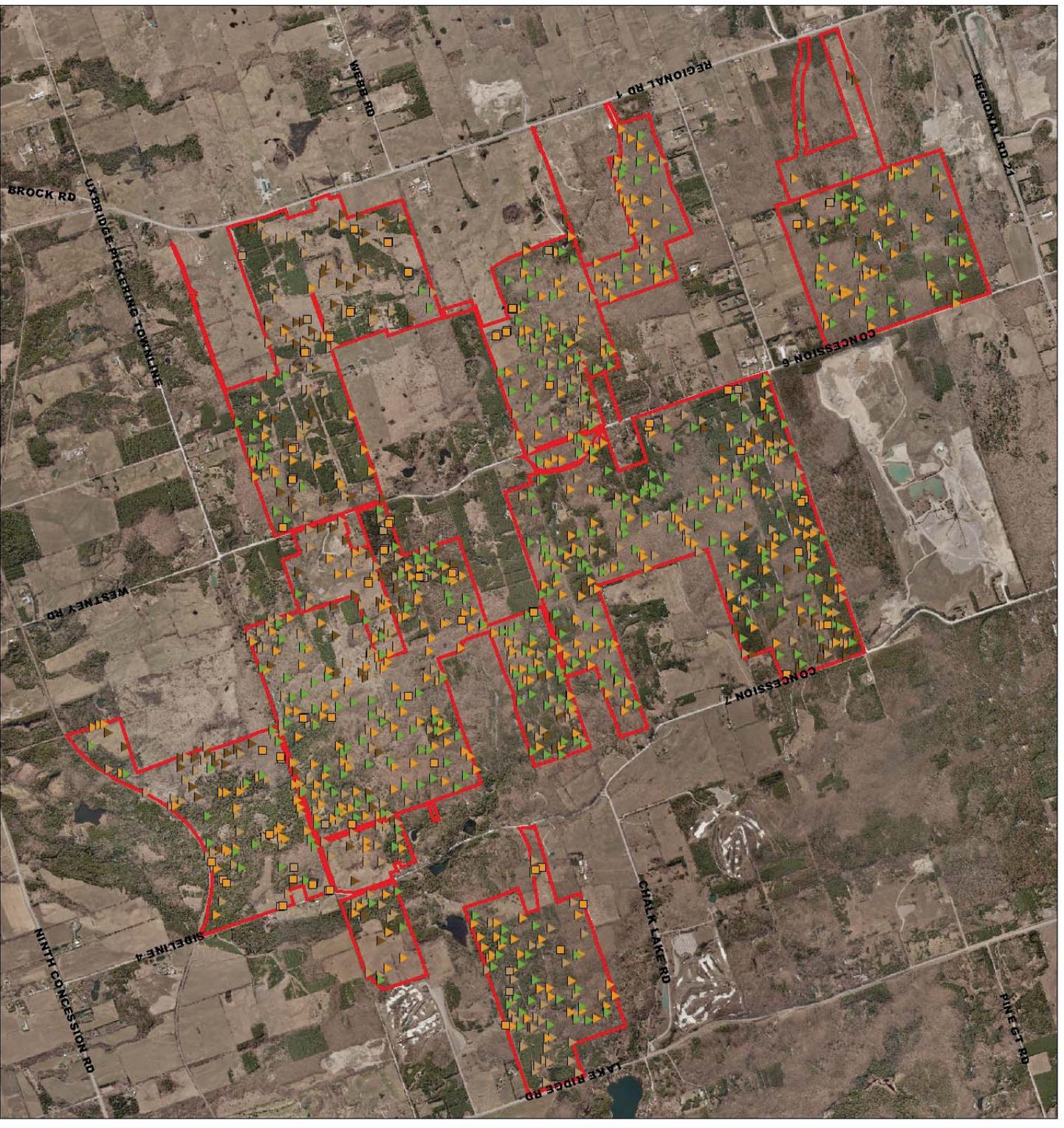


Date: April 2010
 Orthophoto: Spring 2008, First Base
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Map 13:
Location of Fauna
Species of Concern

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

East Duffins
 Headwaters Study Area



- 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.

Legend

- East Duffins Headwaters Study Area
- △ Fauna Species
- (□) Frog Species



0 250 500 1,000 1,500
Meters

Date: April 2010
Orthophoto: Spring 2008, First Base
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**Map 14:
Fauna Species of Concern
Habitat Dependence
Scores**

Appendix 1: List of Vegetation Communities

Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
Forest					
Dry-Fresh Scots Pine Coniferous Forest	0.66	4.0	0.0	4.0	L+
Dry-Fresh White Cedar Coniferous Forest	2.14	2.5	2.0	4.5	L4
Fresh-Moist White Cedar Coniferous Forest	14.04	2.0	2.0	4.0	L4
Dry-Fresh White Pine - Oak Mixed Forest	2.15	3.0	4.0	7.0	L2
Dry-Fresh White Pine - Sugar Maple Mixed Forest	3.83	2.5	1.0	3.5	L4
Dry-Fresh White Pine - Hardwood Mixed Forest	0.09	2.5	1.0	3.5	L4
Dry-Fresh Paper Birch Mixed Forest	41.29	3.0	2.0	5.0	L3
Dry-Fresh Poplar Mixed Forest	5.11	3.5	2.0	5.5	L3
Fresh-Moist Sugar Maple - Hemlock Mixed Forest	16.08	1.5	2.0	3.5	L4
Fresh-Moist Hemlock - Hardwood Mixed Forest	12.46	2.0	3.0	5.0	L3
Fresh-Moist White Cedar - Sugar Maple Mixed Forest	0.17	2.5	2.0	4.5	L4
Fresh-Moist White Cedar - Hardwood Mixed Forest	4.45	1.5	2.0	3.5	L4
Fresh-Moist Poplar Mixed Forest	0.77	3.5	2.0	5.5	L3
Fresh-Moist Paper Birch Mixed Forest	1.05	3.5	2.0	5.5	L3
Dry-Fresh Red Oak Deciduous Forest	4.02	3.5	4.0	7.5	L2
Dry-Fresh Oak - Red Maple Deciduous Forest	1.63	4.5	2.0	6.5	L2
Dry-Fresh Oak - Hardwood Deciduous Forest	14.32	2.5	2.0	4.5	L4
Dry-Fresh Poplar Deciduous Forest	42.69	2.0	2.0	4.0	L4
Dry-Fresh Paper Birch Deciduous Forest	54.89	2.5	1.0	3.5	L4
Dry-Fresh Beech Deciduous Forest	1.37	2.5	1.0	3.5	L4
Dry-Fresh White Ash Deciduous Forest	2.09	2.5	0.0	2.5	L5
Dry-Fresh Red Maple Deciduous Forest	3.92	3.5	2.0	5.5	L3
Dry-Fresh Sugar Maple Deciduous Forest	197.57	1.0	0.0	1.0	L5
Dry-Fresh Sugar Maple - Beech Deciduous Forest	31.45	1.5	0.0	1.5	L5
Dry-Fresh Sugar Maple - Oak Deciduous Forest	82.76	1.5	2.0	3.5	L4
Dry-Fresh Sugar Maple - Hickory Deciduous Forest	2.10	3.5	1.0	4.5	L4
Dry-Fresh Sugar Maple - Black Cherry Deciduous Forest	8.83	2.5	0.0	2.5	L5
Dry-Fresh Sugar Maple - White Ash Deciduous Forest	7.01	1.5	0.0	1.5	L5
Dry-Fresh Sugar Maple - Paper Birch - Poplar Deciduous Forest	10.83	2.5	1.0	3.5	L4
Fresh-Moist Sugar Maple - Ash Deciduous Forest	6.64	2.0	0.0	2.0	L5
Fresh-Moist Ash Deciduous Forest	2.50	1.5	1.0	2.5	L5
Fresh-Moist Exotic Lowland Deciduous Forest	0.52	2.5	0.0	2.5	L+
Fresh-Moist Red Maple Lowland Deciduous Forest	0.06	3.5	2.0	5.5	L3

Appendix 1: List of Vegetation Communities

Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
Fresh-Moist Poplar Deciduous Forest	2.89	1.0	0.0	1.0	L5
Hybrid Poplar Deciduous Plantation*	-	3.0	0.0	3.0	L5
Red Oak Deciduous Plantation	5.98	3.5	0.0	3.5	L5
Restoration Deciduous Plantation	1.43	2.5	0.0	2.5	L5
Black Locust Deciduous Plantation	6.76	2.5	0.0	2.5	L+
Restoration Mixed Plantation	2.04	2.5	0.0	2.5	L5
Red Pine Coniferous Plantation	246.86	1.5	0.0	1.5	L5
White Pine Coniferous Plantation	32.51	1.5	0.0	1.5	L5
Scotch Pine Coniferous Plantation	2.47	2.0	0.0	2.0	L+
Jack Pine Coniferous Plantation	23.36	3.0	0.0	3.0	L+
European Larch Coniferous Plantation	28.18	3.0	0.0	3.0	L+
White Spruce - European Larch Coniferous Plantation	1.09	3.5	0.0	3.5	L5
Restoration Coniferous Plantation	30.65	2.5	0.0	2.5	L5
White Spruce Coniferous Plantation	18.71	2.0	0.0	2.0	L5
Norway Spruce Coniferous Plantation	6.81	2.5	0.0	2.5	L+
Douglas Fir Coniferous Plantation	3.87	4.5	0.0	4.5	L+
Successional					
Sumac Deciduous Thicket	11.20	2.0	0.0	2.0	L5
Raspberry Deciduous Thicket	0.06	3.0	0.0	3.0	L4
Native Deciduous Sapling Regeneration Thicket	1.16	2.0	0.0	2.0	L5
Native Mixed Sapling Regeneration Thicket	6.40	2.5	0.0	2.5	L5
Buckthorn Deciduous Thicket	0.35	2.5	0.0	2.5	L+
Exotic Deciduous Thicket	17.65	2.0	0.0	2.0	L+
Treed Hedgerow	0.39	1.5	0.0	1.5	L5
Buckthorn Hedgerow	0.82	2.5	0.0	2.5	L+
Exotic Shrub Hedgerow	0.15	3.5	0.0	3.5	L+
Hawthorn Successional Savannah	7.20	1.5	0.0	1.5	L5
Native Deciduous Successional Savannah	31.45	1.5	0.0	1.5	L5
White Pine Successional Savannah	5.72	2.5	1.0	3.5	L4
Exotic Successional Savannah	1.09	1.5	0.0	1.5	L+
White Cedar Successional Woodland	7.86	2.5	1.0	3.5	L4
White Pine Successional Woodland	3.77	2.5	1.0	3.5	L4
Native Deciduous Successional Woodland	9.48	1.5	0.0	1.5	L5
Exotic Successional Woodland	0.04	1.5	0.0	1.5	L+

Appendix 1: List of Vegetation Communities

Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
Wetland					
White Cedar Mineral Coniferous Swamp	0.70	2.5	2.0	4.5	L4
White Cedar - Conifer Mineral Coniferous Swamp	3.60	3.5	2.0	5.5	L3
Hemlock Mineral Coniferous Swamp	2.78	3.5	2.0	5.5	L3
White Cedar Organic Coniferous Swamp	15.64	2.5	3.0	5.5	L3
White Cedar - Conifer Organic Coniferous Swamp	9.95	2.5	3.0	5.5	L3
Hemlock Organic Coniferous Swamp	9.10	3.5	3.0	6.5	L2
White Cedar - Hardwood Mineral Mixed Swamp	1.32	2.0	2.0	4.0	L4
White Cedar - Hardwood Organic Mixed Swamp	1.77	2.0	3.0	5.0	L3
Red Maple - Conifer Organic Mixed Swamp	0.82	3.5	3.0	6.5	L2
Red (Green) Ash Mineral Deciduous Swamp	0.83	2.5	2.0	4.5	L4
Paper Birch - Poplar Mineral Deciduous Swamp*	-	2.0	2.0	4.0	L4
Black Ash Organic Deciduous Swamp	0.78	3.5	3.0	6.5	L2
Yellow Birch Organic Deciduous Swamp	0.35	3.0	3.0	6.0	L3
Willow Mineral Thicket Swamp	0.54	2.0	2.0	4.0	L4
Red-osier Mineral Thicket Swamp	0.94	2.0	2.0	4.0	L4
Willow Organic Thicket Swamp	0.05	2.5	3.0	5.5	L3
Red-osier Organic Thicket Swamp	0.23	3.0	3.0	6.0	L3
Winterberry Organic Thicket Swamp	1.44	3.5	4.0	7.5	L2
Low White Cedar Shrub Fen	0.37	4.5	5.0	9.5	L1
Reed Canary Grass Mineral Meadow Marsh	2.40	1.0	1.0	2.0	L+
Fowl Manna Grass Mineral Meadow Marsh	0.18	4.0	1.0	5.0	L3
Broad-leaved Sedge Mineral Meadow Marsh	0.24	3.0	1.0	4.0	L4
Horsetail Mineral Meadow Marsh	0.92	3.0	2.0	5.0	L3
Jewelweed Mineral Meadow Marsh	1.70	2.0	1.0	3.0	L4
Forb Mineral Meadow Marsh	1.72	1.5	1.0	2.5	L5
Rice Cut-Grass Mineral Meadow Marsh	0.04	4.0	0.0	4.0	L4
Narrow-leaved Sedge Organic Meadow Marsh	0.09	4.0	3.0	7.0	L2
Jewelweed Organic Meadow Marsh	0.09	4.0	2.0	6.0	L3
Forb Organic Meadow Marsh	1.05	3.0	3.0	6.0	L3
Broad-leaved Cattail Mineral Shallow Marsh	0.47	2.0	1.0	3.0	L4
Narrow-Leaved Cattail Mineral Shallow Marsh	0.16	2.0	0.0	2.0	L+
Reed Canary Grass Mineral Shallow Marsh	0.08	3.0	1.0	4.0	L+
Broad-leaved Cattail Organic Shallow Marsh	0.08	2.5	3.0	5.5	L3

Appendix 1: List of Vegetation Communities

Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
Rice Cut-grass Organic Shallow Marsh	0.47	3.5	3.0	6.5	L2
Forb Organic Shallow Marsh	0.02	4.0	3.0	7.0	L2
Aquatic					
Pondweed Submerged Shallow Aquatic	0.06	2.0	2.0	4.0	L4
Stonewort Submerged Shallow Aquatic	0.02	2.5	1.0	3.5	L4
Duckweed Mixed Shallow Aquatic	0.07	3.0	2.0	5.0	L3
Watercress Mixed Shallow Aquatic	0.05	4.0	1.0	5.0	L3
Duckweed Floating-leaved Shallow Aquatic	0.15	2.5	1.0	3.5	L4
Open Aquatic (deep or riverine unvegetated)	0.58	1.5	0.0	1.5	L5
Dynamic (Beach, Bluff, Barren, Prairie, Savannah)					
Open Clay Barren	0.02	4.0	4.0	8.0	L2
Dry Hay Sedge Sand Barren	0.74				
Dry-Fresh Flat-stemmed Blue Grass - Forb Sand Barren	0.09	3.5	3.0	6.5	L2
Shrub Sand Barren*	-	3.5	5.0	8.5	L1
Dry Tallgrass Prairie	0.48	4.5	5.0	9.5	L1
Red Oak Non-tallgrass Savannah	1.14	4.0	2.0	6.0	L3
Red Oak Non-tallgrass Woodland*	-	3.5	2.0	5.5	L3
Meadow					
Native Forb Meadow	103.13	1.5	0.0	1.5	L5
Exotic Cool-season Grass Meadow	2.60	1.0	0.0	1.0	L+
Exotic Forb Meadow	7.37	1.5	0.0	1.5	L+

Appendix 2: List of Flora Species

Scientific Name	Common Name	Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
		1-5	1-5	0-5	0-5	2-20	(03/2009)
<i>Corallorhiza maculata</i>	spotted coral-root	5	5	5	5	20	L1
<i>Cypripedium acaule</i>	moccasin flower	5	5	5	4	19	L1
<i>Drosera rotundifolia</i>	round-leaved sundew	4	5	5	5	19	L1
<i>Lycopodium annotinum</i>	stiff club-moss	4	5	5	5	19	L1
<i>Orthilia secunda</i>	one-sided pyrola	4	5	5	5	19	L1
<i>Pedicularis canadensis</i>	wood-betony	4	5	5	5	19	L1
<i>Spiranthes lacera</i> var. <i>lacera</i>	northern slender ladies' tresses	5	5	5	5	20	L1
<i>Utricularia minor</i>	small bladderwort	4	5	5	5	19	L1
<i>Viola adunca</i>	hooked-spur violet	5	5	5	4	19	L1
<i>Viola sagittata</i> var. <i>ovata</i>	arrow-leaved violet	5	5	4	5	19	L1
<i>Asclepias exaltata</i>	poke milkweed	4	5	4	5	18	L2
<i>Botrychium dissectum</i>	cut-leaved grape fern	3	4	5	5	17	L2
<i>Botrychium virginianum</i>	rattlesnake fern	3	5	4	5	17	L2
<i>Calla palustris</i>	water arum	3	5	4	5	17	L2
<i>Carex aquatilis</i>	water sedge	3	4	5	5	17	L2
<i>Carex schweinitzii</i>	Schweinitz' sedge	5	4	5	4	18	L2
<i>Chimaphila umbellata</i> ssp. <i>cisatlantica</i>	pipsissewa	4	4	5	5	18	L2
<i>Coptis trifolia</i> ssp. <i>groenlandica</i>	goldthread	2	5	5	5	17	L2
<i>Cornus canadensis</i>	bunchberry	3	5	5	5	18	L2
<i>Cyperus lupulinus</i>	slender umbrella-sedge	5	3	5	4	17	L2
<i>Cypripedium calceolus</i> var. <i>pubescens</i>	larger yellow lady's slipper	4	4	5	4	17	L2
<i>Dennstaedtia punctilobula</i>	hay-scented fern	4	4	5	4	17	L2
<i>Diphasiastrum digitatum</i>	crowfoot club-moss	3	4	5	5	17	L2
<i>Dryopteris goldiana</i>	Goldie's fern	4	4	5	4	17	L2
<i>Dulichium arundinaceum</i>	three-way sedge	3	4	5	5	17	L2
<i>Epilobium strictum</i>	downy willow-herb	4	4	5	4	17	L2
<i>Eriophorum viridi-carinatum</i>	thin-leaved cotton-grass	4	4	5	5	18	L2
<i>Gnaphalium obtusifolium</i>	fragrant cudweed	4	4	5	4	17	L2
<i>Huperzia lucidula</i>	shining club-moss	3	5	5	5	18	L2
<i>Hypericum majus</i>	larger Canada St. Johnswort	5	4	4	4	17	L2
<i>Juncus brachycephalus</i>	small-headed rush	5	3	5	4	17	L2
<i>Juniperus horizontalis</i>	creeping juniper	5	2	5	5	17	L2
<i>Lechea intermedia</i>	pinweed	5	5	5	4	19	L2
<i>Linnaea borealis</i> ssp. <i>longiflora</i>	twinflower	3	5	5	5	18	L2
<i>Lycopodium dendroidium</i>	round-branched ground-pine	2	5	5	5	17	L2
<i>Moneses uniflora</i>	one-flowered pyrola	3	5	5	5	18	L2
<i>Osmunda claytoniana</i>	interrupted fern	3	5	5	5	18	L2

Appendix 2: List of Flora Species

<i>Osmunda regalis</i> var. <i>spectabilis</i>	royal fern	2	5	5	5	17	L2
<i>Panax quinquefolius</i>	ginseng	4	5	4	5	18	L2
<i>Panicum linearifolium</i>	narrow-leaved panic grass	4	3	5	5	17	L2
<i>Panicum perlongum</i>	long-stalked panic grass	5	4	4	4	17	L2
<i>Pinus resinosa</i>	red pine	2	5	5	5	17	L2
<i>Platanthera hyperborea</i>	northern green orchis	3	4	5	5	17	L2
<i>Polypodium virginianum</i>	rock polypody	4	4	5	5	18	L2
<i>Pyrola asarifolia</i>	pink pyrola	3	4	5	5	17	L2
<i>Quercus alba</i>	white oak	3	5	4	5	17	L2
<i>Ranunculus flabellaris</i>	yellow water crowfoot	4	4	4	5	17	L2
<i>Salix pedicellaris</i>	bog willow	4	4	5	4	17	L2
<i>Schizachyrium scoparium</i>	little bluestem	4	4	5	5	18	L2
<i>Thelypteris noveboracensis</i>	New York fern	4	4	5	5	18	L2
<i>Utricularia vulgaris</i>	common bladderwort	3	4	5	5	17	L2
<i>Viburnum lantanoides</i>	hobblebush	4	4	5	5	18	L2
<i>Viburnum rafinesquianum</i>	downy arrow-wood	4	5	4	4	17	L2
<i>Abies balsamea</i>	balsam fir	2	3	4	5	14	L3
<i>Adiantum pedatum</i>	northern maidenhair fern	2	3	5	5	15	L3
<i>Agalinis tenuifolia</i>	slender gerardia	3	4	5	4	16	L3
<i>Agrostis scabra</i>	ticklegrass	3	3	4	4	14	L3
<i>Alnus incana</i> ssp. <i>rugosa</i>	speckled alder	2	4	4	5	15	L3
<i>Alopecurus aequalis</i>	short-awned foxtail	3	4	5	4	16	L3
<i>Anaphalis margaritacea</i>	pearly everlasting	3	4	4	3	14	L3
<i>Andropogon gerardii</i>	big bluestem	4	2	4	4	14	L3
<i>Anemone acutiloba</i>	sharp-lobed hepatica	2	4	4	5	15	L3
<i>Anemone cylindrica</i>	long-fruited thimbleweed	3	4	3	4	14	L3
<i>Aquilegia canadensis</i>	wild columbine	2	4	3	5	14	L3
<i>Arabis glabra</i>	tower mustard	4	4	4	4	16	L3
<i>Aralia racemosa</i> ssp. <i>racemosa</i>	spikenard	2	4	4	4	14	L3
<i>Aster urophyllus</i>	arrow-leaved aster	3	3	4	4	14	L3
<i>Brachyelytrum erectum</i>	bearded short-husk	3	5	3	4	15	L3
<i>Bromus ciliatus</i>	fringed brome grass	2	4	4	5	15	L3
<i>Calystegia spithamea</i> ssp. <i>spithamea</i>	low bindwind	4	4	4	4	16	L3
<i>Campanula aparinoides</i>	marsh bellflower	3	4	5	4	16	L3
<i>Cardamine concatenata</i>	cut-leaved toothwort	2	3	5	4	14	L3
<i>Carex albursina</i>	white bear sedge	2	3	5	4	14	L3
<i>Carex backii</i>	Back's sedge	4	3	4	4	15	L3
<i>Carex brevior</i>	short-fruited sedge	3	3	4	4	14	L3
<i>Carex brunnescens</i> ssp. <i>brunnescens</i>	brownish sedge	3	3	4	4	14	L3
<i>Carex canescens</i> ssp. <i>canescens</i>	silvery sedge	3	4	5	4	16	L3

Appendix 2: List of Flora Species

<i>Carex cephalophora</i>	oval-headed sedge	3	3	4	4	14	L3
<i>Carex comosa</i>	bristly sedge	3	3	5	4	15	L3
<i>Carex crinita</i>	fringed sedge	2	4	4	4	14	L3
<i>Carex digitalis</i>	slender wood sedge	4	4	4	3	15	L3
<i>Carex disperma</i>	two-seeded sedge	2	3	5	4	14	L3
<i>Carex flava</i>	yellow sedge	3	3	5	4	15	L3
<i>Carex gracilescens</i>	rather slender sedge	4	3	4	4	15	L3
<i>Carex hitchcockiana</i>	Hitchcock's sedge	3	3	5	3	14	L3
<i>Carex interior</i>	fen star sedge	2	4	4	4	14	L3
<i>Carex laevivaginata</i>	smooth-sheathed sedge	2	4	4	4	14	L3
<i>Carex laxiculmis</i> var. <i>laxiculmis</i>	spreading wood sedge	4	3	5	3	15	L3
<i>Carex leptalea</i> ssp. <i>leptalea</i>	bristle-stalked sedge	2	3	5	4	14	L3
<i>Carex leptonevia</i>	few-nerved wood sedge	2	4	4	4	14	L3
<i>Carex lupulina</i>	hop sedge	2	4	4	4	14	L3
<i>Carex lurida</i>	sallow sedge	5	2	4	5	16	L3
<i>Carex muhlenbergii</i> var. <i>muhlenbergii</i>	Muhlenberg's sedge	4	4	4	4	16	L3
<i>Carex normalis</i>	tall straw sedge	4	3	5	3	15	L3
<i>Carex plantaginea</i>	plantain-leaved sedge	2	4	5	4	15	L3
<i>Carex platyphylla</i>	broad-leaved sedge	3	4	4	3	14	L3
<i>Carex siccata</i>	hay sedge	4	3	4	4	15	L3
<i>Carex tonsa</i> var. <i>rugosperma</i>	red-seeded sedge	4	4	4	4	16	L3
<i>Carex trisperma</i> var. <i>trisperma</i>	three-seeded sedge	4	3	5	4	16	L3
<i>Carex tuckermanii</i>	Tuckerman's sedge	2	4	4	4	14	L3
<i>Carex utriculata</i>	beaked sedge	2	3	4	5	14	L3
<i>Carex vesicaria</i>	inflated sedge	3	3	5	4	15	L3
<i>Carya ovata</i>	shagbark hickory	2	4	4	4	14	L3
<i>Celastrus scandens</i>	American bittersweet	2	4	3	5	14	L3
<i>Chenopodium capitatum</i>	strawberry-blite	5	4	4	3	16	L3
<i>Chrysosplenium americanum</i>	golden saxifrage	3	3	5	4	15	L3
<i>Cicuta bulbifera</i>	bulblet-bearing water-hemlock	2	3	5	4	14	L3
<i>Cinna latifolia</i>	nodding wood reed	3	3	5	3	14	L3
<i>Circaea alpina</i>	smaller enchanter's nightshade	2	4	5	4	15	L3
<i>Claytonia caroliniana</i>	broad-leaved spring beauty	2	4	5	5	16	L3
<i>Clintonia borealis</i>	bluebead lily	2	5	4	5	16	L3
<i>Collinsonia canadensis</i>	richweed	4	5	4	3	16	L3
<i>Corydalis aurea</i> ssp. <i>aurea</i>	golden corydalis	5	4	4	3	16	L3
<i>Crataegus chrysoarpa</i> var. <i>aboriginum</i>	glabrate fireberry hawthorn	5	3	4	4	16	L3
<i>Crataegus macrosperma</i>	variable hawthorn	5	2	4	3	14	L3
<i>Cypripedium calceolus</i> var. <i>parviflorum</i>	smaller yellow lady's slipper	3	4	4	5	16	L3
<i>Cystopteris tenuis</i>	Mackay's fragile fern	2	4	5	5	16	L3

Appendix 2: List of Flora Species

<i>Dalibarda repens</i>	Robin-run-away	4	2	5	4	15	L3
<i>Deparia acrostichoides</i>	silvery glade fern	3	4	5	4	16	L3
<i>Desmodium glutinosum</i>	pointed-leaved tick-trefoil	3	4	4	5	16	L3
<i>Dicentra canadensis</i>	squirrel-corn	2	4	5	4	15	L3
<i>Dirca palustris</i>	leatherwood	3	4	5	4	16	L3
<i>Dryopteris clintoniana</i>	Clinton's wood fern	2	4	5	4	15	L3
<i>Dryopteris cristata</i>	crested wood fern	2	4	4	4	14	L3
<i>Dryopteris filix-mas</i>	male fern	5	2	5	3	15	L3
<i>Eleocharis smallii</i>	Small's spike-rush	3	4	5	3	15	L3
<i>Epilobium leptophyllum</i>	narrow-leaved willow-herb	2	5	4	4	15	L3
<i>Equisetum fluviatile</i>	water horsetail	2	4	5	4	15	L3
<i>Equisetum scirpoides</i>	dwarf scouring-rush	2	4	5	5	16	L3
<i>Equisetum sylvaticum</i>	woodland horsetail	2	3	5	4	14	L3
<i>Galium lanceolatum</i>	wild licorice	4	5	4	3	16	L3
<i>Galium tinctorium</i>	stiff marsh bedstraw	4	4	4	3	15	L3
<i>Galium trifidum</i> var. <i>trifidum</i>	small bedstraw	4	4	4	3	15	L3
<i>Geum rivale</i>	water avens	3	4	5	4	16	L3
<i>Glyceria borealis</i>	northern manna grass	3	3	5	5	16	L3
<i>Glyceria septentrionalis</i>	eastern manna grass	2	3	5	4	14	L3
<i>Gymnocarpium dryopteris</i>	oak fern	2	3	5	5	15	L3
<i>Hamamelis virginiana</i>	witch-hazel	2	4	4	4	14	L3
<i>Hydrocotyle americana</i>	marsh pennywort	2	4	4	4	14	L3
<i>Hypericum punctatum</i>	spotted St.Johnswort	4	4	4	3	15	L3
<i>Ilex verticillata</i>	winterberry	2	4	4	5	15	L3
<i>Iris versicolor</i>	blue flag	2	5	4	5	16	L3
<i>Juglans cinerea</i>	butternut	1	5	4	4	14	L3
<i>Juniperus communis</i>	common juniper	2	3	4	5	14	L3
<i>Larix laricina</i>	tamarack	2	4	4	4	14	L3
<i>Lemna trisulca</i>	star duckweed	2	4	5	3	14	L3
<i>Lespedeza capitata</i>	round-headed bush-clover	5	2	4	5	16	L3
<i>Liparis loeselii</i>	Loesel's twayblade	3	3	5	5	16	L3
<i>Lobelia inflata</i>	Indian tobacco	3	4	4	4	15	L3
<i>Lobelia siphilitica</i>	great blue lobelia	2	3	4	5	14	L3
<i>Lonicera canadensis</i>	fly honeysuckle	2	4	4	4	14	L3
<i>Lonicera dioica</i>	wild honeysuckle	3	4	4	4	15	L3
<i>Lonicera hirsuta</i>	hairy honeysuckle	3	4	4	4	15	L3
<i>Lysimachia thyrsoiflora</i>	tufted loosestrife	3	3	4	4	14	L3
<i>Medeola virginiana</i>	Indian cucumber-root	2	5	4	5	16	L3
<i>Milium effusum</i>	wood millet	3	5	5	3	16	L3
<i>Mitchella repens</i>	partridgeberry	2	4	4	5	15	L3

Appendix 2: List of Flora Species

<i>Mitella diphylla</i>	mitrewort	2	3	4	5	14	L3
<i>Mitella nuda</i>	naked mitrewort	2	4	5	5	16	L3
<i>Monotropa hypopithys</i>	pinemap	2	4	5	5	16	L3
<i>Monotropa uniflora</i>	Indian-pipe	2	4	5	5	16	L3
<i>Oryzopsis asperifolia</i>	white-fruited mountain-rice	2	4	4	5	15	L3
<i>Oryzopsis racemosa</i>	black-fruited mountain-rice	3	3	5	4	15	L3
<i>Osmunda cinnamomea</i>	cinnamon fern	2	4	5	5	16	L3
<i>Phegopteris connectilis</i>	northern beech fern	3	3	5	5	16	L3
<i>Picea glauca</i>	white spruce	1	5	4	4	14	L3
<i>Pilea fontana</i>	spring clearweed	2	4	4	4	14	L3
<i>Poa saltuensis</i>	bushy spear grass	4	3	5	3	15	L3
<i>Polygonum cilinode</i>	fringed black bindweed	4	4	4	3	15	L3
<i>Polystichum acrostichoides</i>	Christmas fern	1	3	5	5	14	L3
<i>Potamogeton natans</i>	floating pondweed	2	4	5	3	14	L3
<i>Prunus nigra</i>	Canada plum	2	4	4	4	14	L3
<i>Pyrola elliptica</i>	shinleaf	2	4	4	4	14	L3
<i>Ribes triste</i>	swamp red currant	2	4	4	5	15	L3
<i>Rubus flagellaris</i>	northern dewberry	4	3	4	4	15	L3
<i>Salix lucida</i>	shining willow	2	4	5	3	14	L3
<i>Scirpus cyperinus</i>	woolly bulrush	2	3	4	5	14	L3
<i>Shepherdia canadensis</i>	russet buffalo-berry	3	4	5	4	16	L3
<i>Sisyrinchium montanum</i>	blue-eyed grass	2	3	4	5	14	L3
<i>Solidago patula</i>	rough-leaved goldenrod	3	3	4	4	14	L3
<i>Sparganium eurycarpum</i>	great bur-reed	2	4	5	4	15	L3
<i>Sphenopholis intermedia</i>	slender wedge grass	3	3	4	4	14	L3
<i>Spirodela polyrhiza</i>	greater duckweed	2	4	5	3	14	L3
<i>Streptopus roseus</i>	rose twisted-stalk	2	4	4	5	15	L3
<i>Symphoricarpos albus</i> var. <i>albus</i>	eastern snowberry	3	4	4	5	16	L3
<i>Taxus canadensis</i>	Canada yew	2	4	4	5	15	L3
<i>Trientalis borealis</i> ssp. <i>borealis</i>	star-flower	2	4	4	5	15	L3
<i>Triosteum aurantiacum</i>	wild coffee	4	5	4	3	16	L3
<i>Uvularia grandiflora</i>	large-flowered bellwort	1	4	5	5	15	L3
<i>Verbena stricta</i>	hoary vervain	3	5	4	4	16	L3
<i>Veronica catenata</i>	slender water speedwell	3	3	4	4	14	L3
<i>Viburnum acerifolium</i>	maple-leaved viburnum	2	3	4	5	14	L3
<i>Viola blanda</i>	sweet white violet	3	4	4	3	14	L3
<i>Viola canadensis</i>	Canada violet	3	4	4	4	15	L3
<i>Viola cucullata</i>	marsh blue violet	3	3	4	4	14	L3
<i>Viola rostrata</i>	long-spurred violet	2	4	4	4	14	L3
<i>Viola selkirkii</i>	Selkirk's violet	3	3	4	4	14	L3

Appendix 2: List of Flora Species

<i>Acer rubrum</i>	red maple	2	4	1	5	12	L4
<i>Acer saccharinum</i>	silver maple	1	2	5	3	11	L4
<i>Acer saccharum</i> ssp. <i>nigrum</i>	black maple	2	3	4	2	11	L4
<i>Acer spicatum</i>	mountain maple	2	3	4	4	13	L4
<i>Actaea pachypoda</i>	white baneberry	2	3	4	3	12	L4
<i>Allium tricoccum</i>	wild leek	1	3	4	4	12	L4
<i>Amelanchier arborea</i>	downy serviceberry	3	2	4	3	12	L4
<i>Amelanchier laevis</i>	smooth serviceberry	2	2	4	3	11	L4
<i>Amelanchier sanguinea</i> var. <i>sanguinea</i>	round-leaved serviceberry	3	2	3	4	12	L4
<i>Amelanchier</i> x <i>interior</i>	hybrid serviceberry complex	4	3	3	3	13	L4
<i>Antennaria</i> cf. <i>howellii</i> ssp. <i>howellii</i>	Howell's pussytoes	4	2	3	3	12	L4
<i>Apocynum androsaemifolium</i>	spreading dogbane	2	3	2	4	11	L4
<i>Asarum canadense</i>	wild ginger	2	3	4	3	12	L4
<i>Asclepias incarnata</i> ssp. <i>incarnata</i>	swamp milkweed	1	3	4	4	12	L4
<i>Aster macrophyllus</i>	big-leaved aster	2	3	2	4	11	L4
<i>Aster oolentangiensis</i>	sky-blue aster	3	1	4	3	11	L4
<i>Betula alleghaniensis</i>	yellow birch	1	4	3	5	13	L4
<i>Betula papyrifera</i>	paper birch	1	4	2	4	11	L4
<i>Bidens tripartitus</i>	three-parted beggar's-ticks	3	2	4	2	11	L4
<i>Boehmeria cylindrica</i>	false nettle	2	4	4	3	13	L4
<i>Bromus latiglumis</i>	eared brome	3	2	4	3	12	L4
<i>Calamagrostis canadensis</i>	Canada blue joint	1	3	4	4	12	L4
<i>Caltha palustris</i>	marsh marigold	2	4	3	4	13	L4
<i>Cardamine diphylla</i>	broad-leaved toothwort	2	3	4	4	13	L4
<i>Cardamine pensylvanica</i>	bitter cress	3	2	4	4	13	L4
<i>Cardamine</i> x <i>maxima</i>	hybrid toothwort	3	3	3	3	12	L4
<i>Carex arctata</i>	nodding wood sedge	2	4	2	3	11	L4
<i>Carex aurea</i>	golden-fruited sedge	2	2	4	4	12	L4
<i>Carex communis</i>	fibrous-rooted sedge	2	4	3	3	12	L4
<i>Carex deweyana</i>	Dewey's sedge	2	4	3	3	12	L4
<i>Carex gracillima</i>	graceful sedge	2	3	4	2	11	L4
<i>Carex hystericina</i>	porcupine sedge	2	3	2	5	12	L4
<i>Carex intumescens</i>	bladder sedge	2	4	4	2	12	L4
<i>Carex lacustris</i>	lake-bank sedge	2	3	3	4	12	L4
<i>Carex laxiflora</i>	loose-flowered sedge	3	3	4	3	13	L4
<i>Carex peckii</i>	Peck's sedge	3	3	4	3	13	L4
<i>Carex pedunculata</i>	early-flowering sedge	2	3	3	3	11	L4
<i>Carex pensylvanica</i>	Pennsylvania sedge	2	4	3	4	13	L4
<i>Carex projecta</i>	necklace sedge	3	2	4	3	12	L4
<i>Carex pseudo-cyperus</i>	pseudocyperus sedge	2	3	3	4	12	L4

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<i>Carex retrorsa</i>	retrorse sedge	2	3	3	4	12	L4
<i>Carex scabrata</i>	rough sedge	2	3	4	3	12	L4
<i>Carex sparganioides</i>	bur-reed sedge	2	2	5	2	11	L4
<i>Carex sprengeii</i>	long-beaked sedge	2	4	4	2	12	L4
<i>Carex stricta</i>	tussock sedge	2	3	3	4	12	L4
<i>Carex tenera</i>	straw sedge	2	3	3	3	11	L4
<i>Carex tribuloides</i>	blunt broom sedge	3	2	4	3	12	L4
<i>Carpinus caroliniana</i> ssp. <i>virginiana</i>	blue beech	1	3	4	3	11	L4
<i>Carya cordiformis</i>	bitternut hickory	2	4	4	2	12	L4
<i>Caulophyllum giganteum</i>	long-styled blue cohosh	2	3	4	4	13	L4
<i>Cornus rugosa</i>	round-leaved dogwood	2	4	4	3	13	L4
<i>Corylus cornuta</i>	beaked hazel	2	4	3	4	13	L4
<i>Crataegus holmesiana</i>	Holmes' hawthorn	3	3	4	3	13	L4
<i>Crataegus macracantha</i>	long-spined hawthorn	2	2	4	3	11	L4
<i>Crataegus pedicellata</i>	scarlet hawthorn	4	2	3	3	12	L4
<i>Crataegus submollis</i>	Emerson's hawthorn	3	3	4	3	13	L4
<i>Cuscuta gronovii</i>	swamp dodder	3	3	3	3	12	L4
<i>Cystopteris bulbifera</i>	bulblet fern	2	3	4	4	13	L4
<i>Danthonia spicata</i>	poverty oat grass	2	4	3	4	13	L4
<i>Diervilla lonicera</i>	bush honeysuckle	2	3	2	4	11	L4
<i>Dryopteris intermedia</i>	evergreen wood fern	2	4	4	3	13	L4
<i>Dryopteris marginalis</i>	marginal wood fern	2	3	3	4	12	L4
<i>Dryopteris</i> x <i>triploidea</i>	confusing hybrid wood fern	5	2	3	3	13	L4
<i>Eleocharis obtusa</i>	blunt spike-rush	3	2	5	2	12	L4
<i>Elodea canadensis</i>	common water-weed	2	3	5	3	13	L4
<i>Elymus canadensis</i>	Canada wild rye	3	2	5	3	13	L4
<i>Elymus hystrix</i>	bottle-brush grass	2	3	4	3	12	L4
<i>Elymus riparius</i>	riverbank wild rye	2	2	4	4	12	L4
<i>Epifagus virginiana</i>	beech-drops	2	3	5	2	12	L4
<i>Epilobium coloratum</i>	purple-leaved willow-herb	2	3	4	2	11	L4
<i>Equisetum variegatum</i> ssp. <i>variegatum</i>	variegated scouring-rush	2	2	5	4	13	L4
<i>Eupatorium perfoliatum</i>	boneset	1	3	4	3	11	L4
<i>Fagus grandifolia</i>	American beech	1	4	3	4	12	L4
<i>Festuca subverticillata</i>	nodding fescue	3	2	4	3	12	L4
<i>Fraxinus nigra</i>	black ash	2	4	4	3	13	L4
<i>Galium aparine</i>	cleavers	3	3	4	2	12	L4
<i>Galium asprellum</i>	rough bedstraw	3	2	4	2	11	L4
<i>Glyceria grandis</i>	tall manna grass	2	3	4	2	11	L4
<i>Helianthus strumosus</i>	pale-leaved sunflower	4	2	4	3	13	L4
<i>Juncus effusus</i> ssp. <i>solutus</i>	soft rush	2	4	4	3	13	L4

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<i>Juncus nodosus</i>	knotted rush	2	2	5	3	12	L4
<i>Lactuca biennis</i>	tall blue lettuce	3	4	2	4	13	L4
<i>Lactuca canadensis</i>	wild lettuce	3	3	2	3	11	L4
<i>Lycopus americanus</i>	cut-leaved water-horehound	2	4	3	3	12	L4
<i>Lycopus uniflorus</i>	northern water-horehound	2	3	3	3	11	L4
<i>Maianthemum canadense</i>	Canada mayflower	1	4	1	5	11	L4
<i>Mimulus ringens</i>	square-stemmed monkey-flower	2	3	3	4	12	L4
<i>Monarda fistulosa</i>	wild bergamot	3	3	2	3	11	L4
<i>Myosotis laxa</i>	smaller forget-me-not	2	4	3	4	13	L4
<i>Osmorhiza claytonii</i>	woolly sweet cicely	2	3	4	3	12	L4
<i>Panicum acuminatum</i> var. <i>acuminatum</i>	hairy panic grass	2	3	3	3	11	L4
<i>Penthorum sedoides</i>	ditch stonecrop	3	2	4	3	12	L4
<i>Physalis heterophylla</i>	clammy ground-cherry	3	2	3	3	11	L4
<i>Pinus strobus</i>	white pine	1	4	3	4	12	L4
<i>Polygonatum pubescens</i>	downy Solomon's seal	2	4	2	5	13	L4
<i>Polygonum amphibium</i>	water smartweed	2	3	4	4	13	L4
<i>Polygonum pensylvanicum</i>	Pennsylvania smartweed	3	2	4	3	12	L4
<i>Polygonum virginianum</i>	jumpseed	3	3	5	2	13	L4
<i>Populus grandidentata</i>	large-toothed aspen	2	3	4	3	12	L4
<i>Potamogeton pectinatus</i>	sago pondweed	2	2	5	3	12	L4
<i>Prunella vulgaris</i> ssp. <i>lanceolata</i>	heal-all (native)	4	2	3	2	11	L4
<i>Prunus pensylvanica</i>	pin cherry	2	4	3	3	12	L4
<i>Pteridium aquilinum</i> var. <i>latiusculum</i>	eastern bracken	2	4	2	4	12	L4
<i>Quercus macrocarpa</i>	bur oak	2	4	3	3	12	L4
<i>Quercus rubra</i>	red oak	1	4	2	4	11	L4
<i>Rorippa palustris</i> ssp. <i>fernaldiana</i>	Fernald's marsh cress	3	2	4	2	11	L4
<i>Rosa blanda</i>	smooth wild rose	2	3	3	4	12	L4
<i>Rubus pubescens</i>	dwarf raspberry	2	3	3	5	13	L4
<i>Rudbeckia hirta</i>	black-eyed Susan	1	4	4	3	12	L4
<i>Rudbeckia laciniata</i>	cut-leaved coneflower	3	2	4	2	11	L4
<i>Sagittaria latifolia</i>	common arrowhead	1	2	5	4	12	L4
<i>Salix amygdaloides</i>	peach-leaved willow	2	2	5	3	12	L4
<i>Salix bebbiana</i>	Bebb's willow	2	3	3	4	12	L4
<i>Salix discolor</i>	pussy willow	2	3	4	3	12	L4
<i>Salix petiolaris</i>	slender willow	2	3	5	3	13	L4
<i>Sanicula marilandica</i>	sanicle	3	3	3	3	12	L4
<i>Schizachne purpurascens</i> ssp. <i>purpurascens</i>	purple melic grass	2	3	3	5	13	L4
<i>Scirpus microcarpus</i>	barber-pole bulrush	2	2	4	3	11	L4
<i>Scirpus validus</i>	soft-stemmed bulrush	2	2	5	3	12	L4
<i>Sium suave</i>	water-parsnip	3	2	4	4	13	L4

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<i>Smilax hispida</i>	bristly greenbrier	3	3	3	3	12	L4
<i>Solidago juncea</i>	early goldenrod	3	3	4	2	12	L4
<i>Solidago rugosa</i> ssp. <i>rugosa</i>	rough-stemmed goldenrod	3	3	2	3	11	L4
<i>Spiraea alba</i>	wild spiraea	2	4	4	3	13	L4
<i>Stachys palustris</i>	marsh hedge-nettle	3	3	4	3	13	L4
<i>Symplocarpus foetidus</i>	skunk cabbage	3	2	4	3	12	L4
<i>Thelypteris palustris</i> var. <i>pubescens</i>	marsh fern	2	4	2	4	12	L4
<i>Thuja occidentalis</i>	white cedar	1	4	1	5	11	L4
<i>Tiarella cordifolia</i>	foam-flower	1	3	3	4	11	L4
<i>Trillium erectum</i>	red trillium	1	4	3	5	13	L4
<i>Trillium grandiflorum</i>	white trillium	1	3	4	5	13	L4
<i>Tsuga canadensis</i>	eastern hemlock	1	4	3	5	13	L4
<i>Typha latifolia</i>	broad-leaved cattail	1	4	4	4	13	L4
<i>Veronica americana</i>	American speedwell	2	3	4	4	13	L4
<i>Waldsteinia fragarioides</i>	barren strawberry	2	4	4	3	13	L4
<i>Wolffia columbiana</i>	columbia water-meal	2	4	5	2	13	L4
<i>Acalypha virginica</i> var. <i>rhomboidea</i>	three-seeded mercury	3	1	2	0	6	L5
<i>Acer saccharum</i> ssp. <i>saccharum</i>	sugar maple	1	3	0	2	6	L5
<i>Achillea millefolium</i> ssp. <i>lanulosum</i>	woolly yarrow	2	2	0	1	5	L5
<i>Actaea rubra</i>	red baneberry	2	3	1	3	9	L5
<i>Agrimonia gryposepala</i>	agrimony	2	2	0	2	6	L5
<i>Alisma plantago-aquatica</i>	water-plantain	2	2	4	2	10	L5
<i>Ambrosia artemisiifolia</i>	common ragweed	2	1	3	0	6	L5
<i>Amphicarpaea bracteata</i>	hog-peanut	2	2	2	2	8	L5
<i>Anemone canadensis</i>	Canada anemone	2	2	2	2	8	L5
<i>Anemone virginiana</i>	common thimbleweed	2	3	0	3	8	L5
<i>Apocynum cannabinum</i>	hemp dogbane	2	2	2	2	8	L5
<i>Aralia nudicaulis</i>	wild sarsaparilla	2	3	1	4	10	L5
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	1	3	2	3	9	L5
<i>Asclepias syriaca</i>	common milkweed	2	2	0	2	6	L5
<i>Aster cordifolius</i>	heart-leaved aster	2	1	0	2	5	L5
<i>Aster ericoides</i> ssp. <i>ericoides</i>	heath aster	2	1	2	1	6	L5
<i>Aster lanceolatus</i> ssp. <i>lanceolatus</i>	panicked aster	1	2	3	1	7	L5
<i>Aster lateriflorus</i> var. <i>lateriflorus</i>	calico aster	2	2	3	2	9	L5
<i>Aster novae-angliae</i>	New England aster	1	2	2	1	6	L5
<i>Aster puniceus</i> var. <i>puniceus</i>	swamp aster	2	2	2	2	8	L5
<i>Athyrium filix-femina</i> var. <i>angustum</i>	northeastern lady fern	2	3	1	3	9	L5
<i>Bidens cernuus</i>	nodding bur-marigold	2	2	3	3	10	L5
<i>Bidens frondosus</i>	common beggar's-ticks	2	1	4	0	7	L5
<i>Calystegia sepium</i>	hedge bindweed	3	2	3	2	10	L5

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<i>Carex bebbii</i>	Bebb's sedge	2	2	3	3	10	L5
<i>Carex blanda</i>	common wood sedge	2	2	1	2	7	L5
<i>Carex cristatella</i>	crested sedge	2	2	4	1	9	L5
<i>Carex granularis</i>	meadow sedge	2	2	1	3	8	L5
<i>Carex radiata</i>	straight-styled sedge	2	2	2	2	8	L5
<i>Carex rosea</i>	curly-styled sedge	2	2	3	2	9	L5
<i>Carex stipata</i>	awl-fruited sedge	2	3	2	3	10	L5
<i>Carex vulpinoidea</i>	fox sedge	2	2	4	1	9	L5
<i>Cicuta maculata</i>	spotted water-hemlock	2	2	2	2	8	L5
<i>Circaea lutetiana</i> ssp. <i>canadensis</i>	enchanter's nightshade	2	1	1	1	5	L5
<i>Clinopodium vulgare</i>	wild basil	3	3	1	3	10	L5
<i>Conyza canadensis</i>	horse-weed	3	1	2	0	6	L5
<i>Cornus alternifolia</i>	alternate-leaved dogwood	2	2	1	2	7	L5
<i>Cornus foemina</i> ssp. <i>racemosa</i>	grey dogwood	2	2	4	2	10	L5
<i>Cornus stolonifera</i>	red osier dogwood	1	2	0	3	6	L5
<i>Crataegus punctata</i>	dotted hawthorn	2	2	3	3	10	L5
<i>Cryptotaenia canadensis</i>	honewort	2	2	4	1	9	L5
<i>Desmodium canadense</i>	showy tick-trefoil	2	2	3	3	10	L5
<i>Dryopteris carthusiana</i>	spinulose wood fern	2	3	2	2	9	L5
<i>Echinocystis lobata</i>	wild cucumber	2	2	3	1	8	L5
<i>Eleocharis erythropoda</i>	creeping spike-rush	2	2	4	1	9	L5
<i>Elymus virginicus</i> var. <i>virginicus</i>	Virginia wild rye	2	2	3	2	9	L5
<i>Epilobium ciliatum</i> ssp. <i>ciliatum</i>	sticky willow-herb	2	2	2	2	8	L5
<i>Equisetum arvense</i>	field horsetail	1	2	1	1	5	L5
<i>Equisetum hyemale</i> ssp. <i>affine</i>	scouring-rush	2	2	2	2	8	L5
<i>Erigeron annuus</i>	daisy fleabane	2	2	0	1	5	L5
<i>Erigeron philadelphicus</i> ssp. <i>philadelphicus</i>	Philadelphia fleabane	2	2	0	1	5	L5
<i>Erigeron strigosus</i>	rough fleabane	3	2	1	1	7	L5
<i>Erythronium americanum</i> ssp. <i>americanum</i>	yellow trout-lily	2	3	3	2	10	L5
<i>Eupatorium maculatum</i> ssp. <i>maculatum</i>	spotted Joe-Pye weed	2	2	3	3	10	L5
<i>Eupatorium rugosum</i>	white snakeroot	2	2	2	1	7	L5
<i>Euthamia graminifolia</i>	grass-leaved goldenrod	2	1	4	1	8	L5
<i>Fragaria vesca</i> ssp. <i>americana</i>	woodland strawberry	3	2	2	2	9	L5
<i>Fragaria virginiana</i>	wild strawberry	2	2	0	2	6	L5
<i>Fraxinus americana</i>	white ash	1	2	0	3	6	L5
<i>Fraxinus pennsylvanica</i> var. <i>pennsylvanica</i>	red ash	2	2	2	3	9	L5
<i>Fraxinus pennsylvanica</i> var. <i>subintegerrima</i>	green ash	2	2	2	3	9	L5
<i>Galium palustre</i>	marsh bedstraw	2	2	3	3	10	L5
<i>Galium triflorum</i>	sweet-scented bedstraw	2	2	2	2	8	L5
<i>Geum aleppicum</i>	yellow avens	2	3	3	2	10	L5

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<i>Geum canadense</i>	white avens	2	2	1	2	7	L5
<i>Glyceria striata</i>	fowl manna grass	2	2	1	2	7	L5
<i>Hackelia virginiana</i>	Virginia stickseed	2	2	0	2	6	L5
<i>Heracleum lanatum</i>	cow-parsnip	3	2	3	2	10	L5
<i>Hydrophyllum virginianum</i>	Virginia waterleaf	2	2	1	2	7	L5
<i>Impatiens capensis</i>	orange touch-me-not	1	2	0	2	5	L5
<i>Juglans nigra</i>	black walnut	2	1	2	1	6	L5
<i>Juncus articulatus</i>	jointed rush	2	2	4	2	10	L5
<i>Juncus dudleyi</i>	Dudley's rush	2	2	3	1	8	L5
<i>Juncus tenuis</i>	path rush	2	2	1	1	6	L5
<i>Juniperus virginiana</i>	red cedar	2	1	4	1	8	L5
<i>Laportea canadensis</i>	wood nettle	2	3	2	2	9	L5
<i>Leersia oryzoides</i>	rice cut grass	2	2	3	2	9	L5
<i>Lemna minor</i>	common duckweed	2	2	4	2	10	L5
<i>Lysimachia ciliata</i>	fringed loosestrife	2	2	2	2	8	L5
<i>Maianthemum racemosum</i> ssp. <i>racemosum</i>	false Solomon's seal	2	3	2	3	10	L5
<i>Maianthemum stellatum</i>	starry false Solomon's seal	2	2	1	3	8	L5
<i>Matteuccia struthiopteris</i> var. <i>pensylvanica</i>	ostrich fern	1	2	2	2	7	L5
<i>Mentha arvensis</i> ssp. <i>borealis</i>	wild mint	2	2	3	2	9	L5
<i>Muhlenbergia mexicana</i> var. <i>mexicana</i>	common muhly grass	3	2	0	1	6	L5
<i>Oenothera biennis</i>	common evening-primrose	2	1	1	1	5	L5
<i>Onoclea sensibilis</i>	sensitive fern	2	3	1	3	9	L5
<i>Ostrya virginiana</i>	ironwood	2	3	2	2	9	L5
<i>Oxalis dillenii</i>	deflexed yellow wood-sorrel	4	1	0	1	6	L5
<i>Oxalis stricta</i>	common yellow wood-sorrel	3	1	1	1	6	L5
<i>Panicum capillare</i>	panic grass	3	1	4	1	9	L5
<i>Parthenocissus inserta</i>	thicket creeper	1	2	0	1	4	L5
<i>Phryma leptostachya</i>	lopseed	2	2	3	2	9	L5
<i>Pilea pumila</i>	dwarf clearweed	2	2	1	1	6	L5
<i>Plantago rugelii</i>	red-stemmed plantain	2	2	0	1	5	L5
<i>Poa palustris</i>	fowl meadow-grass	2	2	3	2	9	L5
<i>Podophyllum peltatum</i>	May-apple	1	3	3	3	10	L5
<i>Polygonum lapathifolium</i> var. <i>lapathifolium</i>	pale smartweed	2	1	4	0	7	L5
<i>Populus balsamifera</i> ssp. <i>balsamifera</i>	balsam poplar	1	2	3	2	8	L5
<i>Populus deltoides</i>	cottonwood	2	1	4	1	8	L5
<i>Populus tremuloides</i>	trembling aspen	1	3	1	3	8	L5
<i>Prenanthes altissima</i>	tall wood lettuce	2	3	2	2	9	L5
<i>Prunus serotina</i>	black cherry	2	2	0	2	6	L5
<i>Prunus virginiana</i> ssp. <i>virginiana</i>	choke cherry	1	2	0	1	4	L5
<i>Ranunculus abortivus</i>	kidney-leaved buttercup	2	3	1	2	8	L5

Appendix 2: List of Flora Species

<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	hooked buttercup	2	3	2	3	10	L5
<i>Ranunculus sceleratus</i>	cursed crowfoot	2	2	3	2	9	L5
<i>Rhus radicans</i> ssp. <i>negundo</i>	poison ivy (vine form)	2	2	4	2	10	L5
<i>Rhus radicans</i> ssp. <i>rydbergii</i>	poison ivy (shrub form)	2	2	0	2	6	L5
<i>Rhus typhina</i>	staghorn sumach	2	1	2	2	7	L5
<i>Ribes americanum</i>	wild black currant	2	3	2	2	9	L5
<i>Ribes cynosbati</i>	prickly gooseberry	2	3	2	2	9	L5
<i>Rubus allegheniensis</i>	common blackberry	2	3	0	1	6	L5
<i>Rubus idaeus</i> ssp. <i>melanolasius</i>	wild red raspberry	1	1	0	1	3	L5
<i>Rubus occidentalis</i>	wild black raspberry	2	1	0	1	4	L5
<i>Rubus odoratus</i>	purple-flowering raspberry	2	2	2	2	8	L5
<i>Salix eriocephala</i>	narrow heart-leaved willow	2	1	3	1	7	L5
<i>Salix exigua</i>	sandbar willow	2	1	5	2	10	L5
<i>Sambucus canadensis</i>	common elderberry	2	3	2	2	9	L5
<i>Sambucus racemosa</i> ssp. <i>pubens</i>	red-berried elder	2	3	2	2	9	L5
<i>Sanguinaria canadensis</i>	bloodroot	2	3	0	3	8	L5
<i>Scirpus atrovirens</i>	black-fruited bulrush	2	2	4	2	10	L5
<i>Scutellaria galericulata</i>	common skullcap	3	2	3	2	10	L5
<i>Scutellaria lateriflora</i>	mad-dog skullcap	2	2	3	3	10	L5
<i>Smilax herbacea</i>	carrion-flower	3	3	2	2	10	L5
<i>Solidago altissima</i>	tall goldenrod	1	2	0	0	3	L5
<i>Solidago caesia</i>	blue-stemmed goldenrod	2	2	4	2	10	L5
<i>Solidago canadensis</i> var. <i>canadensis</i>	Canada goldenrod	2	2	0	1	5	L5
<i>Solidago flexicaulis</i>	zig-zag goldenrod	2	1	3	2	8	L5
<i>Solidago gigantea</i>	late goldenrod	2	1	1	1	5	L5
<i>Solidago nemoralis</i> ssp. <i>nemoralis</i>	grey goldenrod	2	2	2	2	8	L5
<i>Thalictrum dioicum</i>	early meadow rue	2	3	3	2	10	L5
<i>Thalictrum pubescens</i>	tall meadow rue	2	3	2	2	9	L5
<i>Tilia americana</i>	basswood	1	4	2	3	10	L5
<i>Ulmus americana</i>	white elm	1	4	0	2	7	L5
<i>Urtica dioica</i> ssp. <i>gracilis</i>	American stinging nettle	2	3	2	2	9	L5
<i>Verbena hastata</i>	blue vervain	2	2	4	2	10	L5
<i>Verbena urticifolia</i>	white vervain	2	2	2	2	8	L5
<i>Viburnum lentago</i>	nannyberry	2	3	1	2	8	L5
<i>Viola conspersa</i>	dog violet	2	2	0	2	6	L5
<i>Viola pubescens</i>	stemmed yellow violet	2	3	1	2	8	L5
<i>Viola sororia</i>	common blue violet	2	2	0	2	6	L5
<i>Vitis riparia</i>	riverbank grape	1	1	0	0	2	L5
<i>Xanthium strumarium</i>	clotbur	3	1	4	0	8	L5
<i>Vicia americana</i>	American vetch	5	5	2	4	16	LU

Appendix 2: List of Flora Species

<i>Acer platanoides</i>	Norway maple	3				3	L+
<i>Achillea millefolium</i> ssp. <i>millefolium</i>	European yarrow	4				4	L+
<i>Acinos arvensis</i>	mother-of-thyme	5				5	L+
<i>Aegopodium podagraria</i>	goutweed	4				4	L+
<i>Aesculus hippocastanum</i>	horse-chestnut	4				4	L+
<i>Agrostis gigantea</i>	redtop	3				3	L+
<i>Ajuga reptans</i>	common bugle	5				5	L+
<i>Alliaria petiolata</i>	garlic mustard	2				2	L+
<i>Alnus glutinosa</i>	European alder	4				4	L+
<i>Alopecurus pratensis</i>	meadow foxtail	5				5	L+
<i>Amaranthus retroflexus</i>	red-root pigweed	4				4	L+
<i>Anthemis cotula</i>	stinking mayweed	5				5	L+
<i>Aquilegia vulgaris</i>	garden columbine	5				5	L+
<i>Arctium lappa</i>	great burdock	3				3	L+
<i>Arctium minus</i> ssp. <i>minus</i>	common burdock	3				3	L+
<i>Arenaria serpyllifolia</i>	thyme-leaved sandwort	5				5	L+
<i>Artemisia biennis</i>	biennial wormwood	5				5	L+
<i>Artemisia vulgaris</i>	common mugwort	4				4	L+
<i>Asparagus officinalis</i>	asparagus	4				4	L+
<i>Barbarea vulgaris</i>	winter cress	3				3	L+
<i>Berberis thunbergii</i>	Japanese barberry	4				4	L+
<i>Brassica nigra</i>	black mustard	5				5	L+
<i>Brassica oleracea</i>	kale	5				5	L+
<i>Bromus inermis</i> ssp. <i>inermis</i>	smooth brome grass	3				3	L+
<i>Bromus japonicus</i>	Japanese chess	5				5	L+
<i>Bromus tectorum</i>	downy chess	4				4	L+
<i>Camelina microcarpa</i>	small-seeded false flax	5				5	L+
<i>Campanula rapunculoides</i>	creeping bellflower	3				3	L+
<i>Capsella bursa-pastoris</i>	shepherd's purse	4				4	L+
<i>Caragana arborescens</i>	Siberian pea-shrub	5				5	L+
<i>Carduus acanthoides</i>	plumeless thistle	4				4	L+
<i>Carex spicata</i>	spiked sedge	3				3	L+
<i>Celastrus orbiculatus</i>	oriental bittersweet	4				4	L+
<i>Celtis occidentalis</i>	hackberry	5				5	L+
<i>Centaurea maculosa</i>	spotted knapweed	4				4	L+
<i>Cerastium arvense</i> ssp. <i>arvense</i>	field chickweed	5				5	L+
<i>Cerastium fontanum</i>	mouse-ear chickweed	3				3	L+
<i>Chelidonium majus</i>	celandine	3				3	L+
<i>Chenopodium album</i> var. <i>album</i>	lamb's quarters	3				3	L+
<i>Chrysanthemum leucanthemum</i>	ox-eye daisy	3				3	L+

Appendix 2: List of Flora Species

<i>Cichorium intybus</i>	chicory	3				3	L+
<i>Cirsium arvense</i>	creeping thistle	2				2	L+
<i>Cirsium vulgare</i>	bull thistle	3				3	L+
<i>Convallaria majalis</i>	lily-of-the-valley	3				3	L+
<i>Convolvulus arvensis</i>	field bindweed	4				4	L+
<i>Coronilla varia</i>	crown vetch	4				4	L+
<i>Crataegus monogyna</i>	English hawthorn	3	1	4	0	8	L+
<i>Cynanchum rossicum</i>	dog-strangling vine	3				3	L+
<i>Cynoglossum officinale</i>	hound's tongue	4				4	L+
<i>Cytisus scoparius</i>	Scotch broom	5				5	L+
<i>Dactylis glomerata</i>	orchard grass	3				3	L+
<i>Daucus carota</i>	Queen Anne's lace	3				3	L+
<i>Dianthus armeria</i>	Deptford pink	4				4	L+
<i>Dipsacus fullonum</i> ssp. <i>sylvestris</i>	teasel	4				4	L+
<i>Echinacea purpurea</i>	purple coneflower	5				5	L+
<i>Echinochloa crusgalli</i>	barnyard grass	4				4	L+
<i>Echium vulgare</i>	viper's bugloss	4				4	L+
<i>Elaeagnus angustifolia</i>	Russian olive	3				3	L+
<i>Elaeagnus umbellata</i>	autumn olive	4				4	L+
<i>Elymus repens</i>	quack grass	3				3	L+
<i>Epilobium hirsutum</i>	European willow-herb	4				4	L+
<i>Epilobium parviflorum</i>	small-flowered willow-herb	4				4	L+
<i>Epipactis helleborine</i>	helleborine	3				3	L+
<i>Erysimum cheiranthoides</i>	wormseed mustard	4				4	L+
<i>Euphorbia cyparissias</i>	cypress spurge	5				5	L+
<i>Euphorbia esula</i>	leafy spurge	5				5	L+
<i>Festuca arundinacea</i>	tall fescue	5				5	L+
<i>Festuca pratensis</i>	meadow fescue	3				3	L+
<i>Festuca rubra</i> ssp. <i>rubra</i>	red fescue	3				3	L+
<i>Festuca trachyphylla</i>	hard fescue	5				5	L+
<i>Galeopsis tetrahit</i>	hemp-nettle	4				4	L+
<i>Galinsoga parviflora</i>	small-flowered galinsoga	5				5	L+
<i>Galium mollugo</i>	white bedstraw	3				3	L+
<i>Galium verum</i>	yellow bedstraw	4				4	L+
<i>Geum urbanum</i>	urban avens	3				3	L+
<i>Glechoma hederacea</i>	creeping Charlie	3				3	L+
<i>Hemerocallis fulva</i>	orange day-lily	4				4	L+
<i>Hesperis matronalis</i>	dame's rocket	2				2	L+
<i>Hieracium aurantiacum</i>	orange hawkweed	4				4	L+
<i>Hieracium caespitosum</i> ssp. <i>caespitosum</i>	yellow hawkweed	3				3	L+

Appendix 2: List of Flora Species

<i>Hieracium lachenalii</i>	blotched hawkweed	5				5	L+
<i>Hieracium pilosella</i>	mouse-ear hawkweed	5				5	L+
<i>Hieracium piloselloides</i>	smooth yellow hawkweed	3				3	L+
<i>Hieracium x floribundum</i>	smoothish hawkweed	5				5	L+
<i>Hordeum jubatum</i> ssp. <i>jubatum</i>	squirrel-tail barley	4				4	L+
<i>Hypericum perforatum</i>	common St. Johnswort	3				3	L+
<i>Inula helenium</i>	elecampane	3				3	L+
<i>Ipomoea hederacea</i>	ivy-leaved morning-glory	5				5	L+
<i>Iris pseudacorus</i>	yellow flag	4				4	L+
<i>Kochia scoparia</i>	summer-cypress	5				5	L+
<i>Lactuca serriola</i>	prickly lettuce	3				3	L+
<i>Lapsana communis</i>	nipplewort	5				5	L+
<i>Larix decidua</i>	European larch	4				4	L+
<i>Lathyrus latifolius</i>	everlasting pea	4				4	L+
<i>Leonurus cardiaca</i> ssp. <i>cardiaca</i>	motherwort	3				3	L+
<i>Lepidium campestre</i>	field pepper-grass	4				4	L+
<i>Linaria vulgaris</i>	butter-and-eggs	3				3	L+
<i>Lithospermum officinale</i>	Eurasian gromwell	4				4	L+
<i>Lolium perenne</i>	perennial rye	4				4	L+
<i>Lonicera morrowii</i>	Morrow's honeysuckle	3				3	L+
<i>Lonicera tatarica</i>	Tartarian honeysuckle	4				4	L+
<i>Lonicera x bella</i>	shrub honeysuckle	3				3	L+
<i>Lonicera xylosteum</i>	European fly honeysuckle	4				4	L+
<i>Lotus corniculatus</i>	bird's foot trefoil	3				3	L+
<i>Lupinus polyphyllus</i>	garden lupine	5				5	L+
<i>Lysimachia nummularia</i>	moneywort	4				4	L+
<i>Lythrum salicaria</i>	purple loosestrife	3				3	L+
<i>Malus pumila</i>	apple	2				2	L+
<i>Malva moschata</i>	musk mallow	5				5	L+
<i>Malva neglecta</i>	common mallow	5				5	L+
<i>Matricaria matricarioides</i>	pineappleweed	5				5	L+
<i>Medicago lupulina</i>	black medick	3				3	L+
<i>Medicago sativa</i> ssp. <i>sativa</i>	alfalfa	3				3	L+
<i>Melilotus alba</i>	white sweet clover	3				3	L+
<i>Melilotus officinalis</i>	yellow sweet clover	3				3	L+
<i>Mentha spicata</i>	spear mint	4				4	L+
<i>Mentha x piperita</i>	peppermint	5				5	L+
<i>Morus alba</i>	white mulberry	4				4	L+
<i>Mycelis muralis</i>	wall lettuce	5				5	L+
<i>Myosotis scorpioides</i>	true forget-me-not	3				3	L+

Appendix 2: List of Flora Species

<i>Myosotis sylvatica</i>	woodland forget-me-not	5				5	L+
<i>Myosoton aquaticum</i>	giant chickweed	5				5	L+
<i>Nasturtium microphyllum</i>	small-leaved watercress	4				4	L+
<i>Nepeta cataria</i>	catnip	3				3	L+
<i>Papaver orientale</i>	oriental poppy	5				5	L+
<i>Pastinaca sativa</i>	wild parsnip	4				4	L+
<i>Phleum pratense</i>	timothy grass	3				3	L+
<i>Picea abies</i>	Norway spruce	5				5	L+
<i>Picris hieracioides</i> ssp. <i>hieracioides</i>	hawkweed oxtongue	5				5	L+
<i>Pinus banksiana</i>	Jack pine	5				5	L+
<i>Pinus sylvestris</i>	Scots pine	3				3	L+
<i>Plantago lanceolata</i>	English plantain	4				4	L+
<i>Plantago major</i>	common plantain	3				3	L+
<i>Poa annua</i>	annual blue grass	5				5	L+
<i>Poa compressa</i>	Canada blue grass	3				3	L+
<i>Poa nemoralis</i>	woodland spear grass	4				4	L+
<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky blue grass	3				3	L+
<i>Poa trivialis</i>	rough blue grass	5				5	L+
<i>Polygonum cuspidatum</i>	Japanese knotweed	4				4	L+
<i>Polygonum persicaria</i>	lady's thumb	3				3	L+
<i>Populus alba</i>	white poplar	4				4	L+
<i>Populus x canadensis</i>	Carolina poplar	5				5	L+
<i>Potentilla argentea</i>	silvery cinquefoil	5				5	L+
<i>Potentilla recta</i>	sulphur cinquefoil	3				3	L+
<i>Potentilla x inclinata</i>	lintermediate cinquefoil	5				5	L+
<i>Prunella vulgaris</i> ssp. <i>vulgaris</i>	heal-all (European)	5				5	L+
<i>Pseudotsuga menziesii</i> var. <i>glauca</i>	Rocky Mountain Douglas-fir	5				5	L+
<i>Pyrus communis</i>	pear	4				4	L+
<i>Ranunculus acris</i>	tall buttercup	3				3	L+
<i>Ranunculus repens</i>	creeping buttercup	4				4	L+
<i>Rhamnus cathartica</i>	common buckthorn	2				2	L+
<i>Ribes rubrum</i>	garden red currant	3				3	L+
<i>Robinia pseudoacacia</i>	black locust	3				3	L+
<i>Rosa canina</i>	dog rose	5				5	L+
<i>Rosa multiflora</i>	multiflora rose	3				3	L+
<i>Rubus idaeus</i> ssp. <i>idaeus</i>	garden red raspberry	5				5	L+
<i>Rudbeckia triloba</i>	brown-eyed Susan	4				4	L+
<i>Rumex acetosa</i> ssp. <i>thyrsoiflora</i>	garden sorrel	5				5	L+
<i>Rumex acetosella</i> ssp. <i>acetosella</i>	sheep sorrel	4	2	5	4	15	L+
<i>Rumex crispus</i>	curly dock	3				3	L+

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<i>Rumex longifolius</i>	northern dock	5				5	L+
<i>Rumex obtusifolius</i> ssp. <i>obtusifolius</i>	bitter dock	4				4	L+
<i>Salix alba</i> var. <i>vitellina</i>	weeping willow	5				5	L+
<i>Salix fragilis</i>	crack willow	4				4	L+
<i>Salix x rubens</i>	European tree willow	3				3	L+
<i>Salix x sepulcralis</i>	weeping willow	4				4	L+
<i>Saponaria officinalis</i>	bouncing Bet	4				4	L+
<i>Sedum acre</i>	mossy stonecrop	5				5	L+
<i>Sedum hispanicum</i>	Spanish stonecrop						L+
<i>Setaria glauca</i>	yellow foxtail	5				5	L+
<i>Silene pratensis</i>	evening lychnis	4				4	L+
<i>Silene vulgaris</i>	bladder campion	4				4	L+
<i>Sinapis arvensis</i>	charlock	4				4	L+
<i>Solanum dulcamara</i>	bittersweet nightshade	3				3	L+
<i>Solanum nigrum</i>	black nightshade	5	1	4	0	10	L+
<i>Sonchus arvensis</i> ssp. <i>arvensis</i>	glandular perennial sow-thistle	5				5	L+
<i>Sonchus oleraceus</i>	annual sow-thistle	5				5	L+
<i>Sorbaria sorbifolia</i>	false spiraea	4				4	L+
<i>Sorbus aucuparia</i>	European mountain-ash	3				3	L+
<i>Spergula arvensis</i>	corn spurrey	5				5	L+
<i>Stellaria graminea</i>	grass-leaved chickweed	4				4	L+
<i>Stellaria media</i>	common chickweed	5				5	L+
<i>Symphoricarpos albus</i> var. <i>laevigatus</i>	western snowberry	5				5	L+
<i>Symphytum officinale</i> ssp. <i>officinale</i>	common comfrey	5				5	L+
<i>Syringa vulgaris</i>	common lilac	3				3	L+
<i>Taraxacum officinale</i>	dandelion	3				3	L+
<i>Taraxacum palustre</i>	marsh dandelion	5				5	L+
<i>Taxus cuspidata</i>	Japanese yew	5				5	L+
<i>Thlaspi arvense</i>	penny-cress	3				3	L+
<i>Tragopogon dubius</i>	lemon-yellow goat's beard	3				3	L+
<i>Tragopogon pratensis</i> ssp. <i>pratensis</i>	meadow goat's beard	3				3	L+
<i>Trifolium aureum</i>	hop-clover	5				5	L+
<i>Trifolium hybridum</i>	alsike clover	5				5	L+
<i>Trifolium pratense</i>	red clover	3				3	L+
<i>Trifolium repens</i>	white clover	3				3	L+
<i>Tussilago farfara</i>	coltsfoot	2				2	L+
<i>Typha angustifolia</i>	narrow-leaved cattail	3				3	L+
<i>Typha x glauca</i>	hybrid cattail	3				3	L+
<i>Ulmus glabra</i>	Scotch elm	5				5	L+
<i>Urtica dioica</i> ssp. <i>dioica</i>	European stinging nettle	4				4	L+

Appendix 2: List of Flora Species

<i>Valeriana officinalis</i>	common valerian	4				4	L+
<i>Verbascum thapsus</i>	common mullein	3				3	L+
<i>Veronica anagallis-aquatica</i>	water speedwell	5				5	L+
<i>Veronica arvensis</i>	corn speedwell	5				5	L+
<i>Veronica officinalis</i>	common speedwell	3				3	L+
<i>Veronica serpyllifolia</i> ssp. <i>serpyllifolia</i>	thyme-leaved speedwell	5				5	L+
<i>Veronica verna</i>	Spring speedwell	5				5	L+
<i>Viburnum lantana</i>	wayfaring tree	4				4	L+
<i>Viburnum opulus</i>	European highbush cranberry	3				3	L+
<i>Vicia cracca</i>	cow vetch	3				3	L+
<i>Vicia sativa</i> ssp. <i>nigra</i>	common vetch	5				5	L+
<i>Vicia tetrasperma</i>	slender vetch	5				5	L+
<i>Vinca minor</i>	periwinkle	4				4	L+
<i>Acer negundo</i>	Manitoba maple	2	0	0	2	4	L+?
<i>Agrostis stolonifera</i>	creeping bent grass	3				3	L+?
<i>Chamaesyce glyptosperma</i>	ridge-seeded spurge	5				5	L+?
<i>Cyperus esculentus</i>	yellow nut-sedge	5	0	4	1	10	L+?
<i>Geranium robertianum</i>	herb Robert	3				3	L+?
<i>Lepidium densiflorum</i>	common pepper-grass	5				5	L+?
<i>Phalaris arundinacea</i>	reed canary grass	3				3	L+?
<i>Phragmites australis</i>	common reed	3				3	L+?
<i>Polygonum hydropiper</i>	water-pepper	5				5	L+?
<i>Potentilla norvegica</i>	rough cinquefoil	4				4	L+?
<i>Prunella vulgaris</i>	heal-all	4				4	L+?
<i>Prunus pumila</i> var. <i>pumila</i>	sand cherry	5		5		10	L+?

Appendix 3: List of Fauna Species

Common Name	Code	Scientific Name	number of territories	non-TRCA	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Survey Species: species for which the TRCA protocol effectively surveys.														
Birds														
whip-poor-will	WPWI	<i>Caprimulgus vociferus</i>	2	3	4	3	4	4	2	2	5	1	25	L1
barred owl	BADO	<i>Strix varia</i>	5	4	4	2	3	5	2	3	4	1	24	L2
black and white warbler	BAWW	<i>Mniotilta varia</i>	10	1	1	3	2	4	2	2	5	1	20	L2
blue-winged warbler	BWWA	<i>Vermivora pinus</i>	36	8	3	3	2	3	1	2	5	1	20	L2
broad-winged hawk	BWHA	<i>Buteo platypterus</i>	8	1	3	2	3	5	1	4	3	1	22	L2
canada warbler	CAWA	<i>Wilsonia canadensis</i>	0	1	4	3	2	3	1	3	5	1	22	L2
golden-winged warbler	GWWA	<i>Vermivora chrysoptera</i>	6	0	4	3	3	3	1	2	5	1	22	L2
grasshopper sparrow	GRSP	<i>Ammodramus savannarum</i>	6	14	3	4	3	2	2	3	3	0	20	L2
hooded warbler	HOWA	<i>Wilsonia citrina</i>	11	2	4	1	1	4	1	3	5	1	20	L2
nothern goshawk	NOGO	<i>Accipiter gentilis</i>	2	0	4	2	2	5	1	3	3	1	21	L2
red-shouldered hawk	RSHA	<i>Buteo lineatus</i>	3	2	3	2	3	5	1	4	3	1	22	L2
ruffed grouse	RUGR	<i>Bonasa umbellus</i>	7	3	1	3	3	3	2	2	5	1	20	L2
American redstart	AMRE	<i>Setophaga ruticilla</i>	10	2	1	2	2	3	1	2	4	0	15	L3
American woodcock	AMWO	<i>Scolopax minor</i>	3	2	0	2	3	3	2	2	4	0	16	L3
black-billed cuckoo	BBCU	<i>Coccyzus erythrophthalmus</i>	8	2	0	3	2	3	1	3	3	0	15	L3
Blackburnian warbler	BLBW	<i>Dendroica fusca</i>	33	5	3	1	2	3	1	4	4	0	18	L3
black-throated blue warbler	BTBW	<i>Dendroica caerulescens</i>	17	4	4	2	2	3	1	3	4	0	19	L3
black-throated green warbler	BTNW	<i>Dendroica virens</i>	100	8	1	4	2	3	1	3	4	0	18	L3
blue-headed vireo	BHVI	<i>Vireo solitarius</i>	8	2	3	2	2	3	1	2	3	0	16	L3
bobolink	BOBO	<i>Dolichonyx oryzivorus</i>	9	15	0	3	3	3	1	1	5	1	17	L3
brown creeper	BRCR	<i>Certhia americana</i>	18	5	1	2	2	3	2	2	4	0	16	L3
brown thrasher	BRTH	<i>Toxostoma rufum</i>	15	5	0	3	3	2	2	1	4	0	15	L3
chestnut-sided warbler	CSWA	<i>Dendroica pensylvanica</i>	22	4	2	2	2	3	1	1	4	0	15	L3
clay-coloured sparrow	CCSP	<i>Spizella pallida</i>	11	3	3	3	2	2	1	1	4	0	16	L3
common nighthawk	CONI	<i>Chordeiles minor</i>	na	na	4	3	4	1	1	2	4	0	19	L3
eastern towhee	EATO	<i>Pipilo erythrophthalmus</i>	34	10	2	3	2	2	2	1	4	0	16	L3
golden-crowned kinglet	GCKI	<i>Regulus satrapa</i>	5	0	3	2	2	3	1	3	3	0	17	L3
hermit thrush	HETH	<i>Catharus guttatus</i>	47	9	4	1	2	3	1	1	5	1	18	L3
hooded merganser	HOME	<i>Lophodytes cucullatus</i>	1	0	3	2	2	4	2	2	2	0	17	L3
magnolia warbler	MAWA	<i>Dendroica magnolia</i>	2	1	4	2	2	2	1	3	3	0	17	L3
mourning warbler	MOWA	<i>Oporornis philadelphia</i>	39	16	0	3	2	2	2	2	4	0	15	L3
Nashville warbler	NAWA	<i>Vermivora ruficapilla</i>	54	10	2	1	2	2	1	2	5	1	16	L3
northern harrier	NOHA	<i>Circus cyaneus</i>	1	1	2	3	2	4	1	3	3	0	18	L3
northern waterthrush	NOWA	<i>Seiurus noveboracensis</i>	3	4	1	2	2	3	1	4	5	1	19	L3
osprey	OSPR	<i>Pandion haliaetus</i>	0	1	4	1	2	3	1	2	5	1	19	L3
ovenbird	OVEN	<i>Seiurus aurocapillus</i>	316	106	0	2	3	4	2	4	4	0	19	L3
pileated woodpecker	PIWO	<i>Dryocopus pileatus</i>	7	1	0	2	2	4	1	3	3	0	15	L3
pine siskin	PISI	<i>Carduelis pinus</i>	2	0	5	3	2	3	1	1	1	0	16	L3

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pine warbler	PIWA	<i>Dendroica pinus</i>	97	30	1	2	2	4	1	3	3	0	16	L3
red-headed woodpecker	RHOW	<i>Melanerpes erythrocephalus</i>	1	1	3	3	4	2	1	2	2	0	17	L3
scarlet tanager	SCTA	<i>Piranga olivacea</i>	87	19	1	2	2	4	1	3	4	0	17	L3
sedge wren	SEWR	<i>Cistothorus platensis</i>	1	0	3	2	2	3	3	1	4	0	18	L3
sharp-shinned hawk	SSHA	<i>Accipiter striatus</i>	0	0	1	2	2	4	1	3	3	0	16	L3
summer tanager	SUTA	<i>Piranga rubra</i>	0	1	5	1	2	3	1	2	4	0	18	L3
veery	VEER	<i>Catharus fuscescens</i>	32	15	1	3	2	3	1	2	5	1	18	L3
Virginia Rail	VIRA	<i>Rallus limicola</i>	0	1	0	2	2	2	3	2	4	0	15	L3
white-throated sparrow	WTSP	<i>Zonotrichia albicollis</i>	1	0	2	3	2	2	2	1	4	0	16	L3
wild turkey	WITU	<i>Meleagris gallopavo</i>	12	5	2	1	0	4	3	4	3	0	17	L3
winter wren	WIWR	<i>Troglodytes troglodytes</i>	3	1	1	2	2	3	2	3	5	1	19	L3
wood duck	WODU	<i>Aix sponsa</i>	2	1	1	2	1	3	2	2	4	0	15	L3
wood thrush	WOTH	<i>Hylocichla mustelina</i>	97	38	0	3	2	3	2	2	4	0	16	L3
yellow-bellied sapsucker	YBSA	<i>Sphyrapicus varius</i>	20	1	4	2	2	2	1	3	3	0	17	L3
yellow-billed cuckoo	YBCU	<i>Coccyzus americanus</i>	6	2	2	3	2	3	1	3	3	0	17	L3
yellow-rumped warbler	YRWA	<i>Dendroica coronata</i>	22	5	3	1	2	3	1	2	4	0	16	L3
alder flycatcher	ALFL	<i>Empidonax alnorum</i>	na	na	1	2	2	1	1	2	4	0	13	L4
American kestrel	AMKE	<i>Falco sparverius</i>	na	na	2	2	2	1	1	2	0	0	10	L4
barn swallow	BARS	<i>Hirundo rustica</i>	na	na	0	2	3	1	1	2	1	0	10	L4
common raven	CORA	<i>Corvus corax</i>	na	na	4	1	1	1	1	2	3	0	13	L4
common yellowthroat	COYE	<i>Geothlypis trichas</i>	na	na	0	2	2	1	2	1	4	0	12	L4
Cooper's hawk	COHA	<i>Accipiter cooperii</i>	3	0	0	2	1	4	1	3	2	0	13	L4
eastern bluebird	EABL	<i>Sialia sialis</i>	na	na	3	2	2	2	1	2	2	0	14	L4
eastern kingbird	EAKI	<i>Tyrannus tyrannus</i>	na	na	0	4	2	2	1	1	3	0	13	L4
eastern meadowlark	EAME	<i>Sturnella magna</i>	na	na	0	3	2	3	1	1	3	0	13	L4
eastern screech-owl	EASO	<i>Otus asio</i>	na	1	0	2	2	1	2	3	3	0	13	L4
eastern wood-pewee	EAWP	<i>Contopus virens</i>	na	na	0	4	2	2	1	1	3	0	13	L4
field sparrow	FISP	<i>Spizella pusilla</i>	53	14	0	3	2	2	1	1	4	0	13	L4
great-crested flycatcher	GCFL	<i>Myiarchus crinitus</i>	na	na	0	2	2	3	1	2	2	0	12	L4
great-horned owl	GHOW	<i>Bubo virginianus</i>	na	na	1	2	2	2	2	1	2	0	12	L4
grey catbird	GRCA	<i>Dumetella carolinensis</i>	na	na	0	2	2	1	1	1	3	0	10	L4
hairy woodpecker	HAWO	<i>Picoides villosus</i>	na	na	0	2	2	3	1	2	2	0	12	L4
indigo bunting	INBU	<i>Passerina cyanea</i>	na	na	0	2	2	1	1	2	4	0	12	L4
least flycatcher	LEFL	<i>Empidonax minimus</i>	15	9	1	4	2	2	1	1	3	0	14	L4
northern flicker	NOFL	<i>Colaptes auratus</i>	na	na	0	3	2	1	1	2	3	0	12	L4
purple finch	PUFI	<i>Carpodacus purpureus</i>	3	2	3	4	2	1	1	0	1	0	12	L4
red-breasted nuthatch	RBNU	<i>Sitta canadensis</i>	na	na	0	1	2	3	1	1	2	0	10	L4
red-eyed vireo	REVI	<i>Vireo olivaceus</i>	na	na	0	2	2	2	1	1	3	0	11	L4
rose-breasted grosbeak	RBGR	<i>Pheucticus ludovicianus</i>	na	na	0	2	2	3	1	2	3	0	13	L4
ruby-throated hummingbird	RTHU	<i>Archilochus colubris</i>	na	na	1	2	2	1	1	2	2	0	11	L4
savannah sparrow	SAVS	<i>Passerculus sandwichensis</i>	na	na	0	3	2	1	1	1	4	0	12	L4

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Common Name	Code	Scientific Name	number of territories	non-TRCA	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
swamp sparrow	SWSP	<i>Melospiza georgiana</i>	na	na	0	1	2	1	2	1	5	1	13	L4
tree swallow	TRES	<i>Tachycineta bicolor</i>	na	na	0	2	2	1	1	2	2	0	10	L4
turkey vulture	TUVU	<i>Cathartes aura</i>	na	na	4	1	1	1	1	2	1	0	11	L4
white-breasted nuthatch	WBNU	<i>Sitta carolinensis</i>	na	na	0	2	2	3	1	2	2	0	12	L4
willow flycatcher	WIFL	<i>Empidonax traillii</i>	na	na	0	4	2	1	1	1	3	0	12	L4
American Crow	AMCR	<i>Corvus brachyrhynchos</i>	na	na	0	1	2	1	1	0	0	0	5	L5
American goldfinch	AMGO	<i>Carduelis tristis</i>	na	na	0	2	2	1	1	0	1	0	7	L5
American robin	AMRO	<i>Turdus migratorius</i>	na	na	0	1	2	1	1	0	1	0	6	L5
Baltimore oriole	BAOR	<i>Icterus galbula</i>	na	na	0	2	2	1	1	0	1	0	7	L5
black-capped chickadee	BCCH	<i>Parus atricapillus</i>	na	na	0	1	2	1	1	0	1	0	6	L5
blue jay	BLJA	<i>Cyanocitta cristata</i>	na	na	0	4	2	1	1	0	1	0	9	L5
brown-headed cowbird	BHCO	<i>Molothrus ater</i>	na	na	0	2	2	1	1	0	1	0	7	L5
Canada goose	CANG	<i>Branta canadensis</i>	na	na	0	1	1	1	2	1	0	0	6	L5
cedar waxwing	CEDW	<i>Bombycilla cedrorum</i>	na	na	0	1	2	1	1	0	1	0	6	L5
chipping sparrow	CHSP	<i>Spizella passerina</i>	na	na	0	2	2	1	1	0	2	0	8	L5
common grackle	COGR	<i>Quiscalus quiscula</i>	na	na	0	3	2	1	1	0	1	0	8	L5
downy woodpecker	DOWO	<i>Picoides pubescens</i>	na	na	0	3	2	1	1	1	1	0	9	L5
eastern phoebe	EAPH	<i>Sayornis phoebe</i>	na	na	0	2	2	1	1	2	1	0	9	L5
house wren	HOWR	<i>Troglodytes aedon</i>	na	na	0	2	2	1	2	1	1	0	9	L5
killdeer	KILL	<i>Charadrius vociferus</i>	na	na	0	2	2	1	2	0	2	0	9	L5
mallard	MALL	<i>Anas platyrhynchos</i>	na	na	0	2	2	1	2	0	1	0	8	L5
mourning dove	MODO	<i>Zenaida macroura</i>	na	na	0	2	2	1	1	0	0	0	6	L5
northern cardinal	NOCA	<i>Cardinalis cardinalis</i>	na	na	0	2	2	1	1	1	2	0	9	L5
northern mockingbird	NOMO	<i>Mimus polyglottos</i>	na	na	0	2	0	1	1	1	1	0	6	L5
orchard oriole	OROR	<i>Icterus spurius</i>	na	na	2	2	1	1	1	0	1	0	8	L5
red-tailed hawk	RTHA	<i>Buteo jamaicensis</i>	na	na	0	2	2	2	1	1	1	0	9	L5
red-winged blackbird	RWBL	<i>Agelaius phoeniceus</i>	na	na	0	2	2	1	1	0	2	0	8	L5
song sparrow	SOSP	<i>Melospiza melodia</i>	na	na	0	2	2	1	2	0	2	0	9	L5
warbling vireo	WAVI	<i>Vireo gilvus</i>	na	na	0	1	2	1	1	1	2	0	8	L5
yellow warbler	YWAR	<i>Dendroica petechia</i>	na	na	0	1	2	1	1	1	3	0	9	L5
Eurasian starling	EUST	<i>Sturnus vulgaris</i>	na	na										
ring-necked pheasant	RINP	<i>Phasianus colchicus</i>	na	na										L+
Herpetofauna														
grey treefrog	TGTF	<i>Hyla versicolor</i>	12	na	1	3	3	3	4	2	5	1	22	L2
northern spring peeper	SPPE	<i>Pseudacris crucifer crucifer</i>	31	na	0	2	3	3	4	3	5	1	21	L2
wood frog	WOFR	<i>Rana sylvatica</i>	31	na	0	2	3	3	4	3	5	1	21	L2
eastern red-backed salamander	RBSA	<i>Plethodon cinereus</i>	1	na	1	2	2	1	4	3	4	0	17	L3
northern leopard frog	LEFR	<i>Rana pipiens</i>	2	na	0	3	2	1	4	2	5	1	18	L3

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Common Name	Code	Scientific Name	number of territories	non-TRCA	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
American toad	AMTO	<i>Bufo americanus</i>	na	na	0	3	2	1	4	0	4	0	14	L4
green frog	GRFR	<i>Rana clamitans</i>	na	na	0	2	2	1	3	1	4	0	13	L4
Incidental Species: species that are reported on as incidental to the TRCA protocol.														
Mammals														
northern flying squirrel	NFSQ	<i>Glaucomys sabrinus</i>	1	0	4	2	3	3	3	3	4	0	22	L2
porcupine	PORC	<i>Erethizon dorsatum</i>	12	na	2	2	2	4	4	3	3	0	20	L2
hairy-tailed mole	HTMO	<i>Parascalops breweri</i>	5	na	1	2	2	1	4	1	4	0	15	L3
eastern chipmunk	EACH	<i>Tamias striatus</i>	na	na	0	2	2	2	3	1	3	0	13	L4
eastern cottontail	EACO	<i>Sylvilagus floridanus</i>	na	na	0	2	2	1	3	1	2	0	11	L4
meadow vole	MEVO	<i>Microtus pennsylvanicus</i>	na	na	2	2	2	1	2	1	2	0	12	L4
northern short-tailed shrew	NSTS	<i>Blarina brevicauda</i>	na	na	1	2	2	1	2	2	4	0	14	L4
red fox	REFO	<i>Vulpes vulpes</i>	na	na	2	2	2	1	3	0	1	0	11	L4
red squirrel	RESQ	<i>Tamiasciurus hudsonicus</i>	na	na	0	2	2	1	3	1	2	0	11	L4
white-tailed deer	WTDE	<i>Odocoileus virginianus</i>	na	na	0	2	1	3	2	2	1	0	11	L4
coyote	COYO	<i>Canis latrans</i>	na	na	0	2	2	1	3	0	1	0	9	L5
grey squirrel	GRSQ	<i>Sciurus carolinensis</i>	na	na	0	2	2	1	3	0	0	0	8	L5
raccoon	RACC	<i>Procyon lotor</i>	na	na	0	2	2	1	3	1	0	0	9	L5
striped skunk	STSK	<i>Mephitis mephitis</i>	na	na	1	2	2	1	3	0	0	0	9	L5
domestic cat	DOCA	<i>Felis catus</i>	na	na										L+
Herpetofauna														
yellow-spotted salamander	YSSA	<i>Ambystoma maculatum</i>	1	0	4	3	3	3	5	4	5	2	29	L1
common snapping turtle	SNTU	<i>Chelydra serpentina serpentina</i>	0	1	2	3	3	1	5	2	5	2	23	L2
red-spotted newt	EANE	<i>Notophthalmus viridescens viridescens</i>	7	na	3	2	2	3	4	3	5	1	23	L2
midland painted turtle	MPTU	<i>Chrysemys picta marginata</i>	0	1	1	2	2	1	5	1	4	1	17	L3
eastern gartersnake	EAGA	<i>Thamnophis sirtalis sirtalis</i>	na	na	0	2	2	1	3	0	3	0	11	L4
LEGEND														
LO = local occurrence		PIS = Patch Isolation Sensitivity												
PTn = population trend, continent-wide		STD = sensitivity to development												
PTt = population trend, TRCA		+ = additional points												
HD = habitat dependence		TS = total score												
AS = area sensitivity		L-rank = TRCA Rank, October, 2008												
highlighted species are those that were not reported from TRCA property within the EDH area.														