Milliken Park

Terrestrial Biological Inventory and Assessment

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1.0 Introduction

This report describes Milliken Park in the context of the Terrestrial Natural Heritage Program of the Toronto and Region Conservation Authority (TRCA). The question that the report addresses is "***How does the area surveyed at the Milliken Park site fit within the regional natural system, and how should its contribution to this system be protected and maximized?"*** The important underlying message offered by this question is that the health of the natural system is measured at the regional scale and specific sites must be considered together for their benefits at all scales, from the site to the larger system.

The TRCA has developed a Terrestrial Natural Heritage Systems Strategy (TNHSS) for retaining and recovering natural heritage within its jurisdiction that incorporates target-setting at the regional level (TRCA, 2007d). 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. This report explains the results of vegetation community and flora and fauna species inventories conducted at Milliken Park and, more importantly, will explain how this site-specific information fits into the regional TNHS Strategy and targets.

The report is divided into several sections that include background information on the Terrestrial Natural Heritage (TNH) Program along with the science and rationale behind the Strategy and targets that are a key part of this program. Also included is the data collection methodology along with the results and analysis of the information collected through both remote-sensing and field surveys. Final recommendations are provided within the context of the TNHSS and targets.

1.1 The Terrestrial Natural Heritage Program

Rapid urban expansion in the TRCA jurisdiction has led to continuous and incremental loss of natural cover and species. In a landscape that probably supported 95% forest cover prior to European settlement, current (i.e. 2002) mapping 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.

In the late 1990s the TRCA initiated the TNH Program to address the loss of terrestrial biodiversity within the nine watersheds that compose its jurisdiction. 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 to the historical natural system. The aim of the program is to create a conservation strategy that both protect elements of the natural system (vegetation communities, flora and fauna species) *before* they become rare and to promote greater ecological function of the natural system as a whole. This aim is accomplished through the TNHS Strategy by setting targets – both short and long-term (100 years) – for the two landscape

indicators in order to provide direction in planning at all scales (TRCA, 2007b). The two indicators and the targets that have been set for them are explained below. It is important to understand that both of the indicators are interdependent. For example, neither well-distributed poor quality natural cover, nor poorly-distributed good quality natural cover, achieves the desired conditions.

An example of the stress placed on the natural system is illustrated by a continent-wide study undertaken by the Cornell Laboratory of Ornithology. The study showed that scarlet tanagers (*Piranga olivaceus*) (a bird species that requires mature deciduous forests), are less *area sensitive* in a landscape that still has a high percentage of forest cover than in a landscape where overall forest cover has been greatly reduced (Rosenburg *et al*., 1999). This example demonstrates how important it is to view development and management at the broader regional scale rather than solely at the site-specific level. **The important issue is the cumulative loss of natural cover in the TRCA region that has resulted from innumerable site-specific decisions.**

1.1.1 Landscape Indicators

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 in that region. As agricultural and urban land uses replace 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 and they become rarer and may eventually be at risk of extirpation. This pattern ultimately lowers the ability of the land to support biodiversity and to maintain or enhance the quality of human life (e.g. through increased pollution and decreased space for recreation).

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 that is obtained through field surveys and that is used to ground-truth the evaluation (the latter follows in Section 2).

Quality Distribution of Natural Cover

Quality is not just viewed on its own across the watershed, distribution of this quality is considered at the same time. If the distribution of quality habitat is poor, then the distribution of species of concern will also be poor. Where these species occur there is often a high correlation to the range

and quality of ecosystem services provided. Therefore, for a watershed to deliver the range of ecosystem services equally across the watershed and provide the habitat necessary to maintain a complex and dynamic terrestrial system, good quality habitat must be distributed evenly. By examining the quality of habitat across each subunit or subwatershed the distribution of quality habitat or 'quality distribution' can be ascertained.

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, 2007a). 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 size, shape and matrix influence (patch quality) (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. This target has been set at 30% for the TRCA jurisdiction.

Based on 2002 orthophotography, 25% of the land area in the TRCA jurisdiction consists of natural cover but this figure includes meadow and old field. Although historically, the region would have consisted of up to 95% forest cover, today (i.e. 2002) only about 17% is covered by forest and wetland. Of the non-natural cover (i.e. the remaining 75%), 48% is urban and 27% is rural / agricultural.

1.1.2 The Region Today

The regional level analysis of habitat patches shows that the present average patch quality across the TRCA jurisdiction is "fair" (L3); forest and wetland cover is contained largely in the northern half of the TRCA jurisdiction, especially on the Oak Ridges Moraine; and the quantity is 17% of the surface area of the jurisdiction (Map 1). Thus the existing natural system stands below the quantity target that has been set for the region (30%). It becomes increasingly important to recognize that **all** site-based decisions contribute to the condition of a region.

1.1.3 The Region in 100 Years

The targets for quality distribution and quantity fall short of the historic pre-settlement condition, which was likely an "excellent" patch quality (L1 rank) on average, with an even distribution and close to 100% natural cover. Those historical conditions are not the regional vision any more than 100% urban is desirable; rather, the goal is to promote natural cover in a city region where urban communities, agriculture and natural cover function together as an ecosystem. The targets represent an important move toward the sustainability of regional biodiversity. Achieving the targets would reverse the current trend of declining species and vegetation communities and would improve the system's quality sufficiently to offset many impacts from further urban growth and intensification.

1.1.4 Vegetation 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, 2007e). 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. As shown in Map 2, fauna species of regional concern are generally absent from the urban matrix.

Conservation efforts need to exercised ***before*** a vegetation community or species becomes rare, since much of the damage is irreversible once a community or species is considered rare. This is why the regional targets are relevant at the site scale where cumulative impacts occur. In addition to the L1 to L3 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.

1.2 Inventory Methodology

A biological inventory of Milliken Park was conducted at the levels of habitat patch, vegetation community, and species (flora and fauna) according to the TRCA data collection methodology (TRCA, 2007c). 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.

Vegetation communities and flora species were surveyed concurrently. Botanical field-work for the site was conducted in 2009. Earlier data collected by TRCA in late fall 2000 for the City of Toronto Natural Heritage Study were incorporated (Table 2). 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 2005 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.

Fauna data were collected by the TRCA in April, May, June and July. The spring survey searched primarily for frog species of regional concern but recorded incidentally the presence of any early-spring nocturnal bird species (owls and American woodcocks). The summer surveys were concerned primarily with the mapping of breeding bird species of regional concern. Songbirds are surveyed in June / 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 and urban concern (species ranked L1 to L4) were mapped as point data with each point representing a possible breeding bird.

Table 2: Schedule of the TRCA biological surveys at Milliken Park

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2002 ortho-photos	21 hours
Vegetation Communities and Flora Species	14th Nov 2000; 5th May and 23rd June, 2009	11 hours
Frogs and Nocturnal Spring Birds	18th April, 20th May, 2nd July 2009	1.25 hours
Breeding Songbirds	4th and 18th June, 2nd July, 2009	3.25 hours

2.0 Results and Discussion

Information pertaining to Milliken Park 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.

2.1 Site Location; Floristic and Physiographic Regions

Milliken Park is located on the northern boundary of the Highland Creek watershed, adjacent to the Rouge River watershed (Maps 3 and 4). The site lies in the extreme north-east corner of the Toronto municipality, with the nearest major area of natural cover (the Rouge River valley) lying about 3.5 km to the east.

Milliken Park is on the South Slope physiographic region, with a surface material of glacial till that correlates to the Milliken loam soil series. However, when the area was developed in the 1980s, the site was altered. A pond and artificial stream with associated wetlands were dug out in the middle of the park, and berms constructed along the northern, eastern, and part of the southern edges.

The site lies entirely within the Great Lakes – St. Lawrence floristic region which is composed of mixed coniferous-deciduous forest; however, the one natural pre-development woodlot on the site is entirely deciduous.

2.2 Habitat Patch Findings for Milliken Park

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. Analysis was based on 2002 ortho-photos.

2.2.1 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

At Milliken Park, there are just three areas that have been identified as patches of natural cover. The three ponds, being artificial in origin, are not captured as wetlands in the landscape analysis. Two of the three forest patches score “poor” (L4) for size (both are approximately 3 hectares in size), while the third is smaller, thus scoring as “very poor” (L5) for size (Map 5). In terms of habitat patch shape, the smallest and largest patches are very compact and attain a “good” (L2)

score, while the remaining patch is a long, slender patch on the eastern border of the site, scoring as “poor”.

Habitat Patch Matrix Influence

Analysis based on the 2002 ortho-photos shows that the habitat in the study area is ranked as “very poor” for matrix influence: i.e. scores less than one out of a possible five points (Maps 6 and 7). This score can be attributed to the heavily urban landscape surrounding the site.

The TRCA measures matrix influence at the landscape level by assigning set values; positive, neutral and negative, to the type of landscape use occurring within 2 km of the subject site. It is important, however, to also understand and consider the matrix influence that occurs at the site and patch level. Such influences include those transferred to an otherwise remote natural habitat patch from a distant urban or suburban development, for example via a trail system.

Although the entire matrix is urban, user impacts are most intense in the western and north-central parts of the park, where there is a community centre and parking facilities. Intensity of use declines to the east, which is bordered by Middlefield Road and a non-residential business district.

Habitat Patch Total Score

The combination of the “very poor” matrix influence on the site, and the overall “poor” habitat patch size, results in an overall “poor” habitat patch quality (Map 8).

2.2.2. Quantity of Natural Cover

The area of the Highland Creek watershed is approximately 10,157 ha in size containing 13% natural cover (2002), including 655 ha as forest/successional (6.5%), 657 ha as meadow (6.5%) and 16 ha as wetland (0.16%). The surveyed area at Milliken Park is about 30 ha of which 11.9 ha are natural cover including 9.3 ha of forest and plantation, 0.5 ha of successional, 0.6 ha of wetland, 1.2 ha aquatic, and 0.4 ha of meadow. This amounts to 0.9% of the total natural cover in the Highland Creek watershed.

2.3 Vegetation Community Findings Milliken Park

2.3.1 Vegetation Community Representation

Of the 15 vegetation types observed at Milliken Park, only one – a mature sugar maple–beech woodlot (FOD5-1) is of definite natural origin (Appendix 1; Map 9). Two are agricultural relicts: a small raspberry deciduous thicket (CUT1-5) along the edge of the woodlot, and a deciduous successional savannah (CUS1-A1) at the northwest corner of the park. This was originally associated with a farmhouse, and includes a mix of planted and self-sown trees. The remaining 12 communities are all young in age and arose after urbanization. These include five deciduous and mixed plantations, one planted thicket placed along berms around the perimeter of the park or the

edge of the pond, and the wetland and aquatic communities associated with the pond itself. Observation of the trees (e.g. counting whorls on conifers) suggests that many of the plantings occurred around 1990. The plantations include a mix of species, such as hybrid poplar (*Populus* x *canadensis*), silver maple (*Acer saccharinum*), red oak (*Quercus rubra*), white pine (*Pinus strobus*), and red ash (*Fraxinus pennsylvanica*).

Much of the wetland area consists of a fringe of hybrid cattail marsh (MAS2-1b) around the pond and along the artificial watercourse to the north. In some places, the fringe is dominated by originally-planted sandbar willow (*Salix exigua*) forming a willow mineral thicket swamp. A small area of peachleaf willow (*Salix amygdaloides*) is now a young willow mineral deciduous swamp (SWD4-1). There is also a patch of common reed (*Phragmites australis*) (MAS2-a) in the southeastern part of the pond. This represents an invasive threat to the other wetland communities.

The pond itself actually supports aquatic macrophytes, with Eurasian water-milfoil (*Myriophyllum spicatum*) dominant but not exclusive. This species is moderately invasive although it appears to be much less so than in the past, due to a native weevil having discovered it as a food source (Sheldon and Creed, 1995; Newman and Biesboer, 2000). Thus, the pond is designated as a Water Milfoil Submerged Shallow Aquatic community (SAS1-4). The artificial pond and stream appear to receive little storm water and so the water is fairly clear and able to support macrophytes.

2.3.2 Vegetation Communities of Concern

The vegetation communities that occur in the TRCA jurisdiction are scored and given a local rank from L1 to L5 based on the two criteria mentioned in Section 1.1.4. Vegetation communities with a rank of L1 to L3 are considered of regional concern in the jurisdiction while L4 communities are considered of concern in the urban portion of the jurisdiction. Milliken Park is well within the urban boundary, therefore L4 communities are included as being of conservation concern.

Four of the 15 vegetation communities found at Milliken Park are ranked L4 (of urban concern) (Appendix 1; Map 9). These include one thicket type, two wetlands, and one vegetated aquatic community. The natural sugar maple forest community present in the existing woodlot is ranked L5; however, its age along with the diversity and quality of the understorey and ground layers are also important factors to consider. The fact that this woodlot is mature and contains a number of native ground flora species makes it of central importance for land management.

2.4 Flora Findings for Milliken Park

2.4.1 Flora Species Representation

A total of 204 flora species were found at Milliken Park, mostly during the 2009 field season (see Appendix 2). Of these, 48 were planted during various landscaping and ecological enhancement projects, while 156 can be considered natural or self-sown. More than half of the non-planted

species (91 species or 58% of the total) are exotic, most of them ruderal (i.e. characteristic of recently disturbed sites) species. This reflects the highly disturbed, urban character of the site. Serious invasives such as dog-strangling vine (*Cynanchum rossicum*) and garlic mustard (*Alliaria petiolata*) are mostly concentrated in and near the plantation at the southeast edge of the woodlot. Dog-strangling vine can overtake many kinds of terrestrial habitat (DiTommaso *et al*., 2005; TRCA, 2008). Common reed in one patch at the pond, is the other significant invasive.

2.4.2 Flora Species of Concern

Flora species are of concern in the urban parts of the TRCA jurisdiction if they rank L1 to L4 based on their scores for the four criteria mentioned in Section 1.1.4. Most flora species of concern are not rare plants *per se*, since few of them rank as provincially rare (S1 to S3); however, they are of conservation concern due to their sensitivity to development and restriction to certain habitats or certain areas within the TRCA region (Map 10).

Milliken Park has three non-planted species of regional concern (ranked L3), found in the woodlot: oval-headed sedge (*Carex cephalophora*), narrow-leaved spring beauty (*Claytonia virginica*), and squirrel-corn (*Dicentra canadensis*). Nine species ranked L4 are also found mostly in the forest, but three of them: common water-weed (*Elodea canadensis*), soft rush (*Juncus effusus*), and peach-leaved willow (*Salix amygdaloides*) most likely dispersed naturally to the pond or its margins.

Although Milliken Park is highly urbanized, all 12 flora of concern show at least some sensitivity to development, with a score of three to five points (Appendix 2). This score assesses the vulnerability of plant species to impacts of adjacent urbanization or other anthropogenic disturbances. Trampling in the woodlot, and to some extent competition with invasive species, are the main threats. While sensitive forest floor species such as trillium (*Trillium erectum* and *T. grandiflorum*), squirrel-corn and narrow-leaved spring beauty are present in the woodlot, their populations are low and have likely declined over the past 20 years. Heavy and extensive informal trail use has limited the ground layer with extensive areas of bare soil visible. The invasive species garlic mustard and dog-strangling vine are sparse in the woodlot but more abundant in the adjoining plantation. Unfortunately, this makes the plantation a potential threat to the integrity of the woodlot rather than an unqualified asset because these are highly aggressive species that could disperse readily (Nuzzo, 1999; TRCA, 2008). A secondary invasive species, celandine (*Chelidonium majus*) is prominent in the ground layer of the woodlot itself. Beech (*Fagus grandifolia*), an important species in the woodlot, appears to be widely declining due to beech bark disease.

Canada geese (*Branta canadensis*) are abundant in the park. They take advantage of the pond and the manicured areas. Parts of the north and eastern shore of the pond are denuded by goose grazing, and their droppings contribute to eutrophication of the pond. Eutrophication is likely to lead to increased turbidity and the loss of aquatic macrophytes such as waterweed (Elodea canadensis).

Almost all the flora species of concern (11 of 12) are associated with specific vegetation communities; consequently, they are highly susceptible to changes in these communities. They score relatively high in *habitat dependence* (Appendix 2, Map 11). Roughly, they are found in seven or fewer vegetation cohorts (groupings of vegetation types with similar floristic characteristics) (TRCA, 2007e). The habitats in question are the sugar maple – beech forest and to a smaller extent, the pond – wetland feature.

Plantings

Plantings comprise a significant portion of the flora at Milliken Park: 48 species in total and 23 species of concern. There are almost twice as many planted species of concern (L1-L4) than original natural species of concern (Appendix 2). They have been planted over a period ranging from circa 1990 to the present. Some of these, particularly wetland edge species such as Canada bluejoint (*Calamagrostis canadensis*), fringed sedge (*Carex crinita*), and blue flag (*Iris versicolor*) appear to be in suitable habitats and establishing well provided they are not overtaken by common reed. Others, such as red pine (*Pinus resinosa*) and heart-leaved willow (*Salix cordata*) are not suited to the conditions at Milliken Park and likely will not persist in the long term. Heart-leaved willow, for example, is a sand dune specialist that was historically found on Toronto Island. One mature shagbark hickory (*Carya ovata*) is found in the vicinity of an old homestead at the northwest corner of the park. While this species is not commonly planted, it is adjacent to trees that are obviously planted and the nearest known naturally-occurring specimens are about 11 km to the southeast at Guild Inn.

2.5 Fauna Findings for Milliken Park

2.5.1 Fauna Species Representation

The TRCA fauna surveys at Milliken Park in 2009, documented a total of 19 bird species, four mammals, and two herpetofauna species, bringing the total number of possible breeding fauna species identified by the TRCA to 25. This total compares rather poorly with similarly sized sites within the urban areas of the TRCA jurisdiction. Refer to Appendix 3 for a list of the fauna species and their corresponding L-ranks.

2.5.2 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 1.1.4. Since the subject site is situated within the urban zone this report also considers those species ranked as L4, i.e. those species that are of concern in urban landscapes. As with flora, this is a proactive, preventive approach, identifying where conservation efforts need to be made before a species becomes rare.

Fauna surveys at Milliken Park reported a total of four L4 bird species. In addition, there were three mammal species of urban concern (eastern cottontail, *Sylvilagus floridanus*, red fox, *Vulpes*

vulpes, and woodchuck, *Marmota monax*) and two herpetofauna species of concern (American bullfrog, *Rana catesbeiana*, ranked L2 and eastern gartersnake, *Thamnophis sirtalis*, ranked L4), bringing the total to nine fauna species of regional or urban concern. It should be noted however, that the population of American bullfrog is undoubtedly of artificial origin, having been introduced here intentionally by either local or visiting people. Locations of the breeding fauna at this site are depicted on Map 12.

Local occurrence is one of seven scoring criteria for fauna species and is based on TRCA data and information from the Natural Heritage Information Centre (NHIC) of the Ontario Ministry of Natural Resources (OMNR) (NHIC, 2008). Using local occurrence as a measure of regional rarity, any species that is reported as a probable or confirmed breeder in fewer than 10 of the 44 10x10 km grid squares in the TRCA jurisdiction is considered regionally rare (i.e. scores three to five points for this criterion). At Milliken Park there is one species of regional or urban concern (i.e. ranked L1 to L4) that is considered regionally rare: American bullfrog scores three points since it occurs naturally only sparsely throughout the upper reaches of the region. 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.

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 understory). The second category of impacts involves changes that directly affect individuals of the species in question. Examples include increased predation from an increase in the local population of predator species 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 Milliken Park only two species ranked L1 to L4 other than American bullfrog receive this score and are therefore considered sensitive to one or more of the impacts associated with development (Map 7). Common yellowthroat (*Geothlypis trichas*), is a species that nests in dense, often damp, understory, frequently at the edges of wetlands, and as such is somewhat susceptible to the heavy foot-traffic and dog-disturbance associated with urban parks. Although the species was reported as singing on site in early June of 2009, there is no evidence to confirm that the bird was present on subsequent visits and certainly no evidence that any breeding was successful. Given the highly manicured condition of this park, and the heavy human use it is likely that this individual attempted but failed to maintain a territory.

The other sensitive species is eastern gartersnake, a common snake species across much of the TRCA region. There are several potential matrix impacts from the urban landscape that might jeopardize the maintenance of a population of this species, not least of which is the direct interaction with local residents and their pets.

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 tendency for local urbanization to be accompanied by the clearing and maintenance of woodlands and thickets in the vicinity dramatically disrupts any species that is dependent on such scrub cover for nesting or foraging, and certainly common yellowthroat has such specific requirements. Common yellowthroat nests low in the ground vegetation and as such is 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.

Various studies have shown that many bird species react negatively to human intrusion (i.e. the mere presence of people) to the extent that nest-abandonment and decreased nest-attentiveness lead to reduced reproduction and survival. One example of such a study showed that abundance was 48% lower for hermit thrushes (a ground-nesting/foraging species) in intruded sites than in the control sites (Gutzwiller and Anderson, 1999). Elsewhere, a recent study reported that dog-walking in natural habitats caused a 35% reduction in bird diversity and a 41% reduction in abundance, with even higher impacts on ground-nesting species (Banks and Bryant, 2007).

Area sensitivity is a scoring criterion that can be closely related to the latter issue of a species need for isolation. Fauna species are scored for area sensitivity based on their requirement for a certain minimum size of preferred habitat. Species that require large tracts of habitat (> 100 ha in total) score the maximum five points, while species that either show no minimum habitat requirement, or require < 1 ha in total, score one point. Species scoring three points or more (require 5+ ha in total) are deemed area sensitive species. Researchers have shown that for some species of birds, area sensitivity is a rather fluid factor, dependent and varying inversely with the overall percentage forest cover within the landscape surrounding the site where those species are found (Rosenburg *et al.*, 1999). Just one of the fauna species of regional and urban concern identified at Milliken Park is considered area sensitive. – Cooper's Hawk (*Accipiter cooperii*).

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. Cooper's hawk is listed as having a

requirement for forest habitat in excess of 20 ha. Obviously, this is not satisfied by the forest patches within the site boundaries which amount to less than 6.5 ha total. However, in recent decades, throughout much of North America, this species has seemingly been better adapting to urban landscapes and the fragmented forest patches remaining in such a landscape. The driving force for this adaptation is the abundance of prey items that are to be found in the urban landscape in the form of feral pigeons (*Columba livia*), mourning doves (*Zenaida macroura*) and grey squirrels (*Sciurus carolinensis*). There is still some contention as to whether Cooper's hawks are producing young (i.e. whether the urban populations are viable or not) but evidence from across urban Toronto suggests that the species fares very well. It certainly seems that as long as a stand of mature trees is available, and that the stand is not excessively disturbed, Cooper's hawk can and will nest successfully. The largest forest patch on the site may accommodate a pair of nesting Cooper's hawk, and if not, there are other larger forest patches in the broader landscape such as the 23 ha forest patch 2.5 km to the east.

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.

The three L4 mammal species on the site all score as sensitive to patch isolation. These species achieve this score due to their susceptibility to road-kill. Red fox forages across a large home range and therefore is somewhat more at risk than the more sedentary (and more prolific) eastern cottontail and woodchuck. It is expected when the ranks and scores are next updated (early 2010) that, based on additional data collected in 2009, the latter species will be ranked as L5 since its status in the urban landscape seems quite secure. Grey squirrel (ranked as L5) also scores very high for patch isolation sensitivity but due to the species high abundance and high productivity, the road-kill issue has almost no impact on the population at the present time. It is likely that the same is true of woodchuck.

Fauna species that score greater than three points under the ***habitat dependence*** criterion are considered habitat specialists (Map 13). 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 vegetation community types and macro-habitat types. Cooper's hawk is the only fauna species at Milliken Park which shows any habitat specialization,

being somewhat dependent on the presence of large mature trees within a patch of forest for nest placement. Certainly there are mature trees in the forest patches on the site, and to some extent it is a little surprising that other canopy dependent L4 species were not found at the site. Red-eyed vireo (*Vireo olivaceus*) was reported during the inventory period but was only recorded during the first visit in early June which, for this species, falls below the threshold date for inclusion as a possible breeding individual. A registering of these individuals in the second visit would have confirmed that this species was territorial as opposed to simply passing through the area as a migrant. It is possible, although the larger mature forest patch at Milliken Park satisfies habitat requirements for such canopy breeding species, that the isolation of the site within a landscape of relatively new urbanization with very little urban tree cover (for example, in backyards and along streets) reduces the chances of such species discovering the site.

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 almost complete absence of any habitat dependent species, in particular, species that are dependent on forest, indicates that the forest habitat at Milliken Park is not functioning well. However, as suggested above, this situation is considerably compounded by the extreme isolation of the site.

3.0 Recommendations

The recommendations for Milliken Park 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 within the regional context, followed by specific recommendations.

3.1 Summary of Site Highlights

- 156 naturally-occurring flora species observed, and 48 planted species
- mature sugar maple – beech woodlot on site with native ground flora species persisting, including some spring ephemerals
- plantations along perimeter of park with some weed infestations
- constructed pond and wetland feature in centre of park with successful wetland plantings; pond has aquatic macrophytes (high quality for an urban pond)
- infestation of common reed in one part of pond, garlic mustard and dog-strangling vine around plantations and woodlot edge
- cultural feature: old homestead in northwest corner of park with plantings including shagbark hickory
- total of 25 vertebrate fauna species observed
- barn swallows (*Hirundo rustica*) are nesting on the built structures at the park
- two of the nest-boxes on site are used by tree swallows (*Tachycineta bicolor*)

- the larger forest patch on the site appears to support Cooper's hawk
- the site is providing refuge for more sensitive urban wildlife species such as red fox
- no regionally rare vertebrate fauna found
- site ranks as "poor" for habitat patch total score
- 11.9 ha of natural cover present (0.9% of Highland Creek watershed natural cover)
- there is a small population of American bullfrog on site; however, the fact that this is an intentionally and informally introduced population undermines the significance of the species' presence.

3.2 Site Recommendations

The biological inventory of Milliken Park was specifically conducted in order to provide recommendations in relation to improving habitat conditions for amphibians. While ecological enhancement of vegetation (and associated migrant bird and insect life) at Milliken Park would be simple and feasible, the picture regarding amphibians is more complicated. The presence of a small population of the regionally rare American bullfrog might initially be seen as a positive element; however, this population is certainly derived from released individuals brought in from elsewhere. If the ponds on site were natural ponds with their own native population of frogs (e.g. northern leopard frogs, *Rana pipiens*), then the introduction of American bullfrogs would have been cause for considerable concern; American bullfrogs are voracious predators of smaller frog species. Such informal introductions should be discouraged since their impact on natural communities can be catastrophic as has been the case with the introduction of this species into areas of Northern California (Kupferberg, 1997). Furthermore, there is also the significant risk of spreading the amphibian pathogen caused by Chytrid fungus, *Batrachochytrium dendrobatidis* to other native frog species (Garner *et al*., 2006).

The opportunities for natural recruitment of frog species into the Milliken Park wetlands are very limited, and given the presence of American bullfrog it is highly likely that any local native frogs would not be able to compete successfully. For these reasons it is preferable for management to pursue other options with regards to enhancing the natural fauna features of this park.

One of the main considerations for selecting such options is the presence or absence of opportunities for species to arrive at the site unaided. The fauna groups that would be best able to move across the surrounding urban landscape are migrating songbirds and migrating/foraging insects. The following recommendations are made with this in mind.

Optimize Patch Size & Shape

The larger a habitat block, the more resilient the associated fauna and flora communities are to developments within the landscape or to increased user pressure. Certainly, by increasing the extent of natural cover at Milliken Park, more opportunities will be created for nesting and foraging birds and other fauna species.

Specific recommendations:

- Expand the forest and successional habitats to the south and east: around the south and east sides of the pond.

- Expand the forest along the inner edge of the existing plantations, particularly at the eastern perimeter of the park.

- Restoration of forest cover in these areas would help the pond ecosystem, and also be the furthest away from the heavy use zone.

Minimize Negative Matrix Influence

In order to protect the integrity of the woodlot and allow its ground vegetation and tree regeneration to recover, pedestrian traffic must be restricted to clearly-defined trails, and these trails should be of an appropriate width. It is also important that sections of the pond shoreline not have open access so as to allow refugia for wildlife.

Specific Recommendations:

- Some trails, especially in the extensively trampled south-central part of the woodlot, should be closed.

- Trails should be restricted to 1.5 – 2 m in width with defined margins. Placement of logs, plantings, and perhaps railings could help define trail margins.

- The trail surface in the forest should be bare soil or a neutral material such as brick chips or coarse gravel. Limestone screenings and asphalt alter the soil chemistry and may encourage invasive species. The flat topography of the woodlot reduces the risk of erosion and makes trail surfacing less complicated.

- Dense shrub plantings along much of the east shore of the pond will help protect the shore from disturbance. They will also help to reduce the impacts of Canada geese (*Branta canadensis*).

- The formal trail and viewing platform at the north end of the pond provides an opportunity for public access and wildlife observation.

- Interpretive signage should indicate that the introduction of fauna and flora species is undesirable (and should be prohibited).

Invasive plant populations at Milliken Park are relatively small and localized. Unfortunately, they are in locations that place the natural habitats at risk. Control measures should be applied strategically as follows:

- The patch of common reed along the southern edge of the pond should be removed while it is still relatively small and restricted. Cutting the reed and covering the area with a barrier

mulch while removing side shoots manually has been pursued with some success at Rattray Marsh (Krick, 2009).

- Dog-strangling vine should be removed from the observed infestations along the western side of the woodlot and in the planted areas to the southeast of the woodlot. TRCA observations seem to indicate that the plant is still localized (though dense in a few places). An assessment of the park as a whole and its borders to determine population sizes and locations should be undertaken first to determine feasibility of local eradication. Control of dog-strangling vine is labour-intensive, and involves spot applications of herbicide, either sprayed or applied by wick, repeated as needed (TRCA, 2008).

- Common buckthorn infestation is relatively light. Therefore it should also be removed before it takes over the forest edge and plantation understorey (Knight *et al*., 2007).

- Garlic mustard is difficult to control because of its very long-lived seed bank. Fortunately, there are promising signs of biological control, including a weevil already present in southern Ontario that is adapting to it (Yates, 2009). At present, we recommend an indirect approach through trail management to reduce disturbance and ground layer plantings of robust native species such as May-apple (*Podophyllum peltatum*) and bloodroot (*Sanguinaria canadensis*). Capturing the understorey and ground layer of the plantations and closed trail areas with plantings of native species is particularly important.

- Secondary invasives such as celandine and hedge parsley (*Torilis* sp.) should be removed from woodlot and edge areas. Hedge parsley in particular seems to be expanding rapidly in Toronto over the past 20 years.

Improve Connectivity to Nearby Habitat

The almost complete lack of any connectivity within the urban landscape surrounding Milliken Park probably has a more negative effect on the fauna diversity utilizing the patches of natural cover on the site than any other single feature. Recommendations for alleviating this problem require an effective stewardship program whereby local residents are encouraged to create corridors of urban tree and shrub cover in their back yards, forging effective links between the park and better connected natural patches and corridors such as the hydro corridor one km to the south, or the Rouge corridor 3 km to the east. Without such an increase in the native tree and shrub cover within the surrounding landscape, the efficacy of on-site management at Milliken Park in improving the fauna diversity of the site will be considerably reduced.

Specific Recommendations:

- Enhance the foraging and shelter options on the banks of the ponds and elsewhere on the site to improve the potential use by migrating song-birds. Dense stands of native fruiting shrubs around the ponds will well serve any migrant songbirds which happen to make landfall at this site.

- Improving the density of the shrub cover will improve the nesting opportunities for shrub-nesting species such as yellow warbler (*Dendroica petechia*).

Improve Habitat Quality

The more natural cover retained at the study area and vicinity, the better it can support a healthy level of biodiversity, but only if the public use of the area is properly managed. The quality of habitat on any given site can be improved by managing at two quite different levels. The site habitat quality can be improved by working at both the level of vegetation community and local topography, and at the more fine-detailed microhabitat level, such as providing actual nesting opportunities. The first four of the following recommendations work at the broader scale of the vegetation community level, while the last recommendation is an application at the microhabitat level.

Specific Recommendations:

- The current plantations should be improved and expanded, especially in the southeast part of the park. Plant species should be selected as appropriate to site conditions.

- Existing plantations should receive native understorey and ground flora plantings.

- Areas for plantation expansion should be examined for soil type and moisture regime and species composition selected according to conditions.

- Flatter areas targeted for restoration could be graded to provide variable microtopography and improve moisture retention and a range of microhabitat types.

- Installation and maintenance of tree swallow boxes at this site should be carefully managed – the current location of boxes on the pond edge may be encouraging predation of nests by racoons. A safer option would be to place boxes just off-shore in the pond. Post-season cleaning and maintenance will prove more difficult but the nest success should improve. Alternatively, predator guards could be attached to the supporting poles.

The aquatic features at the site afford an excellent opportunity for establishing restored natural habitat that potentially could attract sensitive (L4) fauna species. Judicious planting of a broad fringe of native shrubs along the banks of the ponds will create nesting opportunities for L4 species such as common yellowthroat and grey catbird (*Dumetella carolinensis*), together with enhancing populations of already established L5 species such as song sparrow (*Melospiza* melodia) and yellow warbler.

Such habitat creation also has the potential to positively influence the foraging of migrant songbirds that utilize such fragments of natural cover as stepping stones on their spring and fall migrations. Such benefits would be enormously enhanced if the site were better connected to established migrant corridors.

Cultural Heritage

The old homestead site with its plantings, including the shagbark hickory, should be protected and retained. Interpretive signage (e.g. a durable plaque) should be installed.

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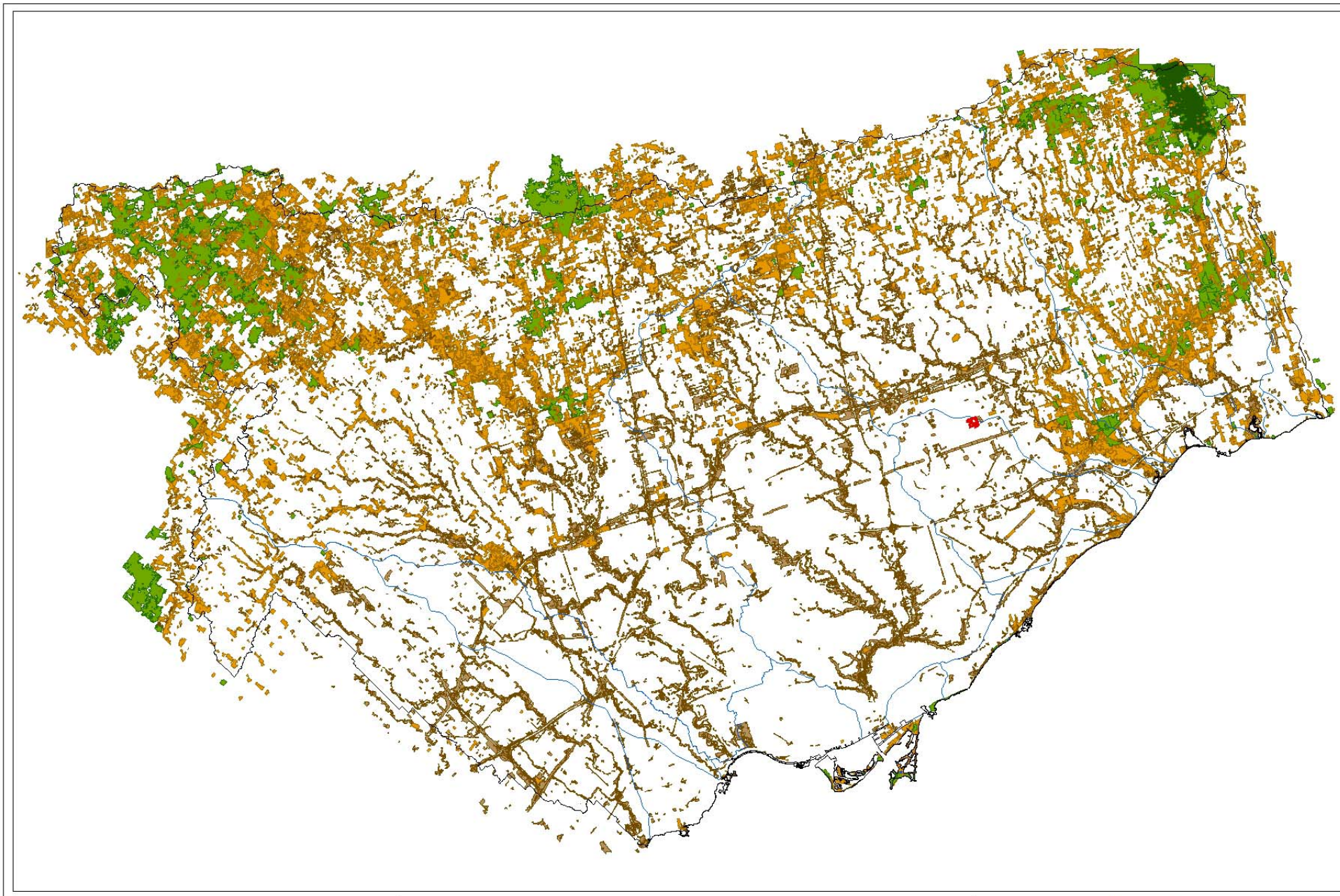


TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: November 2009
* Landscape analysis based on 2002 Orthophotography

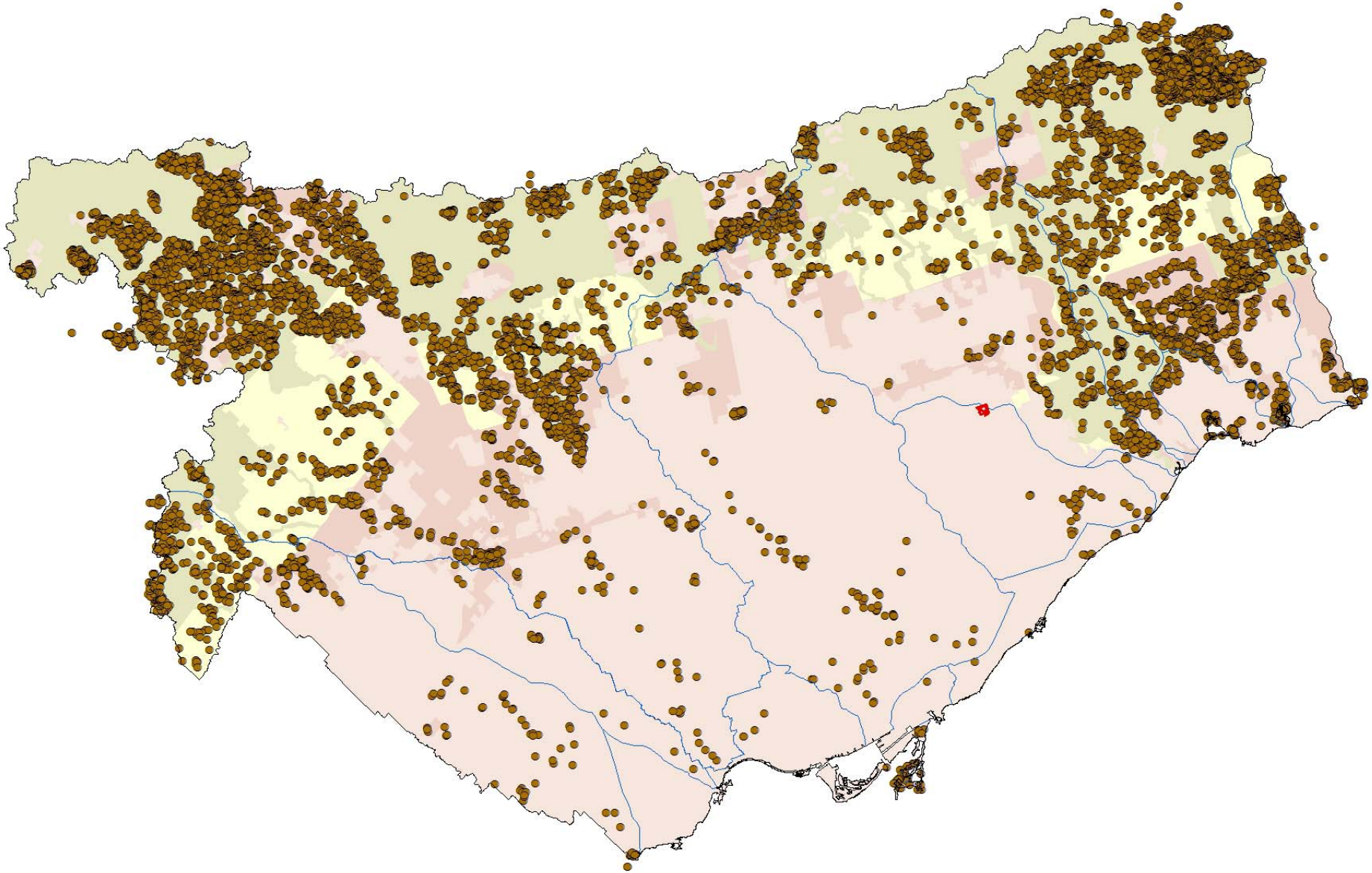
Map 1:
Regional Natural System
Habitat Patch Quality

Legend

Habitat Patch Quality *

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

- Milliken Park Study Area
- TRCA Jurisdiction
- Watershed



TORONTO AND REGION Conservation for The Living City

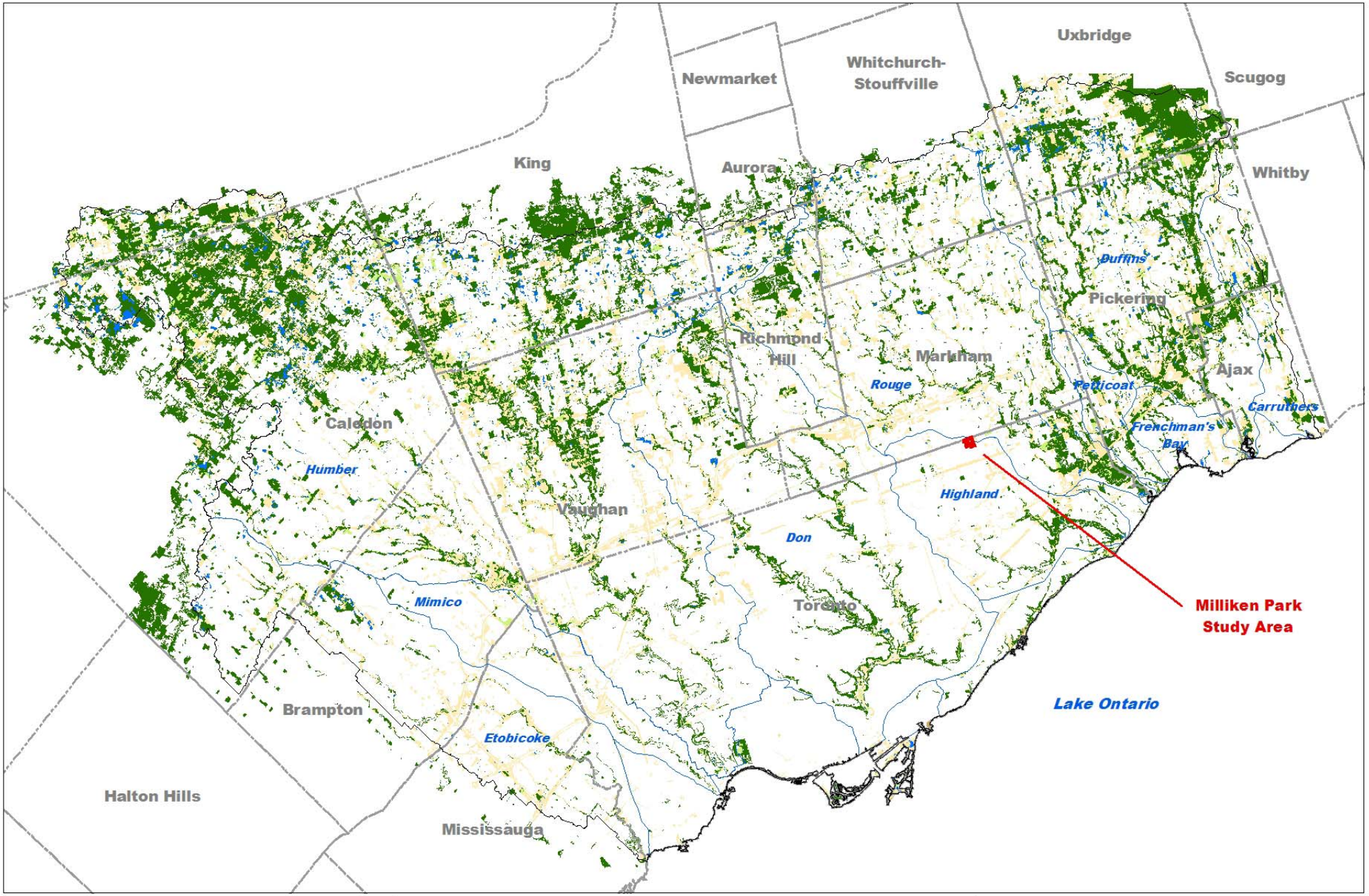
0 2.5 5 10 15 20 Kilometers

Date: November 2009

Map 2:
Distribution of Fauna
Regional Species of Concern

Legend

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



TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: November 2009

* Landscape analysis based on 2002 Orthophotography

Map 3:
Milliken Park Study Area in the Context of Regional Natural Cover

Natural Cover *

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

Legend

- Milliken Park Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

TORONTO AND REGION Conservation for The Living City

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

Map 4:
Milliken Park Study Area

Legend

Study Area

Fauna Area Sensitivity Scores

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

△ Fauna Species

(□ Frog Species)

Habitat Patch Size Scores *

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

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009
Orthophoto: Spring 2007, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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

Legend

Milliken Park Study Area

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

Flora Sensitivity to Development Scores

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

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

Flora Species (Planted Flora Species)

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009
Orthophoto: Spring 2007, First Base Solutions
* Landscape analysis based on 2002 Orthophotography

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

Legend

Habitat Matrix Influence Scores *
- 5 - Excellent
- 4 - Good
- 3 - Fair
- 2 - Poor
- 1 - Very Poor

Milliken Park Study Area

Fauna Sensitivity to Development Scores

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

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

△ Fauna Species (□ Frog Species)

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009
Orthophoto: Spring 2007, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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

Legend

Habitat Matrix Influence Scores *

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

Milliken Park Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

* Landscape analysis based on 2002 Orthophotography

Map 8: Habitat Patch Quality

Legend

Habitat Patch Quality *

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

Milliken Park Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009
Orthophoto: Spring 2007, First Base Solutions Inc.

Map 9: Vegetation Communities with their Associated Local Ranks

Legend

Vegetation Community Ranks

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

Milliken Park Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

Map 10: Location of Flora Species of Concern

Legend

Flora Species of Concern (L1-L4)	Planted Flora Species of Concern (L1-L4)
L1	L1
L2	L2
L3	L3
L4	L4
LX	LX

Milliken Park Study Area

Flora Habitat Dependence Scores

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

Flora Species (Planted Flora Species)

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

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

Map 11: Flora Habitat Dependence Scores

Legend

Milliken Park Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

Map 12: Location of Fauna Species of Concern

Legend

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

Milliken Park 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.

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: November 2009

Orthophoto: Spring 2007, First Base Solutions Inc.

Map 13: Fauna Species of Concern Habitat Dependence Scores

Legend

- Milliken Park Study Area
- △ Fauna Species
- (□ Frog Species)

Appendix 1: List of Vegetation Communities, Milliken Park, 2009

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
	Forest					
FOD5-2	Dry-Fresh Sugar Maple - Beech Deciduous Forest	3.0	1.5	0.0	1.5	L5
CUP1-4	Hybrid Poplar Deciduous Plantation	4.6	3.0	0.0	3.0	L5
CUP1-5	Silver Maple Deciduous Plantation	0.3	3.0	0.0	3.0	L5
CUP1-A	Restoration Deciduous Plantation	0.1	2.5	0.0	2.5	L5
CUP2-E	Silver Maple - Conifer Mixed Plantation	0.7	3.5	0.0	3.5	L5
CUP2-h	Horticultural Mixed Plantation	0.5	3.5	0.0	3.5	L+
	Successional					
CUT1-5	Raspberry Deciduous Thicket	0.04	3.0	0.0	3.0	L4
CUT1-A1	Native Deciduous Sapling Regeneration Thicket	0.1	2.0	0.0	2.0	L5
CUS1-A1	Native Deciduous Successional Savannah	0.3	1.5	0.0	1.5	L5
	Wetland					
SWD4-1	Willow Mineral Deciduous Swamp	0.02	2.0	1.0	3.0	L4
SWT2-2	Willow Mineral Thicket Swamp	0.1	2.0	2.0	4.0	L4
MAS2-1b	Narrow-Leaved Cattail Mineral Shallow Marsh	0.4	2.0	0.0	2.0	L+
MAS2-a	Common Reed Mineral Shallow Marsh	0.04	3.0	0.0	3.0	L+
	Aquatic					
SAS1-4	Water Milfoil Submerged Shallow Aquatic	1.2	3.0	1.0	4.0	L4
OAO1	Open Aquatic unvegetated	0.02	1.5	0.0	1.5	L5
	Meadow					
CUM1-c	Exotic Forb Meadow	0.4	1.5	0.0	1.5	L+

Surveyed Natural Cover (hectares)	11.9
Forest & Plantation	9.3
Successional	0.5
Wetland	0.6
Aquatic	1.2
Meadow	0.4

Appendix 2: Milliken Park Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Carex cephalophora	oval-headed sedge	3	3	4	4	14	L3
Claytonia virginica	narrow-leaved spring beauty	2	4	4	5	15	L3
Dicentra canadensis	squirrel-corn	2	4	5	4	15	L3
Carex arctata	nodding wood sedge	2	4	2	3	11	L4
Caulophyllum giganteum	long-styled blue cohosh	2	3	4	4	13	L4
Elodea canadensis	common water-weed	2	3	5	3	13	L4
Fagus grandifolia	American beech	1	4	3	4	12	L4
Prunus pensylvanica	pin cherry	2	4	3	3	12	L4
Salix amygdaloides	peach-leaved willow	2	2	5	3	12	L4
Trillium erectum	red trillium	1	4	3	5	13	L4
Trillium grandiflorum	white trillium	1	3	4	5	13	L4
Acer saccharum ssp. *saccharum*	sugar maple	1	3	0	2	6	L5
Achillea millefolium ssp. *lanulosum*	woolly yarrow	2	2	0	1	5	L5
Ambrosia artemisiifolia	common ragweed	2	1	3	0	6	L5
Arisaema triphyllum	Jack-in-the-pulpit	1	3	2	3	9	L5
Asclepias syriaca	common milkweed	2	2	0	2	6	L5
Aster cordifolius	heart-leaved aster	2	1	0	2	5	L5
Aster ericoides ssp. *ericoides*	heath aster	2	1	2	1	6	L5
Aster lanceolatus ssp. *lanceolatus*	panicled aster	1	2	3	1	7	L5
Aster novae-angliae	New England aster	1	2	2	1	6	L5
Carex blanda	common wood sedge	2	2	1	2	7	L5
Carex cristatella	crested sedge	2	2	4	1	9	L5
Carex granularis	meadow sedge	2	2	1	3	8	L5
Carex rosea	curly-styled sedge	2	2	3	2	9	L5
Carex vulpinoidea	fox sedge	2	2	4	1	9	L5
Circaea lutetiana ssp. *canadensis*	enchanter's nightshade	2	1	1	1	5	L5
Cornus alternifolia	alternate-leaved dogwood	2	2	1	2	7	L5
Cornus stolonifera	red osier dogwood	1	2	0	3	6	L5
Echinocystis lobata	wild cucumber	2	2	3	1	8	L5
Erigeron annuus	daisy fleabane	2	2	0	1	5	L5
Erigeron philadelphicus ssp. *philadelphicus*	Philadelphia fleabane	2	2	0	1	5	L5
Erythronium americanum ssp. *americanum*	yellow trout-lily	2	3	3	2	10	L5
Eupatorium maculatum ssp. *maculatum*	spotted Joe-Pye weed	2	2	3	3	10	L5
Fragaria virginiana	wild strawberry	2	2	0	2	6	L5
Fraxinus americana	white ash	1	2	0	3	6	L5
Geum aleppicum	yellow avens	2	3	3	2	10	L5
Geum canadense	white avens	2	2	1	2	7	L5
Helianthus tuberosus	Jerusalem artichoke	3	1	2	0	6	L5
Hydrophyllum virginianum	Virginia waterleaf	2	2	1	2	7	L5
Lemna minor	common duckweed	2	2	4	2	10	L5
Maianthemum racemosum ssp. *racemosum*	false Solomon's seal	2	3	2	3	10	L5
Oenothera biennis	common evening-primrose	2	1	1	1	5	L5
Ostrya virginiana	ironwood	2	3	2	2	9	L5
Oxalis stricta	common yellow wood-sorrel	3	1	1	1	6	L5
Parthenocissus inserta	thicket creeper	1	2	0	1	4	L5
Podophyllum peltatum	May-apple	1	3	3	3	10	L5
Populus balsamifera ssp. *balsamifera*	balsam poplar	1	2	3	2	8	L5
Populus deltoides	cottonwood	2	1	4	1	8	L5
Populus tremuloides	trembling aspen	1	3	1	3	8	L5
Prunus serotina	black cherry	2	2	0	2	6	L5
Prunus virginiana ssp. *virginiana*	choke cherry	1	2	0	1	4	L5
Ranunculus abortivus	kidney-leaved buttercup	2	3	1	2	8	L5
Rhus radicans ssp. *rydbergii*	poison ivy (shrub form)	2	2	0	2	6	L5
Rubus idaeus ssp. *melanolasius*	wild red raspberry	1	1	0	1	3	L5
Rubus occidentalis	wild black raspberry	2	1	0	1	4	L5
Rubus odoratus	purple-flowering raspberry	2	2	2	2	8	L5
Salix eriocephala	narrow heart-leaved willow	2	1	3	1	7	L5
Solidago altissima	tall goldenrod	1	2	0	0	3	L5
Tilia americana	basswood	1	4	2	3	10	L5
Ulmus americana	white elm	1	4	0	2	7	L5
Urtica dioica ssp. *gracilis*	American stinging nettle	2	3	2	2	9	L5
Verbena hastata	blue vervain	2	2	4	2	10	L5

Appendix 2: Milliken Park Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Viola pubescens	stemmed yellow violet	2	3	1	2	8	L5
Vitis riparia	riverbank grape	1	1	0	0	2	L5
Acer ginnala	Amur maple	4	0	0	2	6	L+
Acer platanoides	Norway maple	3				3	L+
Alliaria petiolata	garlic mustard	2				2	L+
Alopecurus pratensis	meadow foxtail	5				5	L+
Arctium lappa	great burdock	3				3	L+
Arctium minus ssp. *minus*	common burdock	3				3	L+
Armoracea rusticana	horse-radish	5				5	L+
Barbarea vulgaris	winter cress	3				3	L+
Bromus inermis ssp. *inermis*	smooth brome grass	3				3	L+
Caragana arborescens	Siberian pea-shrub	5				5	L+
Cerastium fontanum	mouse-ear chickweed	3				3	L+
Chelidonium majus	celandine	3				3	L+
Chenopodium album var. *album*	lamb's quarters	3				3	L+
Chrysanthemum leucanthemum	ox-eye daisy	3				3	L+
Cichorium intybus	chicory	3				3	L+
Cirsium arvense	creeping thistle	2				2	L+
Cirsium vulgare	bull thistle	3				3	L+
Cynanchum rossicum	dog-strangling vine	3				3	L+
Dactylis glomerata	orchard grass	3				3	L+
Daucus carota	Queen Anne's lace	3				3	L+
Dipsacus fullonum ssp. *sylvestris*	teasel	4				4	L+
Echium vulgare	viper's bugloss	4				4	L+
Elaeagnus umbellata	autumn olive	4				4	L+
Epilobium hirsutum	European willow-herb	4				4	L+
Epipactis helleborine	helleborine	3				3	L+
Galium mollugo	white bedstraw	3				3	L+
Geum urbanum	urban avens	3				3	L+
Hemerocallis fulva	orange day-lily	4				4	L+
Hesperis matronalis	dame's rocket	2				2	L+
Hieracium caespitosum ssp. *caespitosum*	yellow hawkweed	3				3	L+
Hypericum perforatum	common St. Johnswort	3				3	L+
Leonurus cardiaca ssp. *cardiaca*	motherwort	3				3	L+
Linaria vulgaris	butter-and-eggs	3				3	L+
Linum perenne	perennial flax	5				5	L+
Lonicera x *bella*	shrub honeysuckle	3				3	L+
Lotus corniculatus	bird's foot trefoil	3				3	L+
Lycopus europaeus	European water-horehound	4				4	L+
Malus pumila	apple	2				2	L+
Matricaria perforata	scentless chamomile	4				4	L+
Medicago lupulina	black medick	3				3	L+
Melilotus officinalis	yellow sweet clover	3				3	L+
Melissa officinalis	lemon-balm	3				3	L+
Miscanthus sacchariflorus	eulalia	4				4	L+
Morus alba	white mulberry	4				4	L+
Myriophyllum spicatum	Eurasian water-milfoil	5				5	L+
Narcissus pseudonarcissus	daffodil	5				5	L+
Nepeta cataria	catnip	3				3	L+
Phleum pratense	timothy grass	3				3	L+
Pinus nigra	Austrian pine	5				5	L+
Plantago lanceolata	English plantain	4				4	L+
Plantago major	common plantain	3				3	L+
Poa compressa	Canada blue grass	3				3	L+
Poa nemoralis	woodland spear grass	4				4	L+
Poa pratensis ssp. *pratensis*	Kentucky blue grass	3				3	L+
Polygonatum multiflorum	European Solomon's seal	5				5	L+
Polygonum convolvulus	black bindweed	4				4	L+
Potamogeton crispus	curly pondweed	4				4	L+
Potentilla argentea	silvery cinquefoil	5				5	L+
Potentilla recta	sulphur cinquefoil	3				3	L+
Quercus robur	English oak	5				5	L+

Appendix 2: Milliken Park Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Ranunculus acris	tall buttercup	3				3	L+
Rhamnus cathartica	common buckthorn	2				2	L+
Ribes rubrum	garden red currant	3				3	L+
Rosa canina	dog rose	5				5	L+
Rosa multiflora	multiflora rose	3				3	L+
Rudbeckia fulgida	orange coneflower	5				5	L+
Rumex crispus	curly dock	3				3	L+
Silene pratensis	evening lychnis	4				4	L+
Silene vulgaris	bladder campion	4				4	L+
Solanum dulcamara	bittersweet nightshade	3				3	L+
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	5				5	L+
Sorbus aucuparia	European mountain-ash	3				3	L+
Stellaria graminea	grass-leaved chickweed	4				4	L+
Taraxacum officinale	dandelion	3				3	L+
Torilis sp.	hedge-parsley	4				4	L+
Tragopogon dubius	lemon-yellow goat's beard	3				3	L+
Tragopogon pratensis ssp. *pratensis*	meadow goat's beard	3				3	L+
Trifolium pratense	red clover	3				3	L+
Trifolium repens	white clover	3				3	L+
Typha angustifolia	narrow-leaved cattail	3				3	L+
Typha x *glauca*	hybrid cattail	3				3	L+
Verbascum thapsus	common mullein	3				3	L+
Veronica serpyllifolia ssp. *serpyllifolia*	thyme-leaved speedwell	5				5	L+
Veronica verna	Spring Speedwell	5				5	L+
Viburnum lantana	wayfaring tree	4				4	L+
Viburnum opulus	European highbush cranberry	3				3	L+
Vicia cracca	cow vetch	3				3	L+
Acer negundo	Manitoba maple	2	0	0	2	4	L+?
Geranium robertianum	herb Robert	3				3	L+?
Phalaris arundinacea	reed canary grass	3				3	L+?
Phragmites australis	common reed	3				3	L+?
Crataegus crus-galli	cockspur hawthorn	5	4	5	4	18	pL2
Pinus resinosa	red pine	2	5	5	5	17	pL2
Carex crinita	fringed sedge	2	4	4	4	14	pL3
Carya ovata	shagbark hickory	2	4	4	4	14	pL3
Helianthus divaricatus	woodland sunflower	5	3	4	4	16	pL3
Iris versicolor	blue flag	2	5	4	5	16	pL3
Physocarpus opulifolius	ninebark	3	2	5	4	14	pL3
Picea glauca	white spruce	1	5	4	4	14	pL3
Acer rubrum	red maple	2	4	1	5	12	pL4
Acer saccharinum	silver maple	1	2	5	3	11	pL4
Amelanchier arborea	downy serviceberry	3	2	4	3	12	pL4
Betula papyrifera	paper birch	1	4	2	4	11	pL4
Calamagrostis canadensis	Canada blue joint	1	3	4	4	12	pL4
Diervilla lonicera	bush honeysuckle	2	3	2	4	11	pL4
Eupatorium perfoliatum	boneset	1	3	4	3	11	pL4
Juncus effusus ssp. *solutus*	soft rush	2	4	4	3	13	pL4
Pinus strobus	white pine	1	4	3	4	12	pL4
Populus x *jackii*	Jack's poplar	5	2	4	1	12	pL4
Quercus macrocarpa	bur oak	2	4	3	3	12	pL4
Quercus rubra	red oak	1	4	2	4	11	pL4
Scirpus pungens	three-square	3	2	5	3	13	pL4
Thuja occidentalis	white cedar	1	4	1	5	11	pL4
Tsuga canadensis	eastern hemlock	1	4	3	5	13	pL4
Cornus foemina ssp. *racemosa*	grey dogwood	2	2	4	2	10	pL5
Desmodium canadense	showy tick-trefoil	2	2	3	3	10	pL5
Fraxinus pennsylvanica var. *pennsylvanica*	red ash	2	2	2	3	9	pL5
Juglans nigra	black walnut	2	1	2	1	6	pL5
Juniperus virginiana	red cedar	2	1	4	1	8	pL5
Salix exigua	sandbar willow	2	1	5	2	10	pL5
Viburnum lentago	nannyberry	2	3	1	2	8	pL5
Salix cordata	heart-leaved willow	5	5	5	4	19	pLX

Appendix 2: Milliken Park Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Aesculus glabra	Ohio buckeye	5				5	pL+
Crataegus phaenopyrum	Washington hawthorn	5				5	pL+
Larix decidua	European larch	4				4	pL+
Picea abies	Norway spruce	5				5	pL+
Picea pungens	Colorado spruce	5				5	pL+
Populus alba	white poplar	4				4	pL+
Populus x *canadensis*	Carolina poplar	5				5	pL+
Prunus spinosa	blackthorn	5				5	pL+
Quercus palustris	pin oak	5				5	pL+
Robinia pseudoacacia	black locust	3				3	pL+
Salix caprea	goat willow	5				5	pL+
Salix purpurea	purple-osier willow	5				5	pL+
Salix x *sepulcralis*	weeping willow	4				4	pL+
Sorbaria sorbifolia	false spiraea	4				4	pL+
Taxus cuspidata	Japanese yew	5				5	pL+
Ulmus davidiana	Japanese elm	5				5	pL+
Nymphaea sp.	ornamental water-lily	5				5	pL+?
Rosa virginiana	Virginia rose	5				5	pL+?
	Counts of:		%				
	total species	204	100				
	total natural (not p)	155	75.98				
	total planted	49	24.02				
	total native species (not p)	65	41.94				
	total exotic species (not p)	91	58.71				
	L1-L3 not planted	3					
	L4 not planted	8					
	L1-L4 with LD $\geq$ 4	0					
	L1-L4 with SD $\geq$ 3	11					
	L1-L4 with HD $\geq$ 3	10					
	planted L1-L4 (including LX)	24					

Appendix 3: Milliken Park - Fauna Scores and Ranks.

Common Name	Code	Scientific Name	# of pts	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Survey Species: species for which the TRCA protocol effectively surveys.													
Birds													
barn swallow	BARS	*Hirundo rustica*	1	0	2	3	1	1	2	1	0	10	**L4**
common yellowthroat	COYE	*Geothlypis trichas*	1	0	2	2	1	2	1	4	0	12	**L4**
Cooper's hawk	COHA	*Accipiter cooperii*	1	0	2	1	4	1	3	2	0	13	**L4**
tree swallow	TRES	*Tachycineta bicolor*	2	0	2	2	1	1	2	2	0	10	**L4**
American goldfinch	AMGO	*Carduelis tristis*	x	0	2	2	1	1	0	1	0	7	**L5**
American robin	AMRO	*Turdus migratorius*	x	0	1	2	1	1	0	1	0	6	**L5**
Baltimore oriole	BAOR	*Icterus galbula*	x	0	2	2	1	1	0	1	0	7	**L5**
black-capped chickadee	BCCH	*Parus atricapillus*	x	0	1	2	1	1	0	1	0	6	**L5**
Canada goose	CANG	*Branta canadensis*	x	0	1	1	1	2	1	0	0	6	**L5**
cedar waxwing	CEDW	*Bombycilla cedrorum*	x	0	1	2	1	1	0	1	0	6	**L5**
common grackle	COGR	*Quiscalus quiscula*	x	0	3	2	1	1	0	1	0	8	**L5**
mallard	MALL	*Anas platyrhynchos*	x	0	2	2	1	2	0	1	0	8	**L5**
mourning dove	MODO	*Zenaida macroura*	x	0	2	2	1	1	0	0	0	6	**L5**
red-winged blackbird	RWBL	*Agelaius phoeniceus*	x	0	2	2	1	1	0	2	0	8	**L5**
song sparrow	SOSP	*Melospiza melodia*	x	0	2	2	1	2	0	2	0	9	**L5**
warbling vireo	WAVI	*Vireo gilvus*	x	0	1	2	1	1	1	2	0	8	**L5**
yellow warbler	YWAR	*Dendroica petechia*	x	0	1	2	1	1	1	3	0	9	**L5**
European starling	EUST	*Sturnus vulgaris*	x										**L+**
house sparrow	HOSP	*Passer domesticus*	x										**L+**
Herpetofauna													
bullfrog	BUFR	*Rana catesbeiana*	3	3	3	2	2	4	2	5	1	22	**L2**
eastern gartersnake	EAGA	*Thamnophis sirtalis*	1	0	2	2	1	3	0	3	0	11	**L4**
Incidental Species: species that are reported on as incidental to the TRCA protocol.													
Mammals													
eastern cottontail	EACO	*Sylvilagus floridanus*	1	0	2	2	1	3	1	2	0	11	**L4**
red fox	REFO	*Vulpes vulpes*	1	2	2	2	1	3	0	1	0	11	**L4**
woodchuck	WOOD	*Marmota monax*	1	1	2	2	1	3	0	1	0	10	**L4**
grey squirrel	GRSQ	*Sciurus carolinensis*	x	0	2	2	1	3	0	0	0	8	**L5**

Appendix 3: Milliken Park - Fauna Scores and Ranks.

Common Name	Code	Scientific Name	# of pts	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
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										