



Humber Source Woods

Terrestrial Biological Inventory and Assessment

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1.0 Introduction

In 2011 the Toronto Region Conservation Authority (TRCA) conducted flora and fauna inventories of the Happy Valley Forest complex and more specifically the recently acquired Humber Source Woods (HSW) property in preparation for an impending management zone and trail plan. The HSW site is embedded in the much larger Happy Valley Forest complex where the TRCA has conducted several surveys over the past decade, including a partial survey of the HSW parcel in 2008. As shown in Maps 1 and 2, the study area is located in the middle of a southern extension of Happy Valley Forest.

The purpose of the inventory work conducted by the TRCA during the 2011 field season was to *provide site-specific advice on management decisions* associated with an upcoming management and trail plan. In order to provide this advice, detailed field work was undertaken to *characterize the terrestrial natural heritage features* of the property. Once characterized, the site features can then be understood within the larger regional context of the Terrestrial Natural Heritage Program of the TRCA. The question that the inventory addresses is "*How does the area surveyed at the HSW fit within the regional and watershed natural system, and how should its contribution to this system be protected and maximized?"* The important underlying message offered by this question is that the health of the natural system is measured at the regional scale and specific sites must be considered together for their benefits at all scales, from the site to the larger system.

1.1 TRCA's Terrestrial Natural Heritage Program

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

In the late 1990s the TRCA initiated the Terrestrial Natural Heritage Program to address the loss of terrestrial biodiversity within the jurisdiction's nine watersheds. This work is based on two landscape-level indicators: the quality distribution of natural cover and the quantity of natural cover. The aim of the program is to create a conservation strategy that both protects elements of the natural system (vegetation communities, flora and fauna species) *before* they become rare and promotes greater ecological function of the natural system as a whole.

This preventive approach is needed because by the time a community or species has become rare, irreversible damage has often already occurred. A healthy natural system capable of supporting regional biodiversity in the long term is the goal of the Terrestrial Natural Heritage Systems Strategy by setting targets – both short- and long-term (100 years) – for the two landscape indicators in order to provide direction in planning at all scales (TRCA 2007a, TRCA 2007b).

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

2.0 Study Area Description

The HSW study area is located in the upper east reaches of the Humber watershed, in the City of King, York region. The study area is within the Oak Ridges Moraine and is completely surrounded by a southern extension of the Happy Valley Forest complex (a provincially significant area of natural and scientific interest (ANSI)). The nearest road is Concession 7, almost 800 metres to the west of the centre of the site. The study area covers ~22 ha and lies entirely within the Great Lakes – St. Lawrence floristic region, composed of mixed coniferous-deciduous forest. At the coarse physiographic level, the site is situated on the Oak Ridges Moraine with a surficial geology consisting primarily of glacial deposits (till) of clayey silt to silt.

Recreational activity occurs mostly along the Trans Canada Trail which runs along the northern edge of the site. Additional access occurs along a mixture of formal and informal trails that run through much of the remainder of the property.

3.0 Inventory Methodology

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

A key component of the field data collection is the scoring and ranking of vegetation communities and flora and fauna species to generate local "L" ranks (L1 to L5); this process was undertaken in 1996-2000 and ranks are reviewed regularly (TRCA 2010). Vegetation community scores and ranks are based on two criteria: *local occurrence* and the number of *geophysical requirements* or factors on which they depend. Flora species are scored using four criteria: *local occurrence*, *population trend*, *habitat dependence*, and *sensitivity to* impacts associated with *development.* Fauna species are scored based on seven criteria: *local occurrence*, *local population trend*, *continent-wide population trend*, *habitat dependence*, *sensitivity to development*, *area-sensitivity*, and *patch isolation sensitivity*. With the use of this ranking system, communities or species of *regional concern*, ranked L1 to L3, now replace the idea of *rare* communities or species. Rarity (*local occurrence*) is still considered 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.

3.1 Landscape Analysis

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

Base Mapping

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

Quality Distribution of Natural Cover

The quality of each habitat patch is evaluated according to three criteria: *size* (the number of ha occupied by the patch), *shape* (edge-to-area ratio), and *matrix influence* (measure of the positive and negative impacts from surrounding land use) (TRCA 2007c). A total score for each patch is

obtained through a weighted average of the scores for the three criteria. This total score is used as a measure of the 'quality' of a habitat patch and is translated into a local rank (L-rank) ranging from L1 to L5 based on the range of possible total scores from 3 to 15 points. Of these L-ranks, L1 represents the highest quality habitat and L5 the poorest.

Species presence or absence correlates to habitat patch quality (size, shape and matrix influence) (Kilgour 2003). The quality target is based on attaining a quality of habitat patch throughout the natural system that would support in the very long term a broad range of biodiversity, 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 m from the edge of the forest patch, using 100 m increments. A recognized distance for deep interior conditions occurs at 400 m from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

Quantity of Natural Cover

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 Vegetation Community and Species

Vegetation community and flora and fauna species data were collected through field surveys. These surveys were done during the appropriate times of year to capture breeding status in the case of amphibians and birds, and during the optimal growing period of the various plant species and communities.

Vegetation communities and flora species were surveyed concurrently. Botanical field-work specific to the HSW study area was conducted in 2011. Additional information from survey data

collected in 1999, 2001, 2008 and 2011 for portions of the larger Happy Valley Forest Complex was available but used only if there was data relevant to HSW (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 2007 digital ortho-rectified photographs (ortho-photos) to a scale of 1:2000 and then digitized in ArcView. Flora regional and urban species of concern (species ranked L1 to L4) were mapped as point data with approximate number of individuals seen. A list of all other species observed was documented for the site.

During the fauna survey conducted throughout much of the Happy Valley Forest complex in April and June, 2011, the HSW property was specifically targeted ensuring that a concerted effort was made to produce an inventory for this particular property. The spring surveys searched primarily for frog species of regional concern but recorded incidentally the presence of any early-spring nocturnal bird species (owls and American woodcocks). Surveys in June were concerned primarily with the mapping of breeding bird species of regional concern. As per the TRCA data collection protocol breeding bird surveys are carried out by visiting all parts of a site at least twice during the breeding season (last week of May to mid-July) to determine the breeding status of each mapped point. The methodology for identifying confirmed and possible breeding birds follows Cadman *et al*. (2007). All initial visits are completed by the end of the third week of June. The field-season is organized so that by late June only repeat visits are being conducted. It is imperative that any visit made in the first half of June is subsequently validated by a second visit later in the season. Fauna regional species of concern (species ranked L1 to L3) were mapped as point data with each point representing a possible breeding bird.

Table 2. Schedule of TRCA biological surveys at the HSW study area for 2011

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2007 ortho-photos	21 hours
Vegetation Communities and Flora Species	11th May, 20th July, 17th Aug. 2011	17 hours
Frogs and Nocturnal Spring Birds	10th April, 2011	2.25 hours
Breeding Songbirds	6th and 29th June, 2011	12.75 hours

Note that visits were also conducted within the more extensive Happy Valley Forest complex in 1999, 2001, 2004/05 and 2008. Only the visits made in 1999, 2008 and 2011 have made any extensive fauna observations throughout the Happy Valley area; the 2004/05 visits reported primarily on spring frogs in neighbouring ponds. A 10 ha parcel of land, the volunteer monitoring plot, straddling the northern boundary of HSW and part of the surrounding Happy Valley Forest was inventoried in June, 2008.

4.0 Results and Discussion

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

4.1 Regional Context

Based on 2007/08 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, currently (i.e. 2007/08) only about 17% is covered by forest and wetland. Of the non-natural cover (i.e. the remaining 75%), 48% is urban and 27% is rural / agricultural.

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

4.2 Habitat Patch Findings for Humber Source Woods

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 2007/08 ortho-photos.

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

HSW study area scores “excellent” for patch size (Map 5). The forest interior extends up to 400m and provides flora and fauna species shelter from the negative effects associated with forest

edges and open habitats. Its presence, which is directly related to the size and shape of a given forest tract, is a good indication of woodland health (Map 6).

Habitat Patch Matrix Influence

Analysis based on the 2007/08 ortho-photos shows that the majority of the habitat in the study area is ranked as "good" for matrix influence (i.e. scores four out of a possible five points, see Maps 7 and 8). The mix of natural and agricultural land-use in the vicinity of the site contributes significantly to this score.

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.

Habitat Patch Total Score

The combination of "good" matrix influence on the site, and the mix of "excellent" to "very poor" for habitat patch size and shape, results in a "good" or L2 habitat patch quality (Map 9).

4.2.2. Quantity of Natural Cover

The area of the Humber watershed is approximately 91,078 ha containing 32% natural cover (2007/08), including 18,935 ha as forest (20.8%), 8,169 ha as meadow (9 %) and 2,078 ha as wetland (2.3 %).

The HSW study area is 100% natural cover (Appendix 1). The natural cover includes 21.3 ha of forest (4.2 ha of which is plantation), 0.15 ha of successional, and less than 0.5 ha combined of wetland and meadow. HSW accounts for 0.08% of the total natural cover in the Humber watershed.

4.3 Vegetation Community Findings for Humber Source Woods

4.3.1 Vegetation Community Representation

A total of 16 different ELC vegetation community types were described for the site (Appendix 1). There are 10 forest communities (8 natural forests, 2 plantations), 4 successional communities, 1 wetland community and 1 meadow community. Two of these community types were found solely as inclusions within other communities (2 successional).

By far, forest communities contribute to the greatest proportion of the natural area within the site. HSW has 21.3 ha of forest (including 4.2 ha of plantation), about 95% of the whole study area. They range in both age (i.e. mid-aged to mature) and composition (i.e. purely

deciduous/coniferous to mixed). Many of these communities are contiguous with the larger expanses of the Happy Valley ANSI. Patterns in the occurrence of vegetation communities at the site are evident and due in large part to the areas rugged topography, soil drainage patterns and ensuing microclimates.

Upland areas are occupied by forests that are distinctly deciduous in nature and feature communities such as Dry-Fresh Sugar Maple – White Ash Deciduous Forest (FOD5-8), Dry-Fresh Sugar Maple – Paper Birch – Poplar Deciduous Forest (FOD5-10) and Dry-Fresh Poplar Deciduous Forest (FOD3-1). Species such as sugar maple *(Acer saccharum ssp. saccharum)*, American beech *(Fagus grandifolia)* and red oak *(Quercus rubra)* are the main canopy dominants. Mixed communities occur to a lesser degree and are typically associated with the cooler southern slopes and valley bottoms. Dry-Fresh Hemlock-Sugar Maple Mixed Forest (FOM3-2) and Dry-Fresh White Pine – Hardwood Mixed Forest (FOM2-A) are two of the mixed communities present. Coniferous species such as hemlock *(Tsuga canadensis)* and white pine *(Pinus strobus*) are common. Coniferous plantations, largely characterized by white pine and white spruce *(Picea glauca),* are found along the western boundary of the site. White Pine Coniferous Plantation (CUP3-2) and White Spruce Coniferous Plantation (CUP3-C) are the two communities found.

Successional communities, of which there are four, make up a small fraction of the site (0.15ha). Occurring along the southern-western edge of the site are a Native Deciduous Successional Woodland (CUW1-A3) and a White Pine Successional Savannah (CUS1-A2). The remaining two, a Native Sapling Regeneration Thicket (CUT1-A) and an Exotic Successional Woodland (CUW1-b) are found solely as inclusions within other communities.

Wetland representation is sparse. There is one marsh type, found along the south western tip of HSW. It is a Forb Mineral Shallow Marsh (MAS2-9) that contains a mixture of native and exotic forbs, sedges and grasses. Examples of such include common beggar's-tick *(Bidens frondosus)*, water plantain *(Alisma plantago-aquatica*) and reed canary grass *(Phalaris arundinacea).* This wetland feature contributes a little more than 0.1% to the natural cover. However, it should be noted that the majority of this wetland feature exists beyond the boundary of the site; only its eastern edge is within the HSW study area.

Meadow does not contribute significantly to the area. The edge of one Native Forb Meadow (CUM1-A), less than 0.1 ha in size, extends into the south-western section site. Species occurring here include tall goldenrod *(Solidago altissima*) and a variety of aster species *(Aster spp.)*

4.3.2 Vegetation Communities of Concern

The vegetation communities that occur in the TRCA jurisdiction are scored and given a local rank from L1 to L5 based on the two criteria mentioned in Section 3.0. 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. HSW lies within the rural landscape and so L1 to L3 communities are of conservation concern.

There are no communities of regional conservation concern (ranked L1 to L3) present at HSW. However, it is important to understand that a vegetation community at a particular site can be of conservation concern for considerations other than L-rank. Key considerations that are not captured by community rank alone include the intactness or quality of individual examples of communities. HSW and the larger Happy Valley ANSI, provide prime examples of high-quality L4 forest communities that are of conservation concern because of its extent, mature age, and intact native ground layer (*which includes a high diversity of sensitive sedges, ferns and spring ephemerals)*. There are six-L4 communities (5 forests and 1 wetland).The communities are listed with ranks in Appendix 1 with the locations and boundaries shown on Map 10.

4.4 Flora Findings for Humber Source Woods

4.4.1 Flora Species Representation

A total of 86 vascular plants were recorded within the boundaries of the HSW property in 2011; the addition of one record from 2008 found within the study area increased this value to 87 (Appendix 2). These included 86 naturally-occurring species and one planted species. Of the non-planted species, 76 are native (88 %). In comparison, surveys conducted for the larger Happy Valley Forest complex since 1999 (Appendix 2) recorded a total of 262 species (209 native, 52 exotic and 1 planted). The rich diversity of native flora species supported by HSW and the Happy Valley Forest complex speaks to the presence of high–quality habitats consisting of mature, expansive, relatively intact vegetation communities and varying soil types.

4.4.2 Flora Species of Concern

There are 15 vascular plant species of regional conservation concern (rank L1 to L3) at HSW. Appendix 2 lists plant species by ranks and locations are shown on Map 11. The ranks are based on sensitivity to human disturbance associated with development; and habitat dependence, as well as on rarity (TRCA 2010). In most cases, the species are not currently rare but are at risk of long-term decline due to the other criteria.

All of the flora species of concern are sensitive to development, being vulnerable to at least one kind of disturbance that is associated with land use changes (see Map 7 for sensitivity to development scores). Forest ground layer species for example, are vulnerable to invasive species such as dog-strangling vine (*Cynanchum rossicum*) and European buckthorn *(Rhamnus cathartica)*; both can disperse along disturbance corridors such as trails. Increased human traffic into a natural area results in disturbance caused by trampling and the incursion of invasive species that compete with the existing native flora. The heaviest trampling (due to pedestrian and bike trails) is along northern part of the HSW which are contiguous with the more highly-used Oak Ridge Moraine Trail System.

Habitat fragmentation can lead to increased populations of herbivores such as white-tailed deer (*Odocoileus virginianus*). Evidence of deer browse was observed during field work at HSW, but

seems not yet to have attained severe levels. Selective logging of upland hardwoods in the north-eastern portion of HSW may have occurred in the distant past. The nature of gaps in the forest canopy lends weight to the possibility but observations are solely speculative. In addition to being sensitive to land use impacts, all of the species of concern can be considered habitat specialists, scoring relatively high in *habitat dependence*. Habitat dependence scores are shown on Map 12. Roughly, they are found in seven or fewer vegetation cohorts (groupings of vegetation types with similar floristic characteristics) (TRCA 2010). They will not readily recover when these habitats are lost or altered.

The Humber Source Woods study area has many habitat specialists corresponding to mature deciduous forests. For example, the drier, sandier, forest communities harboured species such as witch hazel *(Hamamelis virginiana)* and pointed-leaved tick-trefoil (*Desmodium glutinosum*), while the moister, richer forests have ferns such as Christmas fern *(Polystichum acrostichoides*) and oak fern (*Gymnocarpium dryopteris)*; as well as sedges such as white bear sedge (*Carex albursina*) and oval-headed sedge *(Carex cephalophora)*. White fruited mountain rice *(Oryzopsis asperifolia*) was the sole woodland grass found in the study area. Sharp-lobed hepatica *(Anemone acutiloba)* is just one of many spring ephemerals that occur in parts of the forested areas.

Of particular interest are a number of species of regional concern that were discovered in the Happy Valley Forest Complex just outside the boundaries of HSW. In 2008, small populations of broad-leaved panic grass *(Panicum latifolium),* a L1 ranked species, were located just north of the HSW property line. Within the same vicinity were rattlesnake fern (*Botrychium virginianum*) (L2) and round-branched ground pine *(Lycopodium dendroidium)* (L2*).* In 2011, the L1 ranked squaw-root *(Conopholis americana),* a parasitic perennial plant that requires mycorrhizal associations with members of the Oak family *(Quercus spp.)* to survive, was also discovered. Its presence indicates strong fungal associations in the soils; this is fundamental to the establishment of healthy forest ecosystems (Baird and Roipel, 1986). Also the conifer plantations present throughout the site have created acidic soil conditions that prove suitable for the native saprophyte, pine-sap *(Monotropa hypopithys).*

Invasive Species

With a few exceptions, invasive species have not taken over large areas of HSW. Considering that HSW has a moderate to sometimes heavy traffic of hikers and mountain bikers, exotic invasion has been relatively mild. They have been mainly observed in the plantations and natural forests along trail systems as well as meadow and marsh communities.

The greatest threat to upland habitats would be dog-strangling vine. This occurs in successional areas in the western portion of HSW; and in patches in the plantations on the southern side. This plant is a formidable threat (TRCA 2008). If allowed, it has the potential to become the dominant ground layer species in most upland habitats except for mature forests. Prompt controls via chemical, mechanical and/or biological agents are the best options for dealing with the plant in the long-term. Garlic mustard is present but very localized, appearing only along the trails at HSW.

Reed canary grass *(Phalaris arundinacea)* is probably the main threat to the marsh habitats. At present, small patches of this exotic grass are found in the meadow marsh community located in the south-west part of HSW. However, additional observations have been recorded for this species in marsh and aquatic habitats throughout the broader area.

4.5 Fauna Species Findings for Humber Source Woods

4.5.1 Fauna Species Representation

The TRCA fauna surveys at the HSW in 2011 documented a total of 35 bird species, 3 mammals, and 3 herpetofauna species, bringing the total number of possible breeding vertebrate fauna species identified by the TRCA to 41. Four additional bird species (broad-winged hawk, *Buteo platypterus*; ruffed grouse, *Bonasa umbellus*; blue-headed vireo, *Vireo solitarius*; and black-throated blue warbler, *Dendroica caerulescens*), can be added from the less extensive survey conducted in 2008 for an overall total of 45 species. A TRCA survey conducted in the Happy Valley Forest in 1999 documented two extra species from within the HSW study area boundary: spring peeper (*Pseudacris crucifer*) and Acadian flycatcher (*Empidonax virescens*), the latter is listed as a Species at Risk at both the Federal and Provincial levels. The protocol for the TRCA fauna database stipulates a 10 year threshold for inclusion of sightings and so the fauna records from 1999 are not included in the fauna list produced for this present document.

The rather low number of breeding fauna species within HSW is largely a consequence of the uniformity of habitat types within the study area. It is important to understand that a low biodiversity for a single site is not necessarily a reflection of poor habitat quality: factors such as habitat patch size, and the number of different habitat types are important factors influencing the associated biodiversity.

The surrounding Happy Valley Forest has been surveyed to different extents over the course of the past decade but most extensively in 2011; the fauna species list for this larger block of forest includes 23 species that have not been documented specifically within the HSW study area boundary, including 16 bird species and 4 herpetofauna. An additional four species have been recorded in the same Happy Valley area prior to the decade report-period covered by this document. In order to adhere to the TRCA inventory and reporting protocol these 27 species are not included in the HSW fauna list. However, given that HSW is embedded within the larger forest block and given that the forest habitat is continuous across the site, it is important to consider that all of the forest fauna species that are found within the larger forest complex are likely to occur - at least sporadically – within the HSW study area boundaries. This is especially important for such highly sensitive species as the L1 ranked Ambystomatid salamanders (Jefferson salamander, *Ambystoma jeffersonianum*, and spotted salamander, *Ambystoma maculatum*, the former listed as Threatened under the Species at Risk legislation). Refer to Appendix 3 for a list of the fauna species reported from the HSW study area and Appendix 4 for a list of species reported from the larger Happy Valley Forest. Appendix 5 presents the TRCA scores and local-ranks for all species reported from the Happy Valley/Humber Source complex.

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. Since the subject site is situated within the rural zone this report does not consider in detail 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 the HSW reported 14 bird species of regional concern (L1 to L3), including two L2 bird species: ruffed grouse (*Bonasa umbellus*) and broad-winged hawk. In addition, there were three herpetofauna of regional concern including the L2 ranked grey treefrog (*Hyla versicolor*) and eastern newt (*Notophthalmus viridescens*), bringing the total to 17 fauna species of regional concern. Locations of these breeding fauna are depicted on Map 13. It should be noted that a further 15 species of concern have been reported from the surrounding forest landscape of Happy Valley, including two L1 (the aforementioned Ambysomatid salamanders) and four L2 species (blue-winged warbler, *Vermivora pinus*, and three herp species).

Although none of the species documented within the HSW study area are listed as provincial or federal Species at Risk list, three such species – Acadian flycatcher, hooded warbler and Jefferson salamander – have been documented in recent years within the surrounding Happy Valley Forest. Acadian flycatcher is listed as Endangered at both the provincial and national levels, Jefferson salamander is listed as Threatened both provincially and nationally, while hooded warbler is listed Special Concern at the provincial level and as Threatened at the national level.

Local occurrence is one of seven scoring criteria for fauna species and is based on TRCA data and information from the Natural Heritage Information Centre (NHIC) of the Ontario Ministry of Natural Resources (OMNR) (NHIC 2008). Using local occurrence as a measure of regional rarity, any species that is reported as a probable or confirmed breeder in fewer than 10 of the forty-four 10x10 km UTM grid squares in the TRCA jurisdiction is considered regionally rare (i.e. scores three to five points for this criterion) (TRCA, 2010). At HSW there are four species that are considered regionally rare: broad-winged hawk, black-throated blue warbler, blue-headed vireo and eastern newt. The two passerine species are restricted to the most northerly forest blocks, occurring in the East Duffins Headwater forest complex and in the Caledon forests (e.g. Palgrave Conservation Area). The hawk requires large, relatively undisturbed mixed and deciduous forests and occurs across the north of the jurisdiction and somewhat further south in the eastern watersheds (as far south as Greenwood Conservation Area). Finally, the eastern newt has a rather patchy distribution throughout the entire rural portion of the jurisdiction, with a few populations persisting in recently urbanized areas; this species maintains just one known locationwithin the City of Toronto in the Rouge Park.

Sensitivity to development is another criterion used to determine the L-rank of fauna species. A large number of impacts that result from local land use, both urban and agricultural, can affect the local fauna. These impacts – considered separately from the issue of actual habitat loss – can be

divided into two distinct categories. The first category involves changes that arise from local urbanization that directly affect the breeding habitat of the species in question. These changes alter the composition and structure of the vegetation communities; for example, the clearing and manicuring of the habitat (e.g. by removal of dead wood and clearance of shrub understorey).

The second category of impacts involves changes that directly affect individuals of the species in question. Examples include increased predation from an increase in the local population of predator species that thrive alongside human developments (e.g. blue jays, *Cyanocitta cristata;* American crows, *Corvus brachyrhynchos;* squirrels, *Sciuridae*; raccoons, *Procyon lotor*; and house cats, *Felis catus*); parasitism (from facilitating the access of brown-headed cowbirds, *Molothrus ater*, a species which prefers more open, edge-type habitat); competition (for nest-cavities with bird species such as house sparrows, *Passer domesticus*; and European starlings, *Sturnus vulgaris*); flushing (causing disturbance and abandonment of nest) and, sensitivity to pesticides.

Fauna species are considered to have a high sensitivity to development if they score three or more points (out of a possible five) for this criterion. At HSW all 17 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 (Map 8). Four of these species (two birds and two herp species) are ranked L2. It is also important to note the presence of an additional 10 sensitive forest species in the neighbouring Happy Valley forest including winter wren (*Troglodytes troglodytes*), yellow-bellied sapsucker (*Sphyrapicus varius*), porcupine (*Erethizon dorsatum*) and the aforementioned trio of Species at Risk. Any of these additional species could very easily hold territories within the HSW study area since the forest habitat quality and type is similar to that which occurs throughout the Happy Valley forest complex.

Five of the 14 sensitive bird species are low-nesting or ground-nesting birds and as such are highly susceptible to ground-borne disturbance, e.g. off-leash dog-walking. Ground-nesting birds are highly susceptible both to increased predation from ground-foraging predators that are subsidized by local residences (house cats, raccoons) and to repeated flushing from the nest (by pedestrians, off-trail bikers and dogs) resulting in abandonment and failed breeding attempts. These same disturbances also have considerable impact on terrestrial amphibians in their upland summer-foraging and overwintering habitat. This factor becomes particularly important when one considers the proximity of well-documented Jefferson salamander occurrence.

Currently, disturbance within the HSW section of Happy Valley occurs largely along the well-established trail along the northern border. Smaller informal trails exist throughout much of the rest of the property and the persistence and increased use of such trails would have considerable influence on the success of the ground-nesting bird and foraging amphibian populations. If such disturbance increase as the site becomes more accessible to the general public then it is highly likely that the numbers of sensitive ground-nesting and foraging fauna will decrease.

Higher ranked species are persisting at this site because the landscape is still largely rural. However, 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.

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 issue of a species' need for isolation. Fauna species are scored for area sensitivity based on their requirement for a certain minimum size of preferred habitat. Species that require large tracts of habitat (>100 ha in total) score the maximum five points, while species that either show no minimum habitat requirement, or require <1 ha in total, score one point. Species scoring three points or more (require ≥5 ha in total) are deemed area sensitive species. Researchers have shown that for some species of birds, area sensitivity is a rather fluid factor, dependent and varying inversely with the overall percentage forest cover within the landscape surrounding the site where those species are found (Rosenburg *et al.* 1999). Fifteen of the fauna species of regional concern that were identified at HSW are considered area sensitive, including five species that require at least 20 ha of forested habitat: broad-winged hawk, pileated woodpecker (*Dryocopus pileatus*), ovenbird (*Seiurus aurocapillus*), scarlet tanager (*Piranga olivacea*) and pine warbler (*Dendroica pinus*). These species, together with several other species recorded in the Happy Valley forest complex, are well-accommodated by the extensive forest existing in the local landscape.

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. Many of the sensitive species which are so well-represented within the Happy Valley forest benefit considerably from the extent of their potential nesting habitats on the site, ensuring that despite some degree of disturbance from the small number of visitors and dogs there are enough successful nestings that populations of these species are maintained on site.

Two non-avian species which certainly benefit from the extensive areas of natural cover at the site are grey treefrog and eastern newt. These species are considered area sensitive primarily due to their requirement for two distinct habitat elements in order to complete their life cycles. Grey treefrogs overwinter in upland forested habitat and then migrate to nearby wetlands in the early spring to breed, returning to forest habitats to forage throughout the summer and fall months. Eastern newts have a somewhat more complicated life cycle whereby the adult and larval stages

are entirely aquatic, but there is a juvenile stage – the red eft – which spends several years in upland habitat within migrating distance of suitable aquatic habitat. Several other amphibian species reported from the surrounding Happy Valley forest are likewise dependent on a combination of upland forest and aquatic habitats. The availability of viable breeding ponds within easy access of extensive upland forest habitat presents excellent opportunities for these species of regional concern.

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 herpetofauna species recorded at HSW, with a further four herps and one mammal (porcupine) reported from the surrounding Happy Valley forest, are considered sensitive to habitat fragmentation and isolation. All but one of these seven herpetofaunal species (i.e. those species reported from within the larger Happy Valley Forest complex) are highly mobile, moving considerable distances across the local landscape to and from breeding and wintering habitats. Fortunately, the life-cycle requirements of these species are currently all satisfied by habitats available either within the site boundaries or on land adjacent to the study area. However, since this group of species is so vagile, the long-term effects of road-kill events on the nearby Concession 7 road need to be examined and monitored carefully to ascertain effects on the local amphibian populations. As yet there have been no road-kill hotspots identified but numbers of eastern newts and Ambystomatid salamanders (including the federally and provincially listed Jefferson salamander) have been recorded crossing the roads in the vicinity of the junction with Sideroad 16. Traffic on this stretch of road may not currently be heavy enough to present any significant effect on local salamander populations, however, the issue of application of chemicals to the roads to deal with ice and dust problems may have considerable impact in both the early spring and late summer when these animals are on the move.

Fauna species that score greater than three points under the ***habitat dependence*** criterion are considered habitat specialists (Map 14). These species exhibit a combination of very specific habitat requirements that range from 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. Nine fauna

species that occur in the study area are considered forest habitat specialist with an additional ten species occurring in the larger Happy Valley forest.

Richness is essentially the presence or absence of species at a site. Beyond mere presence 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 presence of a relatively high number of habitat dependent species, in particular, species that are dependent on forest, indicates that the forest habitat in the study area is functioning at a particularly high level.

5.0 Recommendations

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

5.1 Site Highlights

- HSW is located within the Happy Valley Forest ANSI, one of the largest contiguous tracts of remnant upland forests on the Oak Ridges Moraine and in the TRCA jurisdiction. It is prime example of high quality habitats supporting a diverse array of native flora and fauna species.

- The site is almost entirely comprised of interior forest, with a small area at the very centre of the site which is between 300 and 400 metres from any forest edge.

- There were 16 vegetation types observed: 10 forest (8 natural forest, 2 plantation), 4 successional, 1 wetland, and 1 meadow. Deciduous forest provided the greatest proportion of natural cover for the site.

- There was a high diversity of species associated with mature forest including many sensitive sedges, ferns and spring ephemerals. There were 87 flora species observed; 15 were species of regional conservation concern (L1 to L3).

- Species richness was high in the surrounding Happy Valley area. A total of 223 flora species were recorded; included 2 regionally rare flora species (squaw-root, and broad-leaved panic grass).

- A rather low total of 45 vertebrate fauna species observed, but this is augmented by a further 23 species present within the neighbouring Happy Valley forest.

- Three Species at Risk occur in the neighbouring Happy Valley forest (Acadian flycatcher, hooded warbler and Jefferson salamander).

5.2 Site Recommendations

Protect and Maximize Contribution of HSW to Wider Natural System

Recommendations based on this objective address the landscape ecology indicators of patch size/shape and matrix influence, as well as connections to the larger system.

Optimize Patch Size and Shape, Forest Interior

The sheer size and continuity of the forest habitat across the landscape – which includes the HSW – is the single most important aspect of the natural heritage of this area. This size confers resilience on the ecosystem, allowing fauna and flora communities to function at a high level.

The more that natural cover is retained at the study area and vicinity, the better it can support a healthy level of biodiversity. Although the HSW site is already well-endowed with natural cover, recreation or other activities at the site should be directed away from sensitive forest interior habitat. Increasing forest cover within the broader landscape through strategic plantings and restoration will increase the extent of interior forest locally and facilitate the mitigation of any negative matrix influences that will be associated with increased trail use. The larger a habitat patch the more resilient the associated fauna and flora communities are to developments within the landscape or to increased user pressure.

- Management zones should emphasize protection of existing natural heritage features, i.e. the presence of vegetation communities, plant or animal species of high conservation rank.

- Since fauna distribution within a forest block is dynamic and it is therefore difficult to identify sensitive breeding locations, management should consider the creation of sanctuaries within the larger Happy Valley forest complex where fauna species are undisturbed. Such “sanctuaries” should be exempt from any trail placement and ideally would cover at least 20 hectares of undisturbed habitat.

Minimize Negative Matrix Influence

Although landscape metrics indicate that the matrix influence at the site is largely positive, this does not take into account the disturbance that occurs along trails throughout the spring and

summer months due to visiting hikers and cyclists. This visitor pressure is likely to increase in the future and it is important that management pre-empts such changes in matrix influence by designing a trail plan that steers users away from sensitive habitats, leaving large portions of the forest free from any such disturbance.

- Trails have the potential to act as pathways for the introduction and spread of aggressive exotic plant species into undisturbed natural areas. Any future trail planning needs to consider the locations of sensitive flora and fauna species of concern and to direct visitor pressure away from these areas. Likewise, restoration activities should target non-sensitive areas.

- Installation of board-walks as opposed to typical ground-borne trails should be considered as a means of protecting the sensitive flora and fauna species that occur throughout the site. This is especially true of the impact of bicycles on migrating and foraging amphibians.

- Forest ground-nesting birds have shown considerable declines in more urbanized portions of the region. It is important to ensure that any increase in visitor use of the site does not occur at the expense of these sensitive species.

- Dogs should either be excluded from the site or, at the very least, the leash-by-law should be properly enforced. Local dog-walkers need to be fully informed of the sensitivity of such forest habitats and the detrimental effect that their pets can have on breeding fauna.

- It will be of considerable interest over the next few years to monitor the status of highly sensitive ground-nesting birds and terrestrial fauna such as eastern newt and red-backed salamander. Long-term monitoring of biodiversity at HSW/Happy Valley forest should be implemented through the establishment of monitoring plots on site (at minimum, a forest vegetation plot, a forest bird plot, and a Plethodontid plot); this will help us to document the effect of any changes in visitor pressures and other management initiatives. The plots would be part of a network of monitoring plots across the regional terrestrial natural heritage system.

- This could be done by adding HSW to a network of fixed monitoring plots to assess the changes in ecosystem quality.

Improve Connectivity to Nearby Habitat

HSW is already well connected to the larger Happy Valley forest complex with relatively unobstructed access to important amphibian breeding ponds to the north-west. Although no roads bisect or even border the HSW, the presence of Concession 7 just 500 metres to the west may have some influence on local amphibian populations.

- Ensure continuing effective and adequate passage for amphibians to and from the breeding ponds to the north and west.

- Extensive planting of the meadow habitat that lies between HSW and these ponds would facilitate movement of salamanders and frogs to these breeding ponds. Local landowners should be approached with such planting projects in mind.

Improve Habitat Quality

Efforts should be made to retain the high quality of existing habitat at HSW, and to ensure that restoration work in neighbouring habitats matches site conditions. Although the avifauna species list is relatively short it is important to understand that many of the species that occur are interior forest obligates and as such are known to decline in fragmented landscapes. Management of a forest reserve should not seek to simply increase the number of species on the landscape but rather enhance the opportunities for species that are dependent on extensive forest habitats.

- Where there are existing communities or species of conservation concern, ecological restoration should focus on maintaining conditions that allow these species to thrive and expand.

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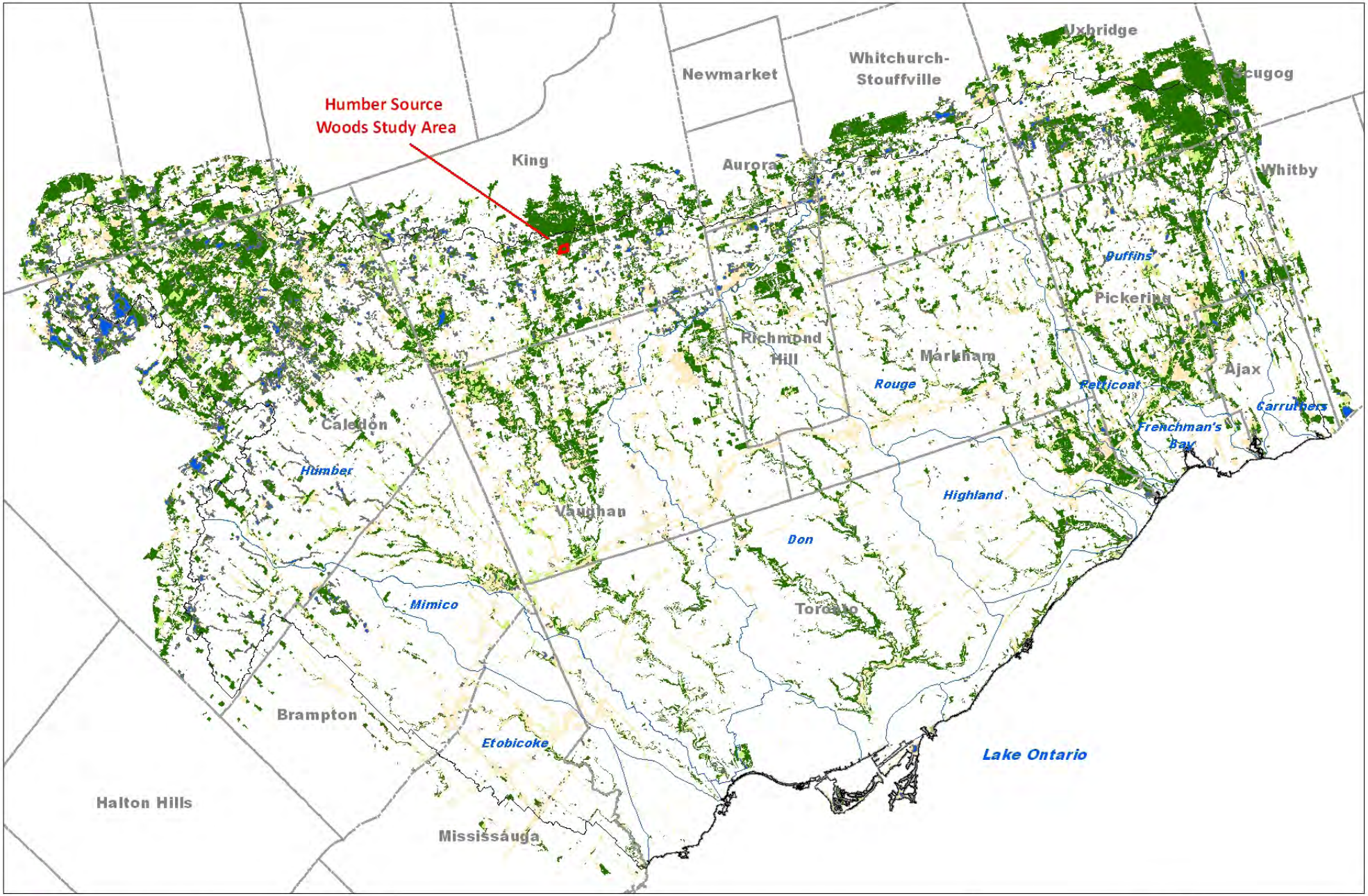


TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: December 2011

* Landscape analysis based on 2007/2008 Orthophotography

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

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

Legend
- Humber Source Woods Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

TORONTO AND REGION Conservation for The Living City

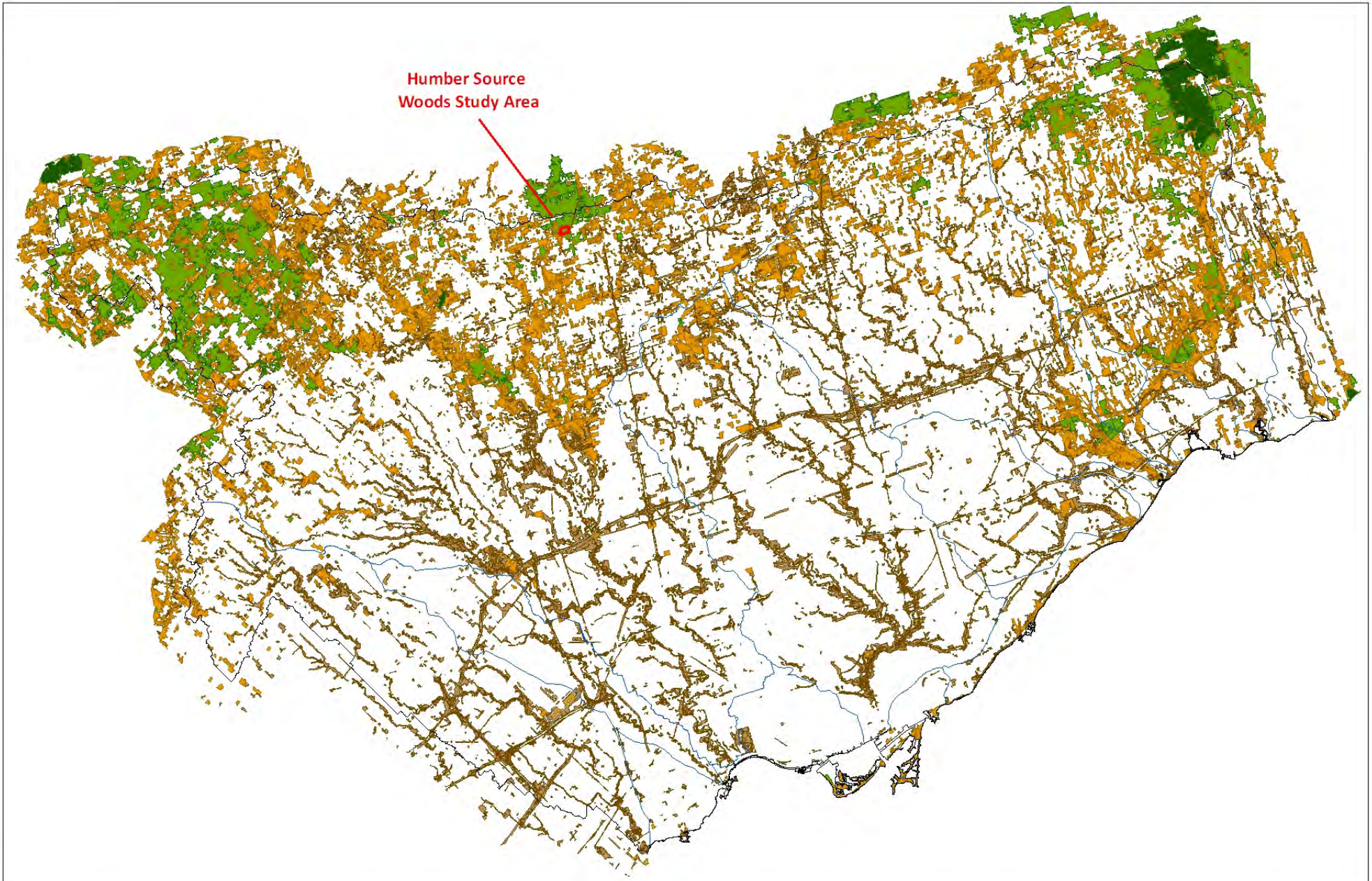
0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 2: Humber Source Woods Study Area

Legend

Humber Souce Woods Boundary



TORONTO AND REGION Conservation for The Living City

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0 2.5 5 10 15 20 Kilometers

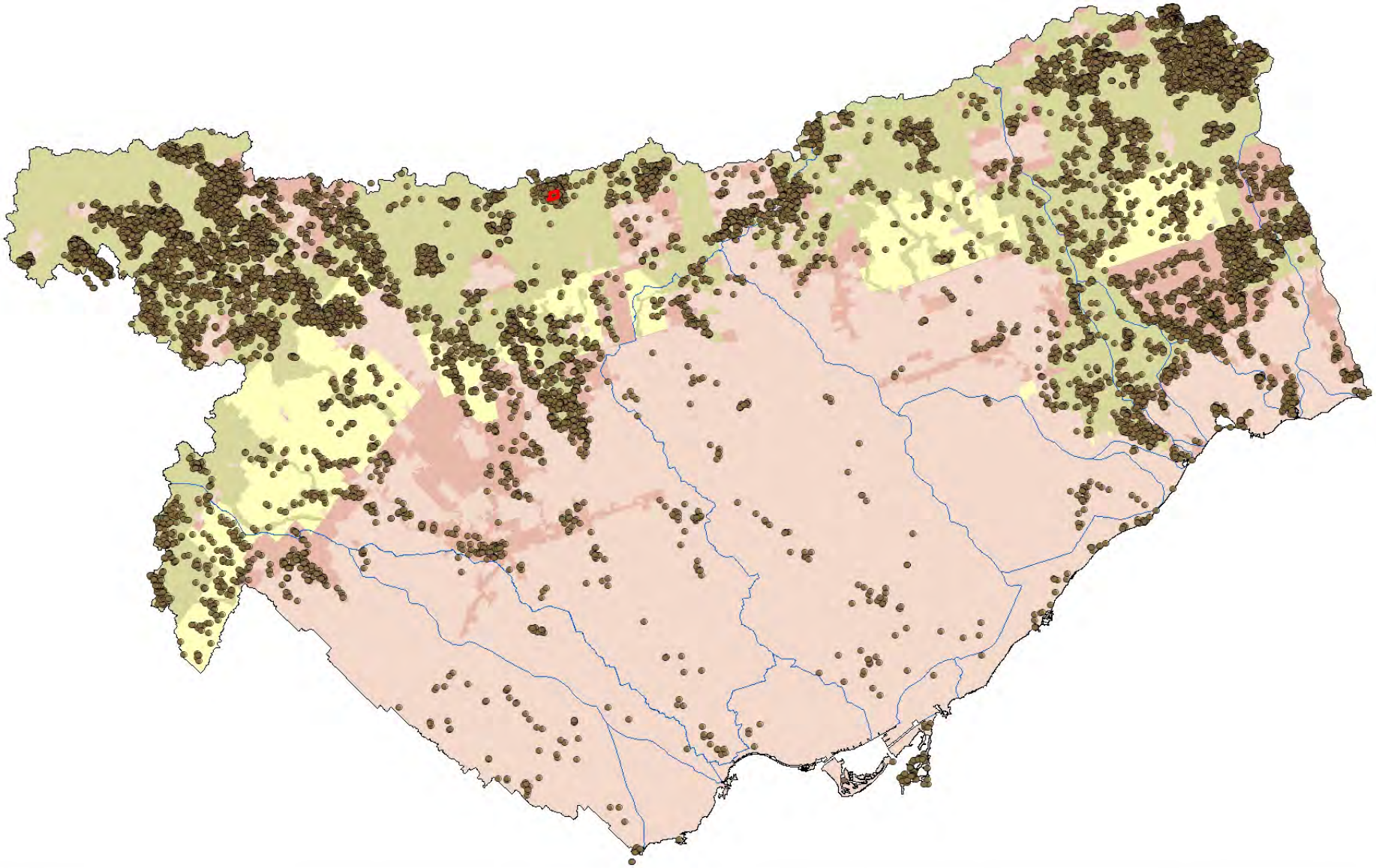
Date: December 2011
* Landscape analysis based on 20072008 Orthophotography

Map 3:
Regional Natural System
Habitat Patch Quality

Legend

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

- Humber Source Woods Study Area
- TRCA Jurisdiction
- Watershed



TORONTO AND REGION Conservation for The Living City

0 2.5 5 10 15 20 Kilometers

Date: December 2011

Map 4:
Distribution of Fauna
Regional Species of Concern

Legend

- Fauna Species of Concern (L1 - L3)
- Humber Source Woods 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

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.
* Landscape analysis based on 20072008 Orthophotography

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

Legend

Humber Sourece Woods Study Area

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

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0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

Map 6: Interior Forest at Humber Source Woods

Legend

- Humber Source Woods 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

Toronto and Region Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

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

Legend

Habitat Matrix Influence Scores *

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

Humber Source Woods 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

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N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.
* Landscape analysis based on 2007-2008 Orthophotography

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

Legend

Habitat Matrix Influence Scores *

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

Humber Source Woods Study Area

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N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.
* Landscape analysis based on 2007/2008 Orthophotography

Map 9: Habitat Patch Quality

Legend

Habitat Patch Quality *

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

Humber Source Woods Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.

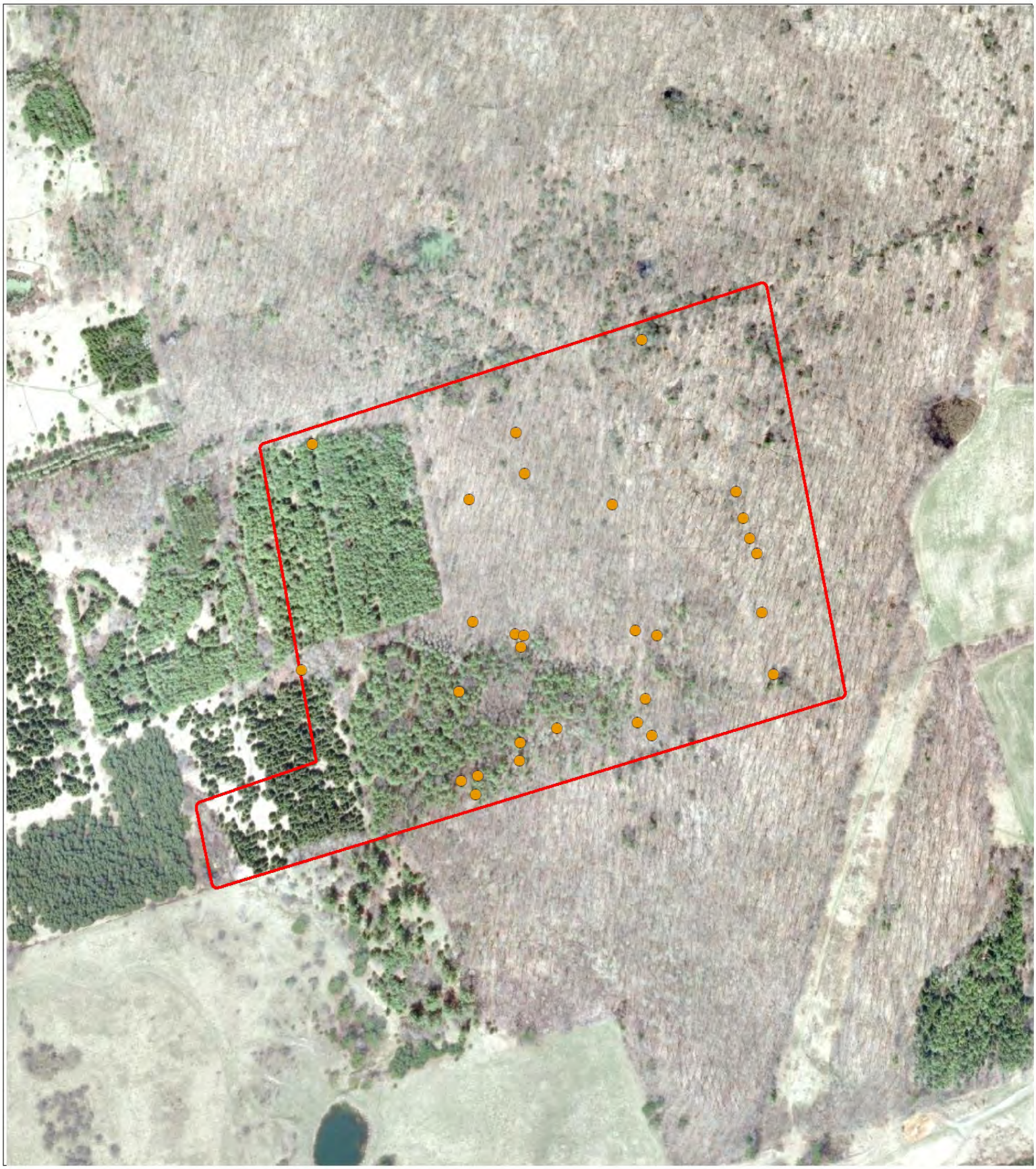
Map 10: Vegetation Communities with their Associated Local Ranks

Legend

Vegetation Community Ranks

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

Humber Source Woods Study Area



TORONTO AND REGION Conservation for The Living City

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0 25 50 100 150 200 Meters

Date: December
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 11: Location of Flora Species of Concern

Legend

Flora Species of Concern (L1-L4)

L1 L3

L2

Humber Source Woods 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

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: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 12: Flora Species Habitat Dependence Scores

Legend

Humber Source Woods Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 200 Meters

Date: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 13: Location of Fauna Species of Concern

Legend

Fauna Species of Concern: L1, L2, L3

Frog Species of Concern: L1, L2, L3

Humber Source Woods 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: December 2011
Orthophoto: Spring 2010, First Base Solutions Inc.

Map 14: Fauna Species Habitat Dependence Scores

Legend

- Humber Source Woods Study Area
- Fauna Species
- Frog Species

Appendix 1: List of Vegetation Communities Found in the Humber Source Woods Study Area

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Distrib.	Geophy. Requir.	Total Score	Local Rank (2002-01)
	Forest					
FOM2-A	Dry-Fresh White Pine - Hardwood Mixed Forest	3.9	3	1	4	L4
FOM3-2	Dry-Fresh Hemlock - Sugar Maple Mixed Forest	0.03	2	2	4	L4
FOM6-1	Fresh-Moist Sugar Maple - Hemlock Mixed Forest	0.2	2	2	4	L4
FOD3-1	Dry-Fresh Poplar Deciduous Forest	0.3	2	0	2	L5
FOD3-2	Dry-Fresh Paper Birch Deciduous Forest	0.03	2	1	3	L4
FOD5-2	Dry-Fresh Sugar Maple - Beech Deciduous Forest	0.02	1	0	1	L5
FOD5-8	Dry-Fresh Sugar Maple - White Ash Deciduous Forest	10.2	2	0	2	L5
FOD5-10	Dry-Fresh Sugar Maple - Paper Birch - Poplar Deciduous Forest	1.7	2	1	3	L4
CUP3-2	White Pine Coniferous Plantation	2.9	2	0	2	L5
CUP3-C	White Spruce Coniferous Plantation	1.4	2	0	2	L5
	Successional					
CUT1-A	Native Sapling Regeneration Thicket*	-	1	0	1	L5
CUS1-A2	White Pine Successional Savannah	0.02	4	1	5	L3
CUW1-A3	Native Deciduous Successional Woodland	0.13	2	0	2	L5
CUW1-b	Exotic Successional Woodland*	-	2	0	2	L+
	Wetland					
MAS2-9	Forb Mineral Shallow Marsh	0.003	2	1	3	L4
	Meadow					
CUM1-A	Native Forb Meadow	0.002	1	0	1	L5

** Community found solely as inclusion*

Appendix 2: List of Flora Species found at Humber Source Woods and Happy Valley Forest Complex

Scientific Name	Common Name	Local Occur. 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (03/2009)	HSW Only	Happy Valley Forest Complex		
								2011	1999	2008	2011
Conopholis americana	squaw-root	5	5	5	5	20	L1				x
Panicum latifolium	broad-leaved panic grass	5	5	5	4	19	L1			x	
Asclepias exaltata	poke milkweed	4	5	4	5	18	L2				x
Botrychium virginianum	rattlesnake fern	3	5	4	5	17	L2			x	
Huperzia lucidula	shining club-moss	3	5	5	5	18	L2				x
Lycopodium dendroidium	round-branched ground-pine	2	5	5	5	17	L2			x	
Osmunda claytoniana	interrupted fern	3	5	5	5	18	L2			x	
Pinus resinosa	red pine	2	5	5	5	17	L2				xp
Polygala paucifolia	fringed polygala	3	5	4	5	17	L2		x		
Quercus alba	white oak	3	5	4	5	17	L2			x	x
Adiantum pedatum	northern maidenhair fern	2	3	5	5	15	L3		x		
Anaphalis margaritacea	pearly everlasting	3	4	4	3	14	L3		x		x
Anemone acutiloba	sharp-lobed hepatica	2	4	4	5	15	L3	x	x		x
Aquilegia canadensis	wild columbine	2	4	3	5	14	L3		x		x
Aralia racemosa ssp. *racemosa*	spikenard	2	4	4	4	14	L3		x		
Aster urophyllus	arrow-leaved aster	3	3	4	4	14	L3		x		
Brachyelytrum erectum	bearded short-husk	3	5	3	4	15	L3				x
Carex albursina	white bear sedge	2	3	5	4	14	L3	x			x
Carex cephaloidea	thin-leaved sedge	3	3	5	3	14	L3				x
Carex cephalophora	oval-headed sedge	3	3	4	4	14	L3			x*	x
Carex crinita	fringed sedge	2	4	4	4	14	L3		x		x
Carex laxiculmis var. *laxiculmis*	spreading wood sedge	4	3	5	3	15	L3			x	
Carex platyphylla	broad-leaved sedge	3	4	4	3	14	L3			x	
Carex tuckermanii	Tuckerman's sedge	2	4	4	4	14	L3		x		
Caulophyllum thalictroides	blue cohosh	3	3	4	5	15	L3		x		
Celastrus scandens	American bittersweet	2	4	3	5	14	L3		x		
Ceratophyllum demersum	coontail	2	3	5	4	14	L3				x
Desmodium glutinosum	pointed-leaved tick-trefoil	3	4	4	5	16	L3	x	x		x
Epilobium angustifolium	fire-weed	3	4	4	4	15	L3		x		x
Galium circaezans	white wild licorice	4	4	4	3	15	L3		x		
Galium lanceolatum	wild licorice	4	5	4	3	16	L3				x
Galium trifidum var. *trifidum*	small bedstraw	4	4	4	3	15	L3		x		
Glyceria septentrionalis	eastern manna grass	2	3	5	4	14	L3		x		x
Gymnocarpium dryopteris	oak fern	2	3	5	5	15	L3	x		x	
Hamamelis virginiana	witch-hazel	2	4	4	4	14	L3	x	x	x	x
Lemna trisulca	star duckweed	2	4	5	3	14	L3				x
Lonicera canadensis	fly honeysuckle	2	4	4	4	14	L3	x	x	x	x
Lonicera dioica	wild honeysuckle	3	4	4	4	15	L3	x		x	x
Luzula acuminata	hairy wood rush	4	3	4	3	14	L3				x
Medeola virginiana	Indian cucumber-root	2	5	4	5	16	L3			x	
Mitchella repens	partridgeberry	2	4	4	5	15	L3	x	x		x
Mitella diphylla	mitrewort	2	3	4	5	14	L3			x	
Monotropa hypopithys	pinesap	2	4	5	5	16	L3		x		
Monotropa uniflora	Indian-pipe	2	4	5	5	16	L3				x
Oryzopsis asperifolia	white-fruited mountain-rice	2	4	4	5	15	L3	x	x	x	x
Osmunda cinnamomea	cinnamon fern	2	4	5	5	16	L3				x
Polystichum acrostichoides	Christmas fern	1	3	5	5	14	L3	x	x	x	x
Potamogeton natans	floating pondweed	2	4	5	3	14	L3				x
Pyrola elliptica	shinleaf	2	4	4	4	14	L3	x	x	x	x
Scirpus cyperinus	woolly bulrush	2	3	4	5	14	L3		x		x

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Sparganium emersum ssp. *emersum*	green-fruited bur-reed	2	3	5	4	14	L3				x
Spirodela polyrhiza	greater duckweed	2	4	5	3	14	L3				x
Streptopus roseus	rose twisted-stalk	2	4	4	5	15	L3	x	x	x	x
Trientalis borealis ssp. *borealis*	star-flower	2	4	4	5	15	L3	x	x	x	x
Uvularia grandiflora	large-flowered bellwort	1	4	5	5	15	L3		x		x
Viburnum acerifolium	maple-leaved viburnum	2	3	4	5	14	L3	x	x	x	x
Viola blanda	sweet white violet	3	4	4	3	14	L3			x	x
Viola rostrata	long-spurred violet	2	4	4	4	14	L3			x	x
Wolffia borealis	dotted water-meal	3	4	5	2	14	L3				x
Acer rubrum	red maple	2	4	1	5	12	L4	x	x	x	x
Acer saccharinum	silver maple	1	2	5	3	11	L4			x	
Actaea pachypoda	white baneberry	2	3	4	3	12	L4	x	x	x	x
Allium tricoccum	wild leek	1	3	4	4	12	L4				x
Apocynum androsaemifolium	spreading dogbane	2	3	2	4	11	L4	x		x	x
Aster macrophyllus	big-leaved aster	2	3	2	4	11	L4	x	x	x	x
Betula alleghaniensis	yellow birch	1	4	3	5	13	L4		x	x	x
Betula papyrifera	paper birch	1	4	2	4	11	L4	x	x	x	x
Boehmeria cylindrica	false nettle	2	4	4	3	13	L4		x		x
Cardamine diphylla	broad-leaved toothwort	2	3	4	4	13	L4				x
Cardamine x *maxima*	hybrid toothwort	3	3	3	3	12	L4				x
Carex arctata	nodding wood sedge	2	4	2	3	11	L4	x	x	x	x
Carex communis	fibrous-rooted sedge	2	4	3	3	12	L4			x	x
Carex deweyana	Dewey's sedge	2	4	3	3	12	L4			x	x
Carex intumescens	bladder sedge	2	4	4	2	12	L4			x	
Carex laxiflora	loose-flowered sedge	3	3	4	3	13	L4			x	x
Carex pedunculata	early-flowering sedge	2	3	3	3	11	L4	x	x	x	x
Carex pensylvanica	Pennsylvania sedge	2	4	3	4	13	L4	x	x	x	x
Carex projecta	necklace sedge	3	2	4	3	12	L4		x		
Carpinus caroliniana ssp. *virginiana*	blue beech	1	3	4	3	11	L4				x
Carya cordiformis	bitternut hickory	2	4	4	2	12	L4	x		x	x
Caulophyllum giganteum	long-styled blue cohosh	2	3	4	4	13	L4	x		x	x
Cornus rugosa	round-leaved dogwood	2	4	4	3	13	L4	x	x	x	
Corylus cornuta	beaked hazel	2	4	3	4	13	L4	x	x	x	x
Diervilla lonicera	bush honeysuckle	2	3	2	4	11	L4		x		x
Dryopteris intermedia	evergreen wood fern	2	4	4	3	13	L4	x	x	x	x
Dryopteris marginalis	marginal wood fern	2	3	3	4	12	L4		x		x
Dryopteris x *triploidea*	confusing hybrid wood fern	5	2	3	3	13	L4				x
Epifagus virginiana	beech-drops	2	3	5	2	12	L4		x		x
Epilobium coloratum	purple-leaved willow-herb	2	3	4	2	11	L4		xcf		
Fagus grandifolia	American beech	1	4	3	4	12	L4	x	x	x	x
Galium aparine	cleavers	3	3	4	2	12	L4			x	
Galium asprellum	rough bedstraw	3	2	4	2	11	L4		x		x
Geranium maculatum	wild geranium	3	3	4	3	13	L4				x
Lycopus uniflorus	northern water-horehound	2	3	3	3	11	L4				x
Maianthemum canadense	Canada May-flower	1	4	1	5	11	L4	x	x	x	x
Osmorhiza claytonii	woolly sweet cicely	2	3	4	3	12	L4		x		
Physalis heterophylla	clammy ground-cherry	3	2	3	3	11	L4		x		
Pinus strobus	white pine	1	4	3	4	12	L4	xpn	x	x	xpn
Polygonatum pubescens	downy Solomon's seal	2	4	2	5	13	L4	x	x	x	x
Polygonum pensylvanicum	Pennsylvania smartweed	3	2	4	3	12	L4		x		

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Populus grandidentata	large-toothed aspen	2	3	4	3	12	L4	x	x	x	x
Prunella vulgaris ssp. *lanceolata*	heal-all (native)	4	2	3	2	11	L4	x	x	x	
Pteridium aquilinum var. *latiusculum*	eastern bracken	2	4	2	4	12	L4	x	x	x	x
Quercus rubra	red oak	1	4	2	4	11	L4	x	x	x	x
Rorippa palustris ssp. *fernaldiana*	Fernald's marsh cress	3	2	4	2	11	L4		x		
Rosa blanda	smooth wild rose	2	3	3	4	12	L4		x		
Salix amygdaloides	peach-leaved willow	2	2	5	3	12	L4				x
Sium suave	water-parsnip	3	2	4	4	13	L4		x		x
Smilax hispida	bristly greenbrier	3	3	3	3	12	L4			x	
Solidago rugosa ssp. *rugosa*	rough-stemmed goldenrod	3	3	2	3	11	L4		x		
Thelypteris palustris var. *pubescens*	marsh fern	2	4	2	4	12	L4		x		
Tiarella cordifolia	foam-flower	1	3	3	4	11	L4			x	
Trillium erectum	red trillium	1	4	3	5	13	L4	x	x		x
Trillium grandiflorum	white trillium	1	3	4	5	13	L4	x	x	x	x
Tsuga canadensis	eastern hemlock	1	4	3	5	13	L4	x	x	x	x
Typha latifolia	broad-leaved cattail	1	4	4	4	13	L4				x
Waldsteinia fragarioides	barren strawberry	2	4	4	3	13	L4		x	x	x
Acer saccharum ssp. *saccharum*	sugar maple	1	3	0	2	6	L5	x	x		x
Achillea millefolium ssp. *lanulosum*	woolly yarrow	2	2	0	1	5	L5		x	x	
Actaea rubra	red baneberry	2	3	1	3	9	L5	x	x	x	x
Agrimonia gryposepala	agrimony	2	2	0	2	6	L5	x	x		x
Alisma plantago-aquatica	water-plantain	2	2	4	2	10	L5				x
Ambrosia artemisiifolia	common ragweed	2	1	3	0	6	L5				x
Amphicarpaea bracteata	hog-peanut	2	2	2	2	8	L5		x	x	x
Anemone virginiana	common thimbleweed	2	3	0	3	8	L5		x		
Aralia nudicaulis	wild sarsaparilla	2	3	1	4	10	L5	x	x	x	x
Arisaema triphyllum	Jack-in-the-pulpit	1	3	2	3	9	L5				x
Asclepias syriaca	common milkweed	2	2	0	2	6	L5	x	x		x
Aster cordifolius	heart-leaved aster	2	1	0	2	5	L5		x	x	
Aster lanceolatus ssp. *lanceolatus*	panicled aster	1	2	3	1	7	L5			x	
Aster lateriflorus var. *lateriflorus*	calico aster	2	2	3	2	9	L5		x		
Aster novae-angliae	New England aster	1	2	2	1	6	L5		x		
Aster puniceus var. *puniceus*	swamp aster	2	2	2	2	8	L5		x		
Athyrium filix-femina var. *angustum*	northeastern lady fern	2	3	1	3	9	L5			x	x
Bidens cernuus	nodding bur-marigold	2	2	3	3	10	L5		x		x
Calystegia sepium	hedge bindweed	3	2	3	2	10	L5			x	
Carex cristatella	crested sedge	2	2	4	1	9	L5				x
Carex granularis	meadow sedge	2	2	1	3	8	L5	x			
Carex radiata	straight-styled sedge	2	2	2	2	8	L5		x		
Carex rosea	curly-styled sedge	2	2	3	2	9	L5	x	x	x	x
Cicuta maculata	spotted water-hemlock	2	2	2	2	8	L5				x
Circaea lutetiana ssp. *canadensis*	enchanter's nightshade	2	1	1	1	5	L5	x	x	x	x
Clinopodium vulgare	wild basil	3	3	1	3	10	L5	x		x	
Cornus alternifolia	alternate-leaved dogwood	2	2	1	2	7	L5	x	x	x	x
Cryptotaenia canadensis	honewort	2	2	4	1	9	L5		x		
Dryopteris carthusiana	spinulose wood fern	2	3	2	2	9	L5		x	x	x
Echinocystis lobata	wild cucumber	2	2	3	1	8	L5		x		x
Eleocharis erythropoda	creeping spike-rush	2	2	4	1	9	L5		x		x
Epilobium ciliatum ssp. *ciliatum*	sticky willow-herb	2	2	2	2	8	L5				x
Equisetum arvense	field horsetail	1	2	1	1	5	L5		x	x	

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								2011	1999	2008	2011
Erigeron annuus	daisy fleabane	2	2	0	1	5	L5		x	x	x
Erigeron philadelphicus ssp. *philadelphicus*	Philadelphia fleabane	2	2	0	1	5	L5			x	
Erythronium americanum ssp. *americanum*	yellow trout-lily	2	3	3	2	10	L5	x		x	x
Euthamia graminifolia	grass-leaved goldenrod	2	1	4	1	8	L5		x		
Fragaria vesca ssp. *americana*	woodland strawberry	3	2	2	2	9	L5	x			x
Fragaria virginiana	wild strawberry	2	2	0	2	6	L5		x	x	x
Fraxinus americana	white ash	1	2	0	3	6	L5	x	x	x	x
Fraxinus pennsylvanica var. *pennsylvanica*	red ash	2	2	2	3	9	L5			x	
Galium triflorum	sweet-scented bedstraw	2	2	2	2	8	L5			x	x
Geum aleppicum	yellow avens	2	3	3	2	10	L5		x		
Geum canadense	white avens	2	2	1	2	7	L5			x	
Glyceria striata	fowl manna grass	2	2	1	2	7	L5		x		
Hackelia virginiana	Virginia stickseed	2	2	0	2	6	L5				x
Hydrophyllum virginianum	Virginia waterleaf	2	2	1	2	7	L5		x		x
Impatiens capensis	orange touch-me-not	1	2	0	2	5	L5		x		
Lemna minor	common duckweed	2	2	4	2	10	L5			x	x
Lysimachia ciliata	fringed loosestrife	2	2	2	2	8	L5	x	x		x
Maianthemum racemosum ssp. *racemosum*	false Solomon's seal	2	3	2	3	10	L5	x	x	x	x
Matteuccia struthiopteris var. *pensylvanica*	ostrich fern	1	2	2	2	7	L5	x			x
Onoclea sensibilis	sensitive fern	2	3	1	3	9	L5	x	x	x	x
Ostrya virginiana	ironwood	2	3	2	2	9	L5	x	x	x	x
Parthenocissus inserta	thicket creeper	1	2	0	1	4	L5	x	x	x	x
Phryma leptostachya	lopseed	2	2	3	2	9	L5		x		
Pilea pumila	dwarf clearweed	2	2	1	1	6	L5		x		
Podophyllum peltatum	May-apple	1	3	3	3	10	L5	x		x	x
Populus tremuloides	trembling aspen	1	3	1	3	8	L5	x	x	x	x
Prenanthes altissima	tall wood lettuce	2	3	2	2	9	L5	x		x	x
Prunus serotina	black cherry	2	2	0	2	6	L5	x	x	x	x
Prunus virginiana ssp. *virginiana*	choke cherry	1	2	0	1	4	L5	x	x	x	x
Ranunculus abortivus	kidney-leaved buttercup	2	3	1	2	8	L5	x	x	x	x
Rhus radicans ssp. *rydbergii*	poison ivy (shrub form)	2	2	0	2	6	L5		x		
Rhus typhina	staghorn sumach	2	1	2	2	7	L5		x		x
Ribes cynosbati	prickly gooseberry	2	3	2	2	9	L5	x	x	x	x
Rubus allegheniensis	common blackberry	2	3	0	1	6	L5	x	x	x	x
Rubus idaeus ssp. *melanolasius*	wild red raspberry	1	1	0	1	3	L5	x		x	x
Rubus occidentalis	wild black raspberry	2	1	0	1	4	L5	x	x		x
Rubus odoratus	purple-flowering raspberry	2	2	2	2	8	L5		x		x
Salix eriocephala	narrow heart-leaved willow	2	1	3	1	7	L5		x		
Sambucus racemosa ssp. *pubens*	red-berried elder	2	3	2	2	9	L5			x	x
Sanguinaria canadensis	bloodroot	2	3	0	3	8	L5	x	x	x	x
Scutellaria galericulata	common skullcap	3	2	3	2	10	L5			x	
Scutellaria lateriflora	mad-dog skullcap	2	2	3	3	10	L5		x		
Smilax herbacea	carrion-flower	3	3	2	2	10	L5		x	x	x
Solidago altissima	tall goldenrod	1	2	0	0	3	L5		x	x	x
Solidago caesia	blue-stemmed goldenrod	2	2	4	2	10	L5	x	x	x	x
Solidago canadensis var. *canadensis*	Canada goldenrod	2	2	0	1	5	L5		x		x
Solidago flexicaulis	zig-zag goldenrod	2	1	3	2	8	L5	x	x	x	x
Thalictrum dioicum	early meadow rue	2	3	3	2	10	L5		x	x	x
Thalictrum pubescens	tall meadow rue	2	3	2	2	9	L5		x		
Tilia americana	basswood	1	4	2	3	10	L5	x	x	x	x

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Ulmus americana	white elm	1	4	0	2	7	L5	x	x	x	x
Urtica dioica ssp. *gracilis*	American stinging nettle	2	3	2	2	9	L5				x
Viburnum lentago	nannyberry	2	3	1	2	8	L5		x		
Viola conspersa	dog violet	2	2	0	2	6	L5	x	xcf		x
Viola pubescens	stemmed yellow violet	2	3	1	2	8	L5	x		x	x
Viola sororia	common blue violet	2	2	0	2	6	L5		x	x	x
Vitis riparia	riverbank grape	1	1	0	0	2	L5	x	x	x	x
Xanthium strumarium	clotbur	3	1	4	0	8	L5				x
Actaea x *ludovici*	hybrid baneberry	5	0	5	0	10	LH		x		
Crataegus monogyna	English hawthorn	3	1	4	0	8	L+				x
Acer negundo	Manitoba maple	2	0	0	2	4	L+?				x
Geranium robertianum	herb Robert	3				3	L+?		x	x	x
Phalaris arundinacea	reed canary grass	3				3	L+?				x
Agrostis gigantea	redtop	3				3	L+				x
Alliaria petiolata	garlic mustard	2				2	L+				x
Arctium minus ssp. *minus*	common burdock	3				3	L+		x	x	
Bromus inermis ssp. *inermis*	smooth brome grass	3				3	L+			x	x
Celastrus orbiculatus	oriental bittersweet	4				4	L+	x			x
Chrysanthemum leucanthemum	ox-eye daisy	3				3	L+			x	
Cirsium arvense	creeping thistle	2				2	L+			x	
Cirsium vulgare	bull thistle	3				3	L+				x
Cynanchum rossicum	dog-strangling vine	3				3	L+	x		x	x
Dactylis glomerata	orchard grass	3				3	L+		x		x
Daucus carota	Queen Anne's lace	3				3	L+				x
Elymus repens	quack grass	3				3	L+				x
Epilobium parviflorum	small-flowered willow-herb	4				4	L+				x
Epipactis helleborine	helleborine	3				3	L+	x	x	x	x
Festuca pratensis	meadow fescue	3				3	L+		x		x
Galeopsis tetrahit	hemp-nettle	4				4	L+				x
Geum urbanum	urban avens	3				3	L+				x
Hieracium caespitosum ssp. *caespitosum*	yellow hawkweed	3				3	L+			x	
Hordeum jubatum ssp. *jubatum*	squirrel-tail barley	4				4	L+				x
Hypericum perforatum	common St. Johnswort	3				3	L+			x	
Impatiens glandulifera	Himalayan balsam	5				5	L+				x
Lapsana communis	nipplewort	5				5	L+				x
Leonurus cardiaca ssp. *cardiaca*	motherwort	3				3	L+		x		x
Ligustrum vulgare	privet	5				5	L+	x			
Linaria vulgaris	butter-and-eggs	3				3	L+			x	
Lonicera x *bella*	shrub honeysuckle	3				3	L+	x		x	
Lotus corniculatus	bird's foot trefoil	3				3	L+				x
Malus pumila	apple	2				2	L+			x	x
Melilotus alba	white sweet clover	3				3	L+				x
Phleum pratense	Timothy grass	3				3	L+				x
Poa pratensis ssp. *pratensis*	Kentucky blue grass	3				3	L+			x	x
Potamogeton crispus	curly pondweed	4				4	L+				x
Potentilla recta	sulphur cinquefoil	3				3	L+		x	x	x
Ranunculus acris	tall buttercup	3				3	L+			x	
Rhamnus cathartica	common buckthorn	2				2	L+	x			x
Ribes rubrum	garden red currant	3				3	L+		x		
Rosa multiflora	multiflora rose	3				3	L+		x		xcf

Appendix 2: List of Flora Species found at Humber Source Woods and Happy Valley Forest Complex

Scientific Name	Common Name	Local Occur. 1-5	Popn. Trend 1-5	Hab. Dep. 0-5	Sens. Dev. 0-5	Total Score 2-20	Rank TRCA (03/2009)	HSW Only 2011	Happy Valley Forest Complex 1999	2008	2011
Salix x *rubens*	European tree willow	3				3	L+				x
Salix x *sepulcralis*	weeping willow	4				4	L+				x
Solanum dulcamara	bittersweet nightshade	3				3	L+	x	x	x	
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	5				5	L+				x
Taraxacum officinale	dandelion	3				3	L+	x		x	x
Tragopogon dubius	lemon-yellow goat's beard	3				3	L+			x	
Typha angustifolia	narrow-leaved cattail	3				3	L+		x		
Veronica officinalis	common speedwell	3				3	L+	x	x	x	x
Veronica serpyllifolia ssp. *serpyllifolia*	thyme-leaved speedwell	5				5	L+			x	
Viburnum opulus	European highbush cranberry	3				3	L+	x	x	x	
Vicia cracca	cow vetch	3				3	L+		x	x	x
Picea glauca	white spruce	1	5	4	4	14	pL3	xp	xp	xp	xp

** record found within the boundaries of HSW*

Humber Source Woods Survey (2008, & 2011)

total number of species	87	
planted species	1	1%
naturally-occurring	86	99%
native (not planted)	76	87%
exotic (not planted)	10	11%
L1-L3 species (not planted)* *includes LU, and LH*	15	17%

Appendix 3: Fauna list for Humber Source Woods by year.

Common Name	Scientific Name	count				L-Rank
		(1999)	2008	2011	combined	
Survey Species: species for which the TRCA protocol effectively surveys.						
Birds						
broad-winged hawk	*Buteo platypterus*		1		1	**L2**
ruffed grouse	*Bonasa umbellus*		1		1	**L2**
Acadian flycatcher	*Empidonax virescens*	(1)				**L3**
blue-headed vireo	*Vireo solitarius*		1		1	**L3**
black-throated blue warbler	*Dendroica caerulescens*		1		1	**L3**
black-throated green warbler	*Dendroica virens*		3	2	4	**L3**
brown creeper	*Certhia americana*			1	1	**L3**
chestnut-sided warbler	*Dendroica pensylvanica*			1	1	**L3**
mourning warbler	*Oporornis philadelphia*	(1)		1	1	**L3**
ovenbird	*Seiurus aurocapillus*	(2)	1	5	5	**L3**
pileated woodpecker	*Dryocopus pileatus*			1	1	**L3**
pine warbler	*Dendroica pinus*		1	1	2	**L3**
scarlet tanager	*Piranga olivacea*	(1)		3	3	**L3**
veery	*Catharus fuscescens*	(1)		1	1	**L3**
wood thrush	*Hylocichla mustelina*	(2)	1	6	6	**L3**
common yellowthroat	*Geothlypis trichas*			x	x	**L4**
eastern wood-pewee	*Contopus virens*			x	x	**L4**
great-crested flycatcher	*Myiarchus crinitus*			x	x	**L4**
hairy woodpecker	*Picoides villosus*			x	x	**L4**
indigo bunting	*Passerina cyanea*			x	x	**L4**
northern flicker	*Colaptes auratus*			x	x	**L4**
red-breasted nuthatch	*Sitta canadensis*			x	x	**L4**
red-eyed vireo	*Vireo olivaceus*			x	x	**L4**
rose-breasted grosbeak	*Pheucticus ludovicianus*			x	x	**L4**
ruby-throated hummingbird	*Archilochus colubris*			x	x	**L4**
white-breasted nuthatch	*Sitta carolinensis*			x	x	**L4**
wood duck	*Aix sponsa*			1	1	**L4**
American Crow	*Corvus brachyrhynchos*			x	x	**L5**
American goldfinch	*Carduelis tristis*			x	x	**L5**
American robin	*Turdus migratorius*			x	x	**L5**
black-capped chickadee	*Parus atricapillus*			x	x	**L5**

Appendix 3: Fauna list for Humber Source Woods by year.

Common Name	Scientific Name	count				L-Rank
		(1999)	2008	2011	combined	
blue jay	*Cyanocitta cristata*			x	x	**L5**
brown-headed cowbird	*Molothrus ater*			x	x	**L5**
cedar waxwing	*Bombycilla cedrorum*			x	x	**L5**
chipping sparrow	*Spizella passerina*			x	x	**L5**
downy woodpecker	*Picoides pubescens*			x	x	**L5**
house wren	*Troglodytes aedon*			x	x	**L5**
northern cardinal	*Cardinalis cardinalis*			x	x	**L5**
red-winged blackbird	*Agelaius phoeniceus*			x	x	**L5**
song sparrow	*Melospiza melodia*			x	x	**L5**
Herpetofauna						
grey treefrog	*Hyla versicolor*			1	1	**L2**
northern spring peeper	*Pseudacris crucifer crucifer*	(1)				**L2**
Incidental Species: **species that are reported on as incidental to the TRCA protocol.**						
Mammals						
eastern chipmunk	*Tamias striatus*			x	x	**L4**
red squirrel	*Tamiasciurus hudsonicus*			x	x	**L4**
white-tailed deer	*Odocoileus virginianus*			x	x	**L4**
Herpetofauna						
eastern newt	*Notophthalmus viridescens viridescens*			1	1	**L2**
eastern red-backed salamander	*Plethodon cinereus*			2	2	**L3**
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, 2010					
( ) = record not included in total since occurs before decade threshold						
Note that since the TRCA data protocol for fauna records stipulates a ten year						
threshold, the 1999 records are not included in the final count.						

Appendix 4: Fauna occurences by year at Happy Valley (not including the Humber Source Woods parcel).

Common Name	Scientific Name	count								L-Rank
		1999	2001	2004	2005	2008	2010	2011	combined	
Survey Species: species for which the TRCA protocol effectively surveys.										
Birds										
blue-winged warbler	*Vermivora pinus*							1	1	**L2**
ruffed grouse	*Bonasa umbellus*					1		1	1	**L2**
Acadian flycatcher	*Empidonax virescens*							1	1	**L3**
American woodcock	*Scolopax minor*			1	1					**L3**
black-throated blue warbler	*Dendroica caerulescens*					1		1	1	**L3**
brown creeper	*Certhia americana*	(2)						1	1	**L3**
chestnut-sided warbler	*Dendroica pensylvanica*		(1)					1	1	**L3**
hooded warbler	*Wilsonia citrina*					1			1	**L3**
magnolia warbler	*Dendroica magnolia*		(3)							**L3**
mourning warbler	*Oporornis philadelphia*							1	1	**L3**
ovenbird	*Seiurus aurocapillus*	(2)	(1)			4		8	9	**L3**
pileated woodpecker	*Dryocopus pileatus*					1		1	1	**L3**
pine warbler	*Dendroica pinus*	(1)				2		1	2	**L3**
scarlet tanager	*Piranga olivacea*	(1)				3		2	4	**L3**
veery	*Catharus fuscescens*							2	2	**L3**
winter wren	*Troglodytes troglodytes*	(1)				1		1	1	**L3**
wood thrush	*Hylocichla mustelina*	(2)	(2)			2		6	8	**L3**
yellow-bellied sapsucker	*Sphyrapicus varius*	(1)	(1)					6	7	**L3**
yellow-billed cuckoo	*Coccyzus americanus*								1	**L3**
yellow-throated vireo	*Vireo flavifrons*	(1)								**L3**
common yellowthroat	*Geothlypis trichas*							x	x	**L4**
eastern kingbird	*Tyrannus tyrannus*							x	x	**L4**
eastern meadowlark	*Sturnella magna*							x	x	**L4**
eastern screech-owl	*Otus asio*					1			1	**L4**
eastern wood-pewee	*Contopus virens*							x	x	**L4**
field sparrow	*Spizella pusilla*					x		x	x	**L4**
great-crested flycatcher	*Myiarchus crinitus*							x	x	**L4**
hairy woodpecker	*Picoides villosus*	(x)						x	x	**L4**
indigo bunting	*Passerina cyanea*							x	x	**L4**
least flycatcher	*Empidonax minimus*					1			1	**L4**
northern flicker	*Colaptes auratus*							x	x	**L4**

Appendix 4: Fauna occurences by year at Happy Valley (not including the Humber Source Woods parcel).

Common Name	Scientific Name	count								L-Rank
		1999	2001	2004	2005	2008	2010	2011	combined	
red-bellied woodpecker	*Melanerpes carolinus*					1			1	**L4**
red-breasted nuthatch	*Sitta canadensis*							x	x	**L4**
red-eyed vireo	*Vireo olivaceus*							x	x	**L4**
rose-breasted grosbeak	*Pheucticus ludovicianus*							x	x	**L4**
ruby-throated hummingbird	*Archilochus colubris*							1	1	**L4**
savannah sparrow	*Passerculus sandwichensis*							x	x	**L4**
turkey vulture	*Cathartes aura*							x	x	**L4**
white-breasted nuthatch	*Sitta carolinensis*							x	x	**L4**
American Crow	*Corvus brachyrhynchos*							x	x	**L5**
American goldfinch	*Carduelis tristis*							x	x	**L5**
American robin	*Turdus migratorius*							x	x	**L5**
Baltimore oriole	*Icterus galbula*							x	x	**L5**
black-capped chickadee	*Parus atricapillus*							x	x	**L5**
blue jay	*Cyanocitta cristata*							x	x	**L5**
cedar waxwing	*Bombycilla cedrorum*							x	x	**L5**
chipping sparrow	*Spizella passerina*							x	x	**L5**
downy woodpecker	*Picoides pubescens*							x	x	**L5**
house wren	*Troglodytes aedon*							x	x	**L5**
northern cardinal	*Cardinalis cardinalis*							x	x	**L5**
red-tailed hawk	*Buteo jamaicensis*							x	x	**L5**
red-winged blackbird	*Agelaius phoeniceus*							x	x	**L5**
song sparrow	*Melospiza melodia*							x	x	**L5**
Herpetofauna										
striped chorus frog	*Pseudacris triseriata*	(2)								**L2**
northern spring peeper	*Pseudacris crucifer crucifer*	(1)	(1)	1		2		2	4	**L2**
grey treefrog	*Hyla versicolor*					1			1	**L2**
wood frog	*Rana sylvatica*		(1)			3		1	4	**L2**
eastern red-backed salamander	*Plethodon cinereus*					1			1	**L3**
Incidental Species: **species that are reported on as incidental to the TRCA protocol.**										
Mammals										
porcupine	*Erethizon dorsatum*			1		1			2	**L2**

Appendix 4: Fauna occurences by year at Happy Valley (not including the Humber Source Woods parcel).

Common Name	Scientific Name	count								L-Rank
		1999	2001	2004	2005	2008	**2010**	**2011**	**combined**	
eastern chipmunk	*Tamias striatus*							x	x	**L4**
red squirrel	*Tamiasciurus hudsonicus*							x	x	**L4**
white-tailed deer	*Odocoileus virginianus*							x	x	**L4**
coyote	*Canis latrans*							x	x	**L5**
grey squirrel	*Sciurus carolinensis*							x	x	**L5**
Herpetofauna										
Jefferson salamander complex	*Ambystoma jeffersonianum* complex				5				5	**L1**
yellow-spotted salamander	*Ambystoma maculatum*					1			1	**L1**
eastern newt	*Notophthalmus viridescens viridescens*			1				3	4	**L2**
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, 2010								
( ) = record not included in total since occurs before decade threshold										
Note that since the TRCA data protocol for fauna records stipulates a ten year										
threshold, the 1999 and 2001 records are not included in the final count.										

Appendix 5: TRCA Scores and Ranks for Fauna Species Occurring at Happy Valley including HSW.

Common Name	Code	Scientific Name	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Survey Species: species for which the TRCA protocol effectively surveys.												
Birds												
blue-winged warbler	BWWA	*Vermivora pinus*	3	3	2	3	1	2	5	1	20	**L2**
broad-winged hawk	BWHA	*Buteo platypterus*	3	2	3	5	1	4	3	1	22	**L2**
ruffed grouse	RUGR	*Bonasa umbellus*	1	3	3	3	2	2	5	1	20	**L2**
Acadian flycatcher	ACFL	*Empidonax virescens*	4	2	2	3	1	2	3	0	17	**L3**
American woodcock	AMWO	*Scolopax minor*	0	2	3	3	2	2	4	0	16	**L3**
black-billed cuckoo	BBCU	*Coccyzus erythropthalmus*	0	3	2	3	1	3	3	0	15	**L3**
black-throated blue warbler	BTBW	*Dendroica caerulescens*	3	2	2	3	1	3	4	0	18	**L3**
black-throated green warbler	BTNW	*Dendroica virens*	1	4	2	3	1	3	4	0	18	**L3**
blue-headed vireo	BHVI	*Vireo solitarius*	3	2	2	3	1	2	3	0	16	**L3**
bobolink	BOBO	*Dolichonyx oryzivorus*	0	3	3	3	1	1	5	1	17	**L3**
brown creeper	BRCR	*Certhia americana*	1	2	2	3	2	2	4	0	16	**L3**
chestnut-sided warbler	CSWA	*Dendroica pensylvanica*	2	2	2	3	1	1	4	0	15	**L3**
hooded warbler	HOWA	*Wilsonia citrina*	3	1	1	4	1	3	5	1	19	**L3**
magnolia warbler	MAWA	*Dendroica magnolia*	4	2	2	2	1	3	3	0	17	**L3**
mourning warbler	MOWA	*Oporornis philadelphia*	0	3	2	2	2	2	4	0	15	**L3**
ovenbird	OVEN	*Seiurus aurocapillus*	0	2	3	4	2	4	4	0	19	**L3**
pileated woodpecker	PIWO	*Dryocopus pileatus*	0	2	2	4	1	3	3	0	15	**L3**
pine warbler	PIWA	*Dendroica pinus*	0	2	2	4	1	3	3	0	15	**L3**
scarlet tanager	SCTA	*Piranga olivacea*	0	2	2	4	1	3	4	0	16	**L3**
veery	VEER	*Catharus fuscescens*	1	3	2	3	1	2	5	1	18	**L3**
winter wren	WIWR	*Troglodytes troglodytes*	1	2	2	3	2	3	5	1	19	**L3**
wood thrush	WOTH	*Hylocichla mustelina*	0	3	2	3	2	2	4	0	16	**L3**
yellow-bellied sapsucker	YBSA	*Sphyrapicus varius*	3	2	2	2	1	3	3	0	16	**L3**
yellow-billed cuckoo	YBCU	*Coccyzus americanus*	1	3	2	3	1	3	3	0	16	**L3**
yellow-throated vireo	YTVI	*Vireo flavifrons*	4	2	2	3	1	1	4	0	17	**L3**
barn swallow	BARS	*Hirundo rustica*	0	2	3	1	1	2	1	0	10	**L4**
common yellowthroat	COYE	*Geothlypis trichas*	0	2	2	1	2	1	4	0	12	**L4**
eastern kingbird	EAKI	*Tyrannus tyrannus*	0	4	2	2	1	1	3	0	13	**L4**
eastern meadowlark	EAME	*Sturnella magna*	0	3	2	3	1	1	3	0	13	**L4**
eastern screech-owl	EASO	*Otus asio*	0	2	2	1	2	3	3	0	13	**L4**
eastern wood-pewee	EAWP	*Contopus virens*	0	4	2	2	1	1	3	0	13	**L4**
field sparrow	FISP	*Spizella pusilla*	0	3	2	2	1	1	4	0	13	**L4**
great-crested flycatcher	GCFL	*Myiarchus crinitus*	0	2	2	3	1	2	2	0	12	**L4**

Appendix 5: TRCA Scores and Ranks for Fauna Species Occurring at Happy Valley including HSW.

Common Name	Code	Scientific Name	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
hairy woodpecker	HAWO	*Picoides villosus*	0	2	2	3	1	2	2	0	12	**L4**
indigo bunting	INBU	*Passerina cyanea*	0	2	2	1	1	2	4	0	12	**L4**
least flycatcher	LEFL	*Empidonax minimus*	0	4	2	2	1	1	3	0	13	**L4**
northern flicker	NOFL	*Colaptes auratus*	0	3	2	1	1	2	3	0	12	**L4**
red-bellied woodpecker	RBWO	*Melanerpes carolinus*	4	1	2	2	1	1	2	0	13	**L4**
red-breasted nuthatch	RBNU	*Sitta canadensis*	0	1	2	3	1	1	2	0	10	**L4**
red-eyed vireo	REVI	*Vireo olivaceus*	0	2	2	2	1	1	3	0	11	**L4**
rose-breasted grosbeak	RBGR	*Pheucticus ludovicianus*	0	2	2	3	1	2	3	0	13	**L4**
ruby-throated hummingbird	RTHU	*Archilochus colubris*	0	2	2	1	1	2	2	0	10	**L4**
savannah sparrow	SAVS	*Passerculus sandwichensis*	0	3	2	1	1	1	4	0	12	**L4**
turkey vulture	TUVU	*Cathartes aura*	3	1	1	1	1	2	1	0	10	**L4**
white-breasted nuthatch	WBNU	*Sitta carolinensis*	0	2	2	3	1	2	2	0	12	**L4**
wood duck	WODU	*Aix sponsa*	0	2	1	3	2	2	4	0	14	**L4**
American Crow	AMCR	*Corvus brachyrhynchos*	0	1	2	1	1	0	0	0	5	**L5**
American goldfinch	AMGO	*Carduelis tristis*	0	2	2	1	1	0	1	0	7	**L5**
American robin	AMRO	*Turdus migratorius*	0	1	2	1	1	0	1	0	6	**L5**
Baltimore oriole	BAOR	*Icterus galbula*	0	2	2	1	1	0	1	0	7	**L5**
black-capped chickadee	BCCH	*Parus atricapillus*	0	1	2	1	1	0	1	0	6	**L5**
blue jay	BLJA	*Cyanocitta cristata*	0	4	2	1	1	0	1	0	9	**L5**
brown-headed cowbird	BHCO	*Molothrus ater*	0	2	2	1	1	0	1	0	7	**L5**
cedar waxwing	CEDW	*Bombycilla cedrorum*	0	1	2	1	1	0	1	0	6	**L5**
chipping sparrow	CHSP	*Spizella passerina*	0	2	2	1	1	0	2	0	8	**L5**
downy woodpecker	DOWO	*Picoides pubescens*	0	3	2	1	1	1	1	0	9	**L5**
house wren	HOWR	*Troglodytes aedon*	0	2	2	1	2	1	1	0	9	**L5**
northern cardinal	NOCA	*Cardinalis cardinalis*	0	2	2	1	1	1	2	0	9	**L5**
red-tailed hawk	RTHA	*Buteo jamaicensis*	0	2	2	2	1	1	1	0	9	**L5**
red-winged blackbird	RWBL	*Agelaius phoeniceus*	0	2	2	1	1	0	2	0	8	**L5**
song sparrow	SOSP	*Melospiza melodia*	0	2	2	1	2	0	2	0	9	**L5**
Herpetofauna												
striped chorus frog	MICF	*Pseudacris triseriata*	3	3	3	2	4	3	5	1	24	**L2**
grey treefrog	TGTF	*Hyla versicolor*	0	3	3	3	4	2	5	1	21	**L2**
northern spring peeper	SPPE	*Pseudacris crucifer crucifer*	0	2	3	3	4	3	5	1	21	**L2**
wood frog	WOFR	*Rana sylvatica*	0	2	3	3	4	3	5	1	21	**L2**
eastern red-backed salamander	RBSA	*Plethodon cinereus*	1	2	2	1	4	3	4	0	17	**L3**

Appendix 5: TRCA Scores and Ranks for Fauna Species Occurring at Happy Valley including HSW.

Common Name	Code	Scientific Name	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Incidental Species: **species that are reported on as incidental to the TRCA protocol.**												
Mammals												
porcupine	PORC	*Erethizon dorsatum*	3	2	2	4	4	3	3	0	21	**L2**
eastern chipmunk	EACH	*Tamias striatus*	0	2	2	2	3	1	3	0	13	**L4**
red squirrel	RESQ	*Tamiasciurus hudsonicus*	0	2	2	1	3	1	2	0	11	**L4**
white-tailed deer	WTDE	*Odocoileus virginianus*	0	2	1	3	2	2	1	0	11	**L4**
coyote	COYO	*Canis latrans*	0	2	2	1	3	0	1	0	9	**L5**
grey squirrel	GRSQ	*Sciurus carolinensis*	0	2	2	1	3	0	0	0	8	**L5**
Herpetofauna												
Jefferson salamander complex	JESA	*Ambystoma jeffersonianum* complex	4	3	3	3	5	5	5	3	31	**L1**
yellow-spotted salamander	YSSA	*Ambystoma maculatum*	3	3	3	3	5	4	5	2	28	**L1**
eastern newt	EANE	*Notophthalmus viridescens viridescens*	3	2	2	3	4	3	5	1	23	**L2**
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, 2010										