



Teston-Pine Valley

Terrestrial Biological Inventory and Assessment

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TORONTO AND REGION Conservation for The Living City

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1.0 Introduction

The Toronto and Region Conservation Authority (TRCA) conducted a flora and fauna inventory of a parcel of land at the northwest corner of Teston Road and Pine Valley Drive, City of Vaughan (henceforth referred to as 'Teston-Pine Valley') in 2009. As shown in Maps 1 and 2, the area is located in the East Humber watershed, on the tableland north of Purpleville Creek. Aside from incidental fauna observations by TRCA in 2003, there are no other known biological surveys. However, one of the several landowners in the study area has taken a long-term interest in the local ecology and provided some background history of the site.

The purpose of the 2009 survey was to provide to TRCA planners *an assessment of natural features that may be affected by proposed road widening and/or realignment of Teston Road*, which forms the south border of the study area. In addition, recommendations are provided to minimize potential impacts and to protect the ecological integrity of the site.

In order to achieve this assessment and to provide a solid basis for recommendations, TRCA conducted detailed a biological inventory to *characterize the terrestrial natural features of the Teston-Pine Valley site*. These features can then be understood within the larger regional context through the Terrestrial Natural Heritage Program of the TRCA. Inventory work addresses the question "*How does the area surveyed at Teston-Pine Valley fit within the regional and watershed natural system, and how should its contribution to this system be protected and maximized?"* The important message presented by this question is that the health of the natural system is measured at the regional scale and specific sites must be considered together for their benefits at all scales, from the site to the larger system. Individual sites should not be considered in isolation.

1.1 The Terrestrial Natural Heritage Program

Rapid urban expansion in the TRCA jurisdiction has led to continuous and incremental loss of natural cover and species. In a landscape that probably supported 95% forest cover prior to European settlement, current (i.e. 2002) mapping shows that only 17% forest and wetland cover remains. Agricultural and natural lands are increasingly being urbanized while species continue to disappear. This represents a substantial loss of ecological integrity and ecosystem function that will be exacerbated in the future according to current urbanization trends. The loss of natural cover results in diminished proportions of various natural vegetation communities and reduced populations of native species. Additional 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 that have been made outside of the context of the natural system as a whole.**

In the late 1990s the TRCA initiated the TNH Program to address the loss of terrestrial biodiversity within the nine watersheds that compose its jurisdiction. This work is based on two landscape-level indicators: the quality distribution of natural cover and the quantity of natural cover. These indicators summarize changes that occurred to the historical natural system. The aim of the program is to create a conservation strategy that both protects elements of the natural system (vegetation communities, flora and fauna species) *before* they become rare and to promote greater ecological function of the natural system as a whole. This preventive approach is needed because by the time a vegetation community or species has become rare, irreversible damage has often already occurred. A healthy natural system capable of supporting regional biodiversity in the long term is the goal of the Terrestrial Natural Heritage Systems Strategy (TNHSS) by setting targets – both short and long-term (100 years) – for the two landscape indicators in order to provide direction in planning at all scales (TRCA 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 study area covers 18.57 hectares, incorporating both public (TRCA-owned) and private lands. The TRCA property constitutes a 4.1 hectare section forming a band that runs east to west across the centre of the site,

The site situated on the north-west corner of the junction between Teston Road and Pine Valley Drive, in the City of Vaughan, lies within the Great Lakes – St. Lawrence floristic region, composed of mixed coniferous-deciduous forest. Physiographically, the study area is on the south slope of the Oak Ridges Moraine, in an area where the surficial geology is characterised by the clayey silt of the glacial deposits (till). Soils are characterized as Cashel clay, King clay loam, and Monoghan clay loam (Hoffman and Richards 1955). The topography is flat with a few depressions containing small wetlands. According to one of the landowners who has had a long-term interest in the area's ecology, most of the site, including forest areas was pastured under cattle until 1966 before becoming a series of large rural estates with more natural cover (open pasture becoming meadow and successional habitat with some young plantation), and small manicured areas.

3.0 Inventory Methodology

A biological inventory of Teston-Pine Valley 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 and field data collection (TRCA 2007c, TRCA 2007d). Habitat patch mapping was excerpted from the regional 2002 mapping of broadly-defined patch categories (forest, wetland, meadow and coastal) and digitized using ArcView GIS software.

3.1 Landscape Analysis

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

Base Mapping

The first step in evaluating a natural system or an individual *habitat patch* is to interpret and map land cover using aerial photographs. The basic unit for the evaluation at all scales is the habitat patch in the region, which are then combined and evaluated as a system at any scale. A *habitat patch* is a continuous piece of habitat, as determined from aerial photo interpretation. The TRCA maps habitat according to four broad categories: *forest, wetland, meadow*, and *coastal* (beach, dune, or bluff). At the regional level, the TRCA jurisdiction is made up of thousands of habitat patches. This mapping of habitat patches in broad categories is conducted through remote–sensing and is used in the evaluation of quality, distribution and quantity of natural cover. It should not be confused with the more detailed mapping of vegetation communities obtained through field surveys and that is used to ground-truth the evaluation (see Section 3.3).

Quality Distribution of Natural Cover

The quality of each habitat patch is evaluated according to three criteria: *size* (the number of hectares occupied by the patch), *shape* (edge-to-area ratio), and *matrix influence* (measure of the positive and negative impacts from surrounding land use) (TRCA 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 three to 15 points. Of these L-ranks, L1 represents the highest quality habitat and L5 the poorest.

Species presence or absence correlates to habitat patch quality (size, shape and matrix influence) (Kilgour 2003). The quality target is based on attaining a quality of habitat patch throughout the natural system that would support in the very long term a broad range of biodiversity, more specifically a quality that would support the region's fauna Species of Conservation Concern (Table 1).

Table 1: Habitat patch quality, rank and species response

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

In addition to the three criteria that make up the total habitat patch score, another important measure to consider in assessing habitat patch quality is forest interior, i.e. the amount of forest habitat that is greater than 100 meters from the edge of the forest patch, using 100 meter increments. A recognized distance for deep interior conditions occurs at 400 meters from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

Quantity

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

3.2 Ranking and Scoring Communities and Species

While the targets for the natural heritage system are derived from regional-scale information, the ground-truthing surveys at the site level provide important information that can be used in conjunction with the targets to plan decisions at the site level. A key component of the ground-truthing surveys is the scoring and ranking of vegetation communities and flora and fauna species to generate local "L" ranks (L1 to L5). Ranks are subject to annual review (TRCA 2010). These roughly correspond to the habitat patch ranks. For example, a species ranked L4 may be expected in habitat patches with a quality of L4 or better.

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

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

3.3 Field Work

Vegetation communities and flora species were surveyed concurrently. Botanical field-work for the site was conducted in 2009 (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 species of concern (species ranked L1 to L3) were mapped as point data with approximate number of individuals seen.

Fauna data were collected by the TRCA in April, June and July. The spring survey searched primarily for frog species of regional concern but recorded incidentally the presence of any early-spring nocturnal bird species (owls and American woodcocks, *Scolopax minor*). The summer surveys were concerned primarily with the mapping of breeding bird species of regional concern. Songbirds are surveyed in June/July in order to obtain breeding bird data and to exclude migrants. The methodology for identifying confirmed and possible breeding birds follows Cadman *et al*. (2007). Fauna species of regional concern (species ranked L1 to L3) were mapped as point data with each point representing a possible breeding bird.

Table 2: Schedule of the TRCA biological surveys at Teston – Pine Valley

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2002 ortho-photos	21 hours
Vegetation Communities and Flora Species	7th and 28th May; 11th June, 1st Sep 2009	14 hours
Frogs and Nocturnal Spring Birds	14th April and 20th May, 2009	1 hour
Breeding Songbirds	4thJune and 2ndJuly, 2009	2 hours

4.0 Results and Discussion

Information pertaining to Teston-Pine Valley 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

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

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% of the surface area of the jurisdiction (Map 3). 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 (see Map 4). The regional picture, being the result of a long history of land use changes, confirms that **all** site-based decisions contribute to the condition of a region.

4.2 Habitat Patch Findings for Teston-Pine Valley

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

4.2.1 Quality Distribution of Natural Cover

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

Habitat Patch Size and Shape

For forest and meadow habitat types, the upper threshold for a "poor" patch size is 10 ha and the lower threshold is set at 2 ha. At Teston-Pine Valley, all of the habitat patches receive a "poor" score for patch size meaning that they score two out of a possible five points, and that none of the patches fall outside of these size thresholds (Map 5).

The forest habitat patch on site has a very convoluted edge and therefore scores as "poor" for shape. The two meadow patches, on the other hand, are considerably more uniform in shape and therefore score as "fair" and "good".

Habitat Patch Matrix Influence

The study area is set in a largely agricultural landscape with scattered, but medium-to-large forest fragments in the vicinity. Analysis based on the 2002 ortho-photos shows that 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 6 and 7). This score can be attributed to the agricultural landscape surrounding the site. At the same time, the Teston–Pine Valley study area positively contributes to the matrix influence on nearby habitat patches such as Purpleville Creek and the Boyd North lands.

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 overall “poor” habitat patch size, results in a habitat patch quality that is split between the “poor” forest patch and the “fair” open meadow habitat (as shown in Map 8).

4.2.2 Quantity of Natural Cover

The total area of the Humber watershed is approximately 91,077 ha in size containing 32.6% natural cover (2002), including 18,481 ha as forest (20.3%), 9779 ha as meadow (10.7%) and 1415 ha as wetland (1.6%). The surveyed area makes up 18.57 ha of which 16.5 ha are natural cover including 4.6 ha of forest, 2.2 ha of successional, 1.0 ha of wetland (including 0.1 ha of vegetated aquatic) and 8.7 ha of meadow. This amounts to 0.06% of the total natural cover in the Humber watershed.

4.3 Vegetation Community Findings for Teston-Pine Valley

4.3.1 Vegetation Community Representation

Natural vegetation at Teston-Pine Valley is focused on a woodlot in the southeast quarter of the site, which is actually a complex of forest, and a couple of ponds. It is roughly bordered by patches of young plantation (Maps 2 and 9). The remainder of the site is meadow with a network of hedgerows and small patches of shrub thicket and younger plantation. There is a total of 18 different ELC vegetation types represented (listed in Appendix 1).

The woodlot is mostly a Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1) with a trend toward the moister end of the spectrum of this type. A small area in the southeast is an unusual Fresh-Moist White Pine – Hawthorn Mixed Forest (FOMA-B). The remaining forested area is plantation, mostly young in age, including five types.

Successional communities include a series of hedgerows (CUH1-A, CUH1-B) extending north and west across the site, as well as small areas with enough woody regeneration to count as Red-osier Dogwood Deciduous Thicket (CUT1-E) or Native Deciduous Successional Savannah (CUS1-A1).

Blocks of former agricultural field are meadow dominated by goldenrod and other native forbs (CUM1-A) or European pasture grasses (CUM1-b).

The forest and successional areas show evidence that is consistent with the aforementioned landowner's report of historical pasturage: for example, the prevalence of hawthorn (*Crataegus* spp.), and a rather depauperate forest ground layer that still hasn't diversified after 40 years. Invasive species are not abundant (with the exception of buckthorn in the hedgerows), and the landowner has done extensive plantings of native forest and wetland species as well as a few ornamentals.

Wetlands are focused around two semi-permanent ponds. One of these, near the centre of the site, includes a Pondweed Submerged Shallow Aquatic community (SAS-1) with a narrow fringe of Silver Maple Mineral Deciduous Swamp (SWD3-2). The other is a larger Bulrush Mineral Shallow Marsh (MAS2-2) with a fringe of Reed Canary Grass Mineral Shallow Marsh (MAS2-d), located at the extreme southeast corner of the woodlot (the intersection of Teston Road and Pine Valley Drive). This wetland includes a swale extending north into the woodlot that features a Willow Mineral Deciduous Swamp (SWD4-1).

4.3.2 Vegetation Communities of Concern

Vegetation communities in the TRCA jurisdiction are scored and assigned a local rank from L1 to L5 based on the two criteria mentioned in Section 3.2. Those 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.

The 18 vegetation communities at Teston-Pine Valley do not include any of regional concern but seven are ranked L4 and account for 2.1 ha of the site (communities with ranks are shown in Appendix 1; location and boundaries shown on Map 9). These include one forest type, Fresh-Moist White Pine – Hawthorn Forest (FOMA-B); three wetlands: Silver Maple Mineral Deciduous Swamp (SWD3-2), Willow Mineral Deciduous Swamp (SWD4-1), Bulrush Mineral Shallow Marsh (MAS2-2); one vegetated aquatic, Pondweed Submerged Shallow Aquatic (SAS1-1); and two successional communities: Red-osier Dogwood Deciduous Thicket (CUT1-E), and Native Shrub – Sapling Hedgerow (CUH1-B). The Fresh-Moist White Pine – Hawthorn Forest is unusual in our jurisdiction and actually quite rare. When it comes to considering the forest communities, however, their age along with the diversity and quality of the understorey and ground layers are also important factors in addition to their ranks. The main sugar maple forest type (Dry-Fresh Sugar Maple Deciduous Forest FOD5-1) is mature and multi-layered, and it has a depauperate but largely native ground layer. The interested landowner's native plantings are gradually diversifying the ground layer.

4.4 Flora Findings for Teston-Pine Valley

4.4.1 Flora Species Representation

A total of 221 naturally-occurring flora species were found at Teston-Pine Valley in 2009 (Appendix 2). In addition, there were 29 planted species within the natural cover of the site. These numbers represent moderate species richness (i.e. total number of species); however, many species were present in low numbers. Of the non-planted species, 125 (57%) are native, and 96 (43%) are exotic (reflecting the site's agricultural history).

4.4.2 Flora Species of Concern

Twelve of the plants at Teston-Pine Valley qualify as being of regional concern in the TRCA (rank of L1 to L3 based on their scores for the four criteria mentioned in Section 1.1.4) (Appendix 2). One of these, purple-tinged sedge (*Carex woodii*), is also regionally rare. This sedge is present as a small vegetative clump, identified by its stiffly upright habit and strong pigmentation. Most of the flora species of concern are not rare plants *per se*; however, they are of conservation concern due to their sensitivity to development and restriction to certain habitats or certain areas within the TRCA region. Map 10 shows locations of flora of regional concern.

All 12 of the flora species of concern are associated with specific vegetation communities; consequently, they are highly susceptible to changes in these communities. They score relatively high in *habitat dependence*. Roughly, they are found in seven or fewer vegetation cohorts (groupings of vegetation types with similar floristic characteristics) (TRCA 2010). Habitat dependence scores for flora are shown on Map 11. Forest species are fairly poorly-represented, likely due to the past history of cow pasture; they are concentrated in the north end of the woodlot (Map 10). Sharp-lobed hepatica (*Anemone acutiloba*), narrow-leaved spring beauty (*Claytonia virginica*), and fly honeysuckle (*Lonicera canadensis*) were found in small to moderate numbers. The wetlands have a greater share of the species of concern: seven species are associated with the two ponds. These include three-way sedge (*Dulichium arundinaceum*), flat-stemmed pondweed (*Potamogeton zosteriformis*), bristly sedge (*Carex comosa*), turtlehead (*Chelone glabra*), water horsetail (*Equisetum fluviatile*), star duckweed (*Lemna trisulca*), and greater duckweed (*Spirodela polyrhiza*). In the hedgerows, Canada plum (*Prunus nigra*) is of regional concern and possibly some of the hawthorns (two *Crataegus* specimens submitted to the Royal Ontario Museum herbarium have not been identified at time of writing).

The 12 species of concern are all more-or-less sensitive to indirect impacts associated with adjacent development or intensive agriculture (sensitivity to development score of three to five). Their scores for sensitivity to development are shown on Map 6 overlaid on habitat matrix influence. Aside from lingering impacts of past cattle grazing, the main indirect impact that threatens the site would be competition from invasive species, which could spread from roadside disturbance and old gardens and agricultural fields. At present, their impact is limited but it is likely to increase. The site is isolated and subject to edge effects. Beech trees (*Fagus grandifolia*) have been declining in the woodlot due to beech bark disease (this was also noted by the landowner).

The stock of native ground flora is depleted. In addition, the woodlot (like most in the Toronto area) appears to be affected by non-native earthworms, which rapidly digest the duff layer and make conditions less suitable for natives (Suarez *et al*. 2006). Buckthorn (*Rhamnus cathartica*) is already prevalent in the hedgerows, and there is a localized but dense population of garlic mustard (*Alliaria petiolata*) in one of the hedgerows. Their impacts on natural areas are well-known (Nuzzo 1999, Knight *et al*. 2007, Stinson *et al*. 2007). Other species that could pose a problem over the longer term are associated with garden and other plantings: Norway maple (*Acer platanoides*), Manitoba maple (*Acer negundo*), Japanese knotweed (*Fallopia japonica*/*Polygonum cuspidatum*), Siberian squill (*Scilla sibirica*), goutweed (*Aegopodium podagraria*), flowering-rush (*Butomus umbellatus*), celandine (*Chelidonium majus*), dame's rocket (*Hesperis matronalis*), lily-of-the-valley (*Convallaria majalis*), and periwinkle (*Vinca minor*). One of the properties within the site (owned by TRCA) has a disturbed area where a house has been demolished; this area supports several exotic plant species. It immediately abuts the rare Fresh-Moist White Pine – Hawthorn Mixed Forest.

Nutrient and silt runoff from the adjacent road could pose a problem for some of the wetland species. The southeast wetland currently has a fringe of reed canary grass (*Phalaris arundinacea*) that thrives with such disturbance. Flat-stemmed pondweed (*Potamogeton zosteriformis*), star duckweed (*Lemna trisulca*), and three-way sedge (*Dulichium arundinaceum*) are more characteristic of less disturbed wetlands.

Plantings

One of the landowners has done extensive planting around the central pond and within part of the woodlot. The majority of the species are native forest and wetland species, with some being native to other parts of Ontario or eastern North America but not the TRCA jurisdiction (e.g. lizard's tail – *Saururus cernuus*). Some of them, such as wild blue phlox (*Phlox divaricata*), fragrant water-lily (*Nymphaea odorata* ssp. *odorata*), Michigan lily (*Lilium michiganense*), bellwort (*Uvularia grandiflora*), fringed sedge (*Carex crinita*), and Christmas fern (*Polystichum acrostichoides*) are very suitable for the habitat and would otherwise not easily disperse to this isolated habitat patch. Many forest herbs, especially those that produce small numbers of large seed, have low dispersal ability (Verheyen *et al*. 2003). The plantings can help to regenerate the woodlot ground layer following its being grazed by livestock.

4.5 Fauna Findings for Teston-Pine Valley

4.5.1 Fauna Species Representation

The TRCA fauna surveys at Teston-Pine Valley in 2009 documented a total of 46 vertebrate fauna species; the inclusion of chimney crayfish (*Fallicambarus fodiens*, a token invertebrate included due to ease of observation and to recognized sensitivity of the species) increases this total to 47 species (Table 3).

Table 3: Breakdown of species total for 2009 site-inventory

	Birds	Mammals	Herpetofauna	Additional Species	Total
Number of species	36	4	6	1	47

An additional species – striped chorus frog (*Pseudacris triseriata*) – was reported from a previous survey conducted within the current study area by the TRCA in 2003 (this species was also reported from a wetland just off-site, to the west of the study area in 2009). This brings the total number of possible breeding fauna species identified by the TRCA to 48. Refer to Appendix 3 for a list of the fauna species and their corresponding L-ranks.

4.5.2 Fauna Species of Concern

Fauna species, like vegetation communities and flora species, are considered of regional concern if they rank L1 to L3 based on their scores for the seven criteria mentioned in Section 3.2. As with flora, this is a proactive, preventive approach, identifying where conservation efforts need to be made before a species becomes rare.

Fauna surveys at Teston-Pine Valley reported a total of two L1 to L3 bird species: pine warbler (*Dendroica pinus*) and bobolink (*Dolichonyx oryzivorus*). In addition, there were six herpetofauna of concern (four L2: grey treefrog *Hyla versicolor*, northern spring peeper *Pseudacris crucifer*, striped chorus frog *Pseudacris triseriata*, wood frog *Rana sylvatica*; two L3: northern leopard frog *Rana pipiens*, and midland painted turtle *Chrysemys picta marginata*), and one invertebrate (the L2 ranked chimney crayfish) bringing the total to nine fauna species of regional concern. Locations of these breeding fauna are depicted on Map 12.

Local occurrence is one of seven scoring criteria for fauna species and is based on TRCA data and information from the Natural Heritage Information Centre (NHIC) of the Ontario Ministry of Natural Resources (OMNR) (NHIC 2008). Using local occurrence as a measure of regional rarity, any species that is reported as a probable or confirmed breeder in fewer than 10 of the 44 10x10 km grid squares in the TRCA jurisdiction is considered regionally rare (i.e. scores three to five points for this criterion). At Teston-Pine Valley there were no species of regional concern, i.e. ranked L1 to L3, that are considered regionally rare. However, there was one L4 ranked species (i.e. a species of concern within the urban and urbanizing sections of the TRCA jurisdiction) that is considered a regionally rare species – eastern bluebird, S*ialia sialis*. It is likely that this species has benefited from nest-boxes placed by the landowner. As is the case with flora, most regionally rare fauna species have other associated factors that explain their vulnerability and need to be taken into account in conservation strategies.

Sensitivity to development is another criterion used to determine the L-rank of fauna species. A large number of impacts that result from local land use, both urban and agricultural, can affect the local fauna. These impacts – considered separately from the issue of actual habitat loss – can be divided into two distinct categories. The first category involves changes that arise from local

urbanization that directly affect the breeding habitat of the species in question. These changes alter the composition and structure of the vegetation communities; for example, the clearing and manicuring of the habitat (e.g. by removal of dead wood and clearance of shrub understorey). The second category of impacts involves changes that directly affect individuals of the species in question. Examples include increased predation from an increase in the local population of predator species that thrive alongside human developments (e.g. blue jays, *Cyanocitta cristata;* American crows, *Corvus brachyrhynchos;* squirrels, raccoons and house cats); parasitism (from facilitating the access of brown-headed cowbirds, *Molothrus ater*, a species which prefers more open, edge-type habitat); competition (for nest-cavities with bird species such as house sparrows, *Passer domesticus*; and European starlings, *Sturnus vulgaris*); flushing (causing disturbance and abandonment of nest) and, sensitivity to pesticides.

Fauna species are considered to have a high sensitivity to development if they score three or more points (out of a possible five) for this criterion. At Teston-Pine Valley all of the 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 7). There are also several lower ranked L4 species that score as sensitive to development, including the recently re-ranked (from L3 to L4) green heron (*Butorides viridescens*). The matrix surrounding the study area is a fairly even mix of natural and agricultural landscape. Such a matrix does not produce many of the negative impacts associated with more urban or suburban matrices.

The study area does not appear to be subjected to significant negative impacts and therefore there is presumed to be factors other than negative matrix impacts that are influencing the rather low representation by bird species of regional concern. However, frog species are well-represented, particularly in the wetland at the south-eastern corner of the site.

Fauna species are scored for the ***area sensitivity*** criterion 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 hectare in total, score one point. Species scoring three points or more (require 5+ hectares in total) are deemed area sensitive species. Researchers have shown that for some species of birds, area sensitivity is a rather fluid factor, dependent and varying inversely with the overall percentage forest cover within the landscape surrounding the site where those species are found (Rosenburg *et al.* 1999). Five of the fauna species of regional concern (both L3 bird species and three of the frog species) that were identified are considered area sensitive.

Forest habitat on the site amounts to less than the 5 hectare threshold for many area sensitive forest species. The quantity of forest on the site is probably one of the main limiting factors preventing the recruitment of more L3 forest species onto the site. Indeed, even some species that require habitat patches of less than 5 hectares are absent from the site despite being present in nearby habitat blocks – eastern wood-pewee (*Contopus virens*, an L4 species) and mourning warbler (*Oporornis piladelphia*, an L3 species) are both present in the nearby landscape but have failed to establish territories in the subject study area. These absences may be attributable to poor understorey and ground layer in the forest habitat, a result of previous grazing by livestock.

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.

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.

At Teston-Pine Valley the most significant fauna features are the several species of frogs that are using the wetlands on the site. All five of the L2/L3 ranked frog species that are present at the study area, together with midland painted turtle (*Chrysemys picta marginata*), are species that score high (four out of a possible five points) for patch isolation sensitivity. In the case of four of these species this high score is a result of their need to move considerable distances across the landscape in search of wetlands in which to breed in the spring, and upland habitat (forests and meadows) in which to forage and hibernate at other times of the year. These requirements mean that these highly vagile (the capacity or tendency for a species to move about or disperse in a given environment) species are particularly sensitive to roads within their home ranges. Such roads become more of a problem as vehicular traffic increases both in speed and density, resulting in, at times, massive road-kill events particularly at times and locations of concentrated migration. At Teston-Pine Valley there is undoubtedly some movement within the habitat patches that comprise the site, it is also highly likely that there is considerable movement to habitat patches elsewhere in the local landscape. The wood frogs, spring peepers and grey tree-frogs breeding in the wetland at the south-east corner of the site, for example, are likely migrating and dispersing to the large forest patches associated with the Humber tributary 300 m to the east of Pine Valley Drive. Any development that compromises these annual movements will have a negative impact on the population of these frog species on the site, and therefore within the landscape.

Fauna species that score greater than three points under the ***habitat dependence*** criterion are considered habitat specialists (Map 13). These species exhibit a combination of very specific habitat requirements that range from their microhabitat (e.g. decaying logs, aquatic vegetation)

and requirements for particular moisture conditions, vegetation structure or spatial landscape structures, to preferences for certain community series and macro-habitat types. Four of the fauna species that occur at Teston-Pine Valley are considered habitat specialists. Three of these species are frogs that exhibit habitat dependence by requiring a particular combination of a wetland breeding habitat and upland foraging/wintering habitat. If one of these two habitat elements is removed or becomes inaccessible then the life cycle of those frog species will be infeasible and the local population will be extirpated.

The fourth habitat dependent species at Teston-Pine Valley was pine warbler which is generally considered to require an area of fairly extensive mature conifer trees. This species was represented at the study area by a single territory, perhaps a reflection of the species' area sensitivity rather than a result of habitat dependence

Representation is essentially the presence or absence of a species at a site. However, beyond mere representation of single species is the idea that a natural system can be considered as a healthy functioning system if there is an association of several species thriving within that system. Each habitat type supports particular species associations. As the quality of the habitat patch improves so will the representation of flora and fauna species within that habitat. In this way representation biodiversity is an excellent measure of the health of a natural system. The presence of so few forest habitat dependent species indicates that the forest habitat at Teston-Pine Valley is not functioning at a particularly high level. On the other hand, the wide variety of frog species associated with the wetlands in the study area, together with other somewhat less sensitive wetland species (green heron, *Butorides virescens*, and midland painted turtle), suggest that the wetlands are functioning fairly well in terms of fauna.

5.0 Recommendations

The recommendations for Teston-Pine Valley are given in relation to the regional targets for natural heritage in the TRCA jurisdiction. To reach the regional targets for quality distribution and quantity of natural cover, every site will require its own individualized plan of action. Following is a short summary of the site within the regional context, followed by specific recommendations. *Issues directly related to road widening are summarized in Section 5.2.2*. Other recommendations are related to improving the quality of the site in general through ecological restoration measures.

5.1 Site Highlights

- Forest and wetland communities occur together on this site; 18 vegetation types
- Unusual white pine – hawthorn forest vegetation type observed, regionally-rare
- Total of 221 vascular plant species observed, with an additional 29 species planted
- Total of 47 vertebrate and one invertebrate fauna species have been observed at the site
- Flora and fauna species associated with wetlands on the site suggest that the wetlands are functioning fairly well

- Wetlands on the site support populations of six frog species, including four species ranked as L2
- One regionally-rare plant found – purple tinged sedge, rank L3
- One regionally-rare vertebrate fauna species found – eastern bluebird, a species of urban concern (L4)
- Habitat patch total score for the site is a mix of "fair" (for the meadow habitat) and "poor" (for the forest habitat)
- 16.5 ha of natural cover present (0.06% of Humber watershed natural cover) – contributes to health of Purpleville Creek subwatershed and Boyd North.

5.2 Site Recommendations

The following recommendations are offered based on ensuring the health of the Teston-Pine Valley site within the wider natural system, in recognition of the pressures from possible future roadwork and nearby urban expansion.

5.2.1 Protect and Maximize Contribution of Teston-Pine Valley to 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 more natural cover retained at the study area and vicinity, the better it can support a healthy level of biodiversity. Development or other activity at the site should be directed away from existing natural cover. Increasing natural cover through strategic plantings and restoration will improve the patch size, shape and facilitate in reducing negative matrix influences. The larger a habitat block, the more buffered the associated fauna and flora communities are from developments within the landscape or from increased user pressure.

- Any road realignment or widening along Teston Road or Pine Valley Drive should avoid encroaching on existing natural cover, especially the wetland in the southeast corner of the site, which is an important amphibian breeding area.

- Convert part of the low-functioning meadow adjacent to the existing forest patch to forest or successional habitat; currently, there are very few forest-dependent bird species associated with the forest at the study area. By restoring forest on the contiguous meadow habitat at the site it would be possible to double the size of the forest patch on site without seriously depleting the meadow habitat available in the local landscape. Once such forest habitat has matured this would also provide potential foraging and wintering habitat for the sensitive frog species that are known to breed in the site wetlands.

- Retain the remainder of the open/semi-open habitat, which supports species of concern such as hawthorn, Canada plum, chorus frogs, chimney crayfish, bluebirds and bobolinks.

Minimize Negative Matrix Influence

Currently, matrix influence is relatively benign at the site, in spite of current and past agricultural impacts. With road improvements and approaching urbanization, this picture can be expected to deteriorate. Although there is a small parcel of TRCA property, the land is mostly privately-owned and therefore recreational/trail pressure will not likely increase. However, there are likely to be additional impacts from increased stormwater runoff from impervious surfaces, invasive species, and opportunistic fauna that are associated with urban land uses. A few preventive measures should be taken.

- Silt and nutrient-laden runoff from pavement or urban land uses should be prevented from entering the existing wetlands particularly during the construction phase; drainage associated with storm water ponds should be kept separate from these wetlands. However, the natural hydro-period and water balance for the wetlands must also be protected.

- Existing invasive species should be controlled, notably those that can invade forest floors: garlic mustard, periwinkle, dames rocket, goutweed, and buckthorn.

- The demolished house site on the TRCA property should be given particular attention with respect to invasive species control and re-planting with native species. Expanding the rare Fresh-Moist White Pine – Hawthorn mixed forest type onto this disturbed area should be considered.

- Landowners at the site should be given support and recognition for their ongoing stewardship efforts, along with advice on controlling invasive species where needed. They should be put in contact with the TRCA's stewardship group.

Improve Connectivity to Nearby Habitat

Teston-Pine Valley has a number of habitat patches in its vicinity to the west, the east and the south-west; however, Teston Road and Pine Valley Drive form barriers to dispersal to the south and east respectively. The nearby natural cover to the east is associated with Purpleville Creek and its tributaries, which in turn flow into the Humber. It is likely that some of the amphibians breeding at this site migrate across the roads (to nearby habitat patches) where they are vulnerable to roadkill. Dispersal may be an issue for flora as well as fauna at this site, given the fact that 40 or more years after cattle have been excluded, forest ground flora have not returned as strongly as one should expect. Measures should be taken to improve connectivity, especially since we can expect traffic volume to increase on the roads.

- An amphibian-movement study should be conducted to determine whether amphibians are crossing the adjacent roads as they migrate and disperse across the landscape, and if so to also to determine the crossing points on those roads.

- If studies indicate that amphibians are crossing the adjacent roads then amphibian tunnels should be incorporated in any anticipated road widenings and other construction. Such tunnels should utilize designs that focus amphibian dispersal by using techniques such as roadside retaining walls.

- Corridors of natural cover should be provided both in land use plans and restoration projects to link this site across the landscape to other habitat patches such as the Purpleville Creek valley.

Improve Habitat Quality

The quality of habitat on any given site can be improved by managing at two quite different levels: first at the level of vegetation community and local topography, and second at the more fine-detailed microhabitat level, such as providing actual nesting opportunities. The first two of the following recommendations work at the broader scale of the vegetation community level, while the latter are applications at the microhabitat level.

- Any restoration work conducted in order to extend the forest block should consider the use of pit-and-mound topography, creating additional potential vernal pool sites for breeding wood frogs and spring peepers.

- All restoration work should accommodate the existing frog populations, e.g. with regards to timing of restoration works and extent of plantings. For example, machinery associated with site prep or planting could interfere with amphibian movements and breeding if work occurs in early to mid spring.

- Support should be expressed for the nest-box project, located on the western boundary of the site and which currently accommodates eastern bluebird and tree swallow (Tachycineta bicolor). The project should be maintained.

- Ensure that adequate nesting opportunities are available for the turtles associated with the north-east pond, thereby perhaps avoiding the potential for roadkill as turtles disperse in search of nest-sites. Artificial nest-sites should be constructed where appropriate as described at the Toronto Zoo web-site (Toronto Zoo 2008).

5.2.2 Summary of Road Ecology Issues to be Addressed

- Any road realignment or widening along Teston Road or Pine Valley Drive should avoid encroaching on existing natural cover, especially the wetland in the southeast corner of the site, which is an important amphibian breeding area.

- Silt and nutrient-laden runoff from pavement or urban land uses should be prevented from entering the existing wetlands particularly during the construction phase; drainage associated with storm water ponds should be kept separate from these wetlands. However, the natural hydro-period and water balance for the wetlands must also be protected.

- An amphibian-movement study should be conducted to determine whether amphibians are crossing the adjacent roads as they migrate and disperse across the landscape, and if so to also to determine the crossing points on those roads.

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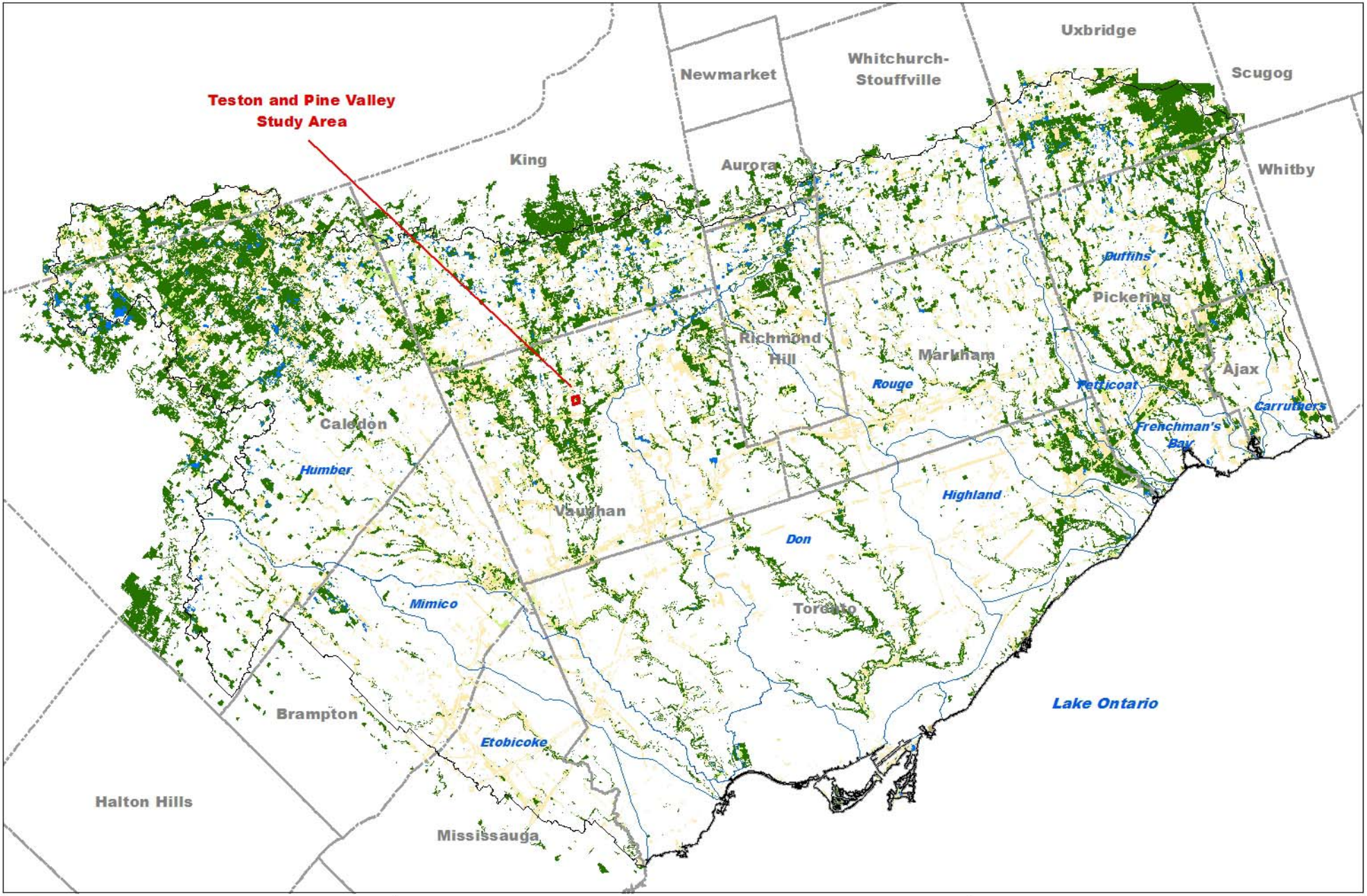


Toronto and Region Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: January 2010

* Landscape analysis based on 2002 Orthophotography

Map 1: Teston and Pine Valley Study Area in the Context of Regional Natural Cover

Natural Cover *

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

Legend

- Teston and Pine Valley Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

TORONTO AND REGION Conservation for The Living City

0 12.5 25 50 75 100 125 Meters

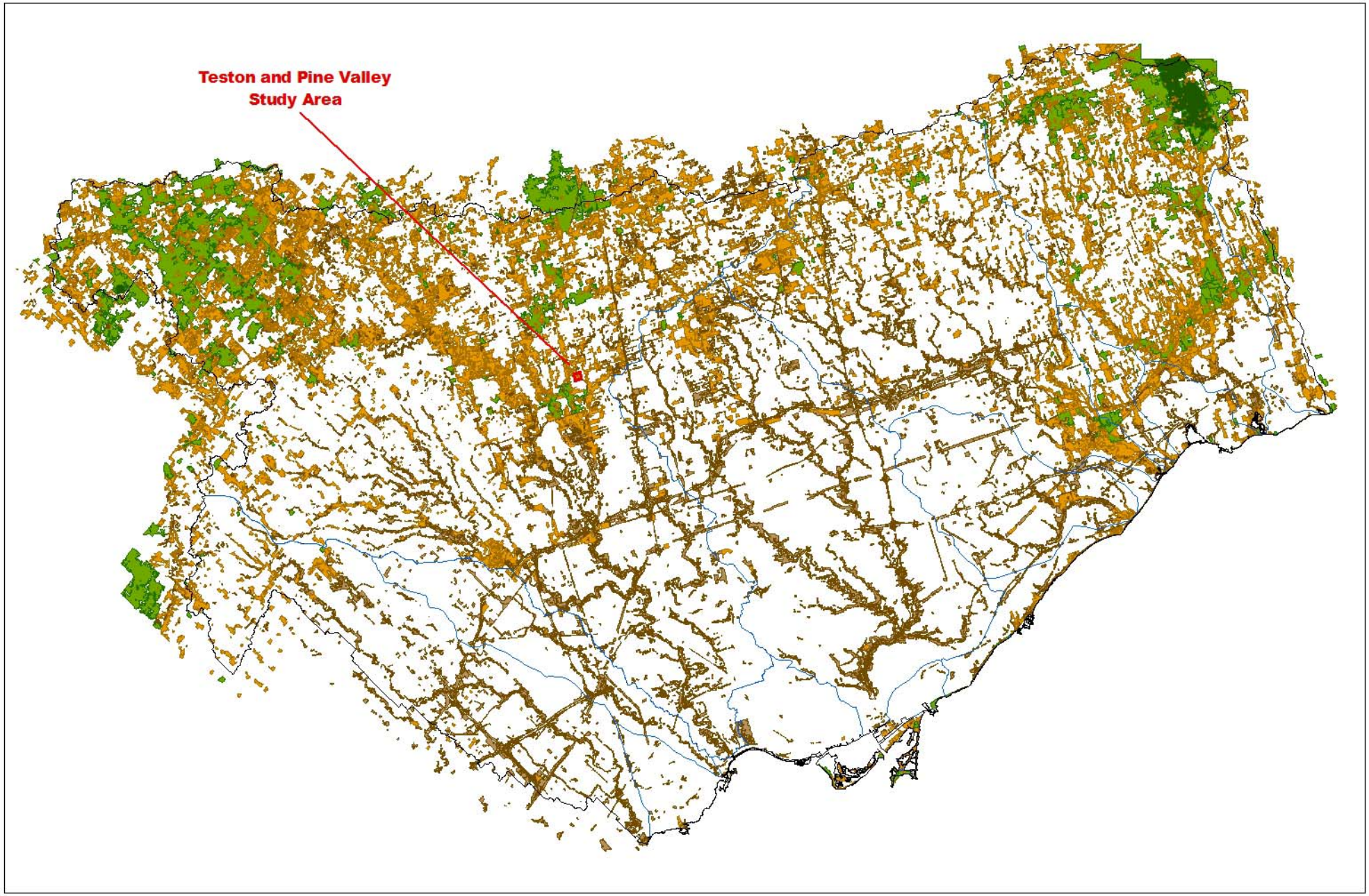
Date: January 2010

Orthophoto: Spring 2009, First Base Solutions Inc.

Map 2:
Teston and Pine Valley Study Area

Legend

Study Area



TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: January 2010
* Landscape analysis based on
2002 Orthophotography

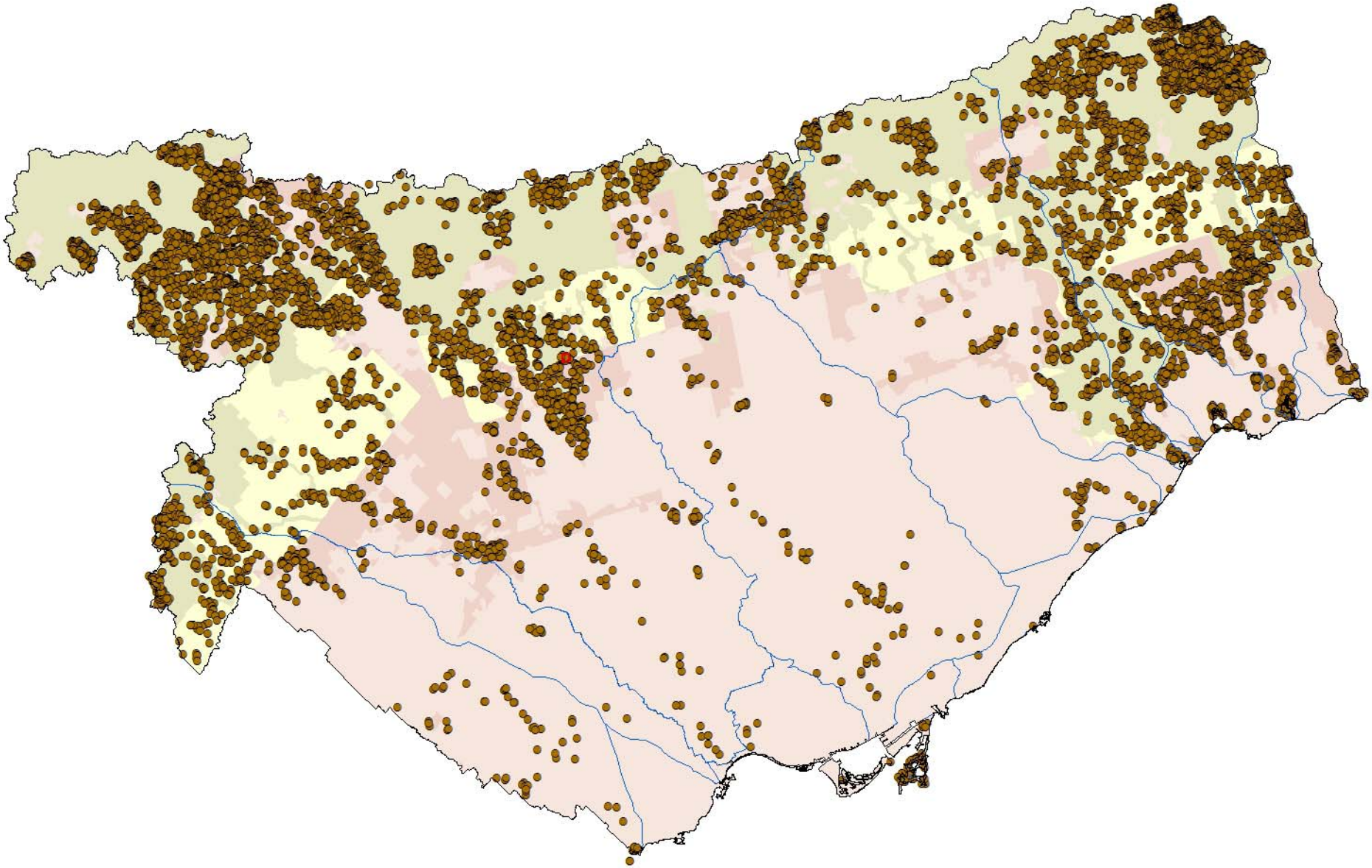
Map 3:
Regional Natural System
Habitat Patch Quality

Legend

Habitat Patch Quality *

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

- Teston and Pine Valley Study Area
- TRCA Jurisdiction
- Watershed



TORONTO AND REGION Conservation for The Living City

0 2.5 5 10 15 20 Kilometers

Date: January 2010

Map 4: Distribution of Fauna Regional Species of Concern

Legend

- Fauna Species of Concern (L1 - L3)
- Teston and Pine Valley 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 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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

Legend

Teston and Pine Valley Study Area

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

Flora Sensitivity to Development Scores

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

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

○ Flora Species

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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

Legend

Habitat Matrix Influence Scores*

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

Teston and Pine Valley Study Area

Fauna Sensitivity to Development Scores

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

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

△ Fauna Species (□ Frog Species)

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.
* Landscape analysis based on 2002 Orthophotography

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

Legend

Habitat Matrix Influence Scores *

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

Teston & Pine Valleu Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010

Orthophoto: Spring 2009, First Base Solutions Inc.

* Landscape analysis based on 2002 Orthophotography

Map 8: Habitat Patch Quality

Legend

Habitat Patch Quality *

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

Teston and Pine Valley Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.

Map 9: Vegetation Communities with their Associated Local Ranks

Legend

Vegetation Community Ranks

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

Teston and Pine Valley Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.

Map 10: Location of Flora Species of Concern

Legend

Flora Species of Concern (L1-L3)

- L1
- L2
- L3

Teston and Pine Valley Study Area

Flora Habitat Dependence Scores

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

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

○ Flora Species

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010
Orthophoto: Spring 2009, First Base Solutions Inc.

Map 11: Flora Habitat Dependence Scores

Legend

Teston and Pine Valley Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: January 2010

Orthophoto: Spring 2009, First Base Solutions Inc.

Map 12:
Location of Fauna Species of Concern

Legend

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

Teston and Pine Valley 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 Meters

Date: January 2010

Orthophoto: Spring 2009, First Base Solutions Inc.

Map 13: Fauna Species of Concern Habitat Dependence Scores

Legend

Teston & Pine Valley Study Area

Fauna Species

(Frog Species)

Appendix 1: List of Vegetation Communities at Teston - Pine Valley 2009

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	area # ha	Local Occur.	Geophy. Requir.	Total Score	Local Rank (2009-03)
	Forest					
FOMA-B	Fresh-Moist White Pine - Hawthorn Mixed Forest	0.4	4.5	0.0	4.5	L4
FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest	2.0	1.0	0.0	1.0	L5
CUP1-1	Sugar Maple Deciduous Plantation	0.2	4.0	0.0	4.0	L5
CUP2-A	Restoration Mixed Plantation	0.4	2.5	0.0	2.5	L5
CUP2-b	Black Locust - Conifer Mixed Plantation	0.1	3.5	0.0	3.5	L+
CUP3-C	White Spruce Coniferous Plantation	0.3	2.0	0.0	2.0	L5
CUP3-H	Mixed Conifer Coniferous Plantation	1.1	1.5	0.0	1.5	L5
	Successional					
CUT1-E	Red Osier Dogwood Deciduous Thicket	0.7	3.0	0.0	3.0	L4
CUH1-A	Treed Hedgerow	1.2	1.5	0.0	1.5	L5
CUH1-B	Native Shrub - Sapling Hedgerow	0.1	3.0	0.0	3.0	L4
CUS1-A1	Native Deciduous Successional Savannah	0.2	1.5	0.0	1.5	L5
	Wetland					
SWD3-2	Silver Maple Mineral Deciduous Swamp	0.1	2.5	2.0	4.5	L4
SWD4-1	Willow Mineral Deciduous Swamp	0.4	2.0	1.0	3.0	L4
MAS2-2	Bulrush Mineral Shallow Marsh	0.4	3.0	1.0	4.0	L4
MAS2-d	Reed Canary Grass Mineral Shallow Marsh	0.1	3.0	1.0	4.0	L+
	Aquatic					
SAS1-1	Pondweed Submerged Shallow Aquatic	0.1	2.0	2.0	4.0	L4
	Meadow					
CUM1-A	Native Forb Meadow	3.7	1.5	0.0	1.5	L5
CUM1-b	Exotic Cool-season Grass Graminoid Meadow	5.1	1.0	0.0	1.0	L+

Appendix 2: Teston and Pine Valley Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Dulichium arundinaceum	three-way sedge	3	4	5	5	17	L2
Potamogeton zosteriformis	flat-stemmed pondweed	3	5	5	5	18	L2
Anemone acutiloba	sharp-lobed hepatica	2	4	4	5	15	L3
Carex comosa	bristly sedge	3	3	5	4	15	L3
Carex woodii	purple-tinged sedge	4	3	5	3	15	L3
Chelone glabra	turtlehead	2	3	4	5	14	L3
Claytonia virginica	narrow-leaved spring beauty	2	4	4	5	15	L3
Equisetum fluviatile	water horsetail	2	4	5	4	15	L3
Lemna trisulca	star duckweed	2	4	5	3	14	L3
Lonicera canadensis	fly honeysuckle	2	4	4	4	14	L3
Prunus nigra	Canada plum	2	4	4	4	14	L3
Spirodela polyrhiza	greater duckweed	2	4	5	3	14	L3
Acer saccharinum	silver maple	1	2	5	3	11	L4
Acer saccharum ssp. *nigrum*	black maple	2	3	4	2	11	L4
Actaea pachypoda	white baneberry	2	3	4	3	12	L4
Allium tricoccum	wild leek	1	3	4	4	12	L4
Amelanchier laevis	smooth serviceberry	2	2	4	3	11	L4
Asarum canadense	wild ginger	2	3	4	3	12	L4
Aster macrophyllus	big-leaved aster	2	3	2	4	11	L4
Betula papyrifera	paper birch	1	4	2	4	11	L4
Caltha palustris	marsh marigold	2	4	3	4	13	L4
Cardamine diphylla	broad-leaved toothwort	2	3	4	4	13	L4
Cardamine x *maxima*	hybrid toothwort	3	3	3	3	12	L4
Carex aurea	golden-fruited sedge	2	2	4	4	12	L4
Carex hirtifolia	hairy wood sedge	2	3	4	3	12	L4
Carex peckii	Peck's sedge	3	3	4	3	13	L4
Carex pellita	woolly sedge	2	3	4	3	12	L4
Carex cf.*sprengelii*	long-beaked sedge	2	4	4	2	12	L4
Carex stricta	tussock sedge	2	3	3	4	12	L4
Crataegus macracantha	long-spined hawthorn	2	2	4	3	11	L4
Crataegus cf. *pedicellata*	scarlet hawthorn	4	2	3	3	12	L4
Epifagus virginiana	beech-drops	2	3	5	2	12	L4
Eupatorium perfoliatum	boneset	1	3	4	3	11	L4
Fagus grandifolia	American beech	1	4	3	4	12	L4
Pinus strobus	white pine	1	4	3	4	12	L4
Pteridium aquilinum var. *latiusculum*	eastern bracken	2	4	2	4	12	L4
Quercus rubra	red oak	1	4	2	4	11	L4
Rosa blanda	smooth wild rose	2	3	3	4	12	L4
Sagittaria latifolia	common arrowhead	1	2	5	4	12	L4
Salix amygdaloides	peach-leaved willow	2	2	5	3	12	L4
Salix bebbiana	Bebb's willow	2	3	3	4	12	L4
Salix discolor	pussy willow	2	3	4	3	12	L4
Scirpus microcarpus	barber-pole bulrush	2	2	4	3	11	L4
Scirpus validus	soft-stemmed bulrush	2	2	5	3	12	L4
Sium suave	water-parsnip	3	2	4	4	13	L4
Thuja occidentalis	white cedar	1	4	1	5	11	L4
Tiarella cordifolia	foam-flower	1	3	3	4	11	L4
Trillium erectum	red trillium	1	4	3	5	13	L4
Trillium grandiflorum	white trillium	1	3	4	5	13	L4
Tsuga canadensis	eastern hemlock	1	4	3	5	13	L4
Typha latifolia	broad-leaved cattail	1	4	4	4	13	L4
Acer saccharum ssp. *saccharum*	sugar maple	1	3	0	2	6	L5
Achillea millefolium ssp. *lanulosum*	woolly yarrow	2	2	0	1	5	L5
Actaea rubra	red baneberry	2	3	1	3	9	L5
Agrimonia gryposepala	agrimony	2	2	0	2	6	L5
Alisma plantago-aquatica	water-plantain	2	2	4	2	10	L5
Anemone virginiana	common thimbleweed	2	3	0	3	8	L5
Apocynum cannabinum	hemp dogbane	2	2	2	2	8	L5
Arisaema triphyllum	Jack-in-the-pulpit	1	3	2	3	9	L5
Asclepias syriaca	common milkweed	2	2	0	2	6	L5
Aster cordifolius	heart-leaved aster	2	1	0	2	5	L5
Aster lanceolatus ssp. *lanceolatus*	panicled aster	1	2	3	1	7	L5

Appendix 2: Teston and Pine Valley Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Aster lateriflorus var. *lateriflorus*	calico aster	2	2	3	2	9	L5
Aster novae-angliae	New England aster	1	2	2	1	6	L5
Aster puniceus var. *puniceus*	swamp aster	2	2	2	2	8	L5
Athyrium filix-femina var. *angustum*	northeastern lady fern	2	3	1	3	9	L5
Carex cristatella	crested sedge	2	2	4	1	9	L5
Carex radiata	straight-styled sedge	2	2	2	2	8	L5
Carex rosea	curly-styled sedge	2	2	3	2	9	L5
Carex stipata	awl-fruited sedge	2	3	2	3	10	L5
Carex vulpinoidea	fox sedge	2	2	4	1	9	L5
Circaea lutetiana ssp. *canadensis*	enchanter's nightshade	2	1	1	1	5	L5
Clematis virginiana	virgin's bower	2	2	2	3	9	L5
Cornus alternifolia	alternate-leaved dogwood	2	2	1	2	7	L5
Cornus stolonifera	red osier dogwood	1	2	0	3	6	L5
Crataegus punctata	dotted hawthorn	2	2	3	3	10	L5
Dryopteris carthusiana	spinulose wood fern	2	3	2	2	9	L5
Echinocystis lobata	wild cucumber	2	2	3	1	8	L5
Equisetum arvense	field horsetail	1	2	1	1	5	L5
Erigeron annuus	daisy fleabane	2	2	0	1	5	L5
Erigeron philadelphicus ssp. *philadelphicus*	Philadelphia fleabane	2	2	0	1	5	L5
Erythronium americanum ssp. *americanum*	yellow trout-lily	2	3	3	2	10	L5
Fragaria virginiana	wild strawberry	2	2	0	2	6	L5
Fraxinus americana	white ash	1	2	0	3	6	L5
Galium palustre	marsh bedstraw	2	2	3	3	10	L5
Geum aleppicum	yellow avens	2	3	3	2	10	L5
Geum canadense	white avens	2	2	1	2	7	L5
Glyceria striata	fowl manna grass	2	2	1	2	7	L5
Hackelia virginiana	Virginia stickseed	2	2	0	2	6	L5
Hydrophyllum virginianum	Virginia waterleaf	2	2	1	2	7	L5
Impatiens capensis	orange touch-me-not	1	2	0	2	5	L5
Juglans nigra	black walnut	2	1	2	1	6	L5
Juncus tenuis	path rush	2	2	1	1	6	L5
Lemna minor	common duckweed	2	2	4	2	10	L5
Maianthemum stellatum	starry false Solomon's seal	2	2	1	3	8	L5
Matteuccia struthiopteris var. *pensylvanica*	ostrich fern	1	2	2	2	7	L5
Mentha arvensis ssp. *borealis*	wild mint	2	2	3	2	9	L5
Onoclea sensibilis	sensitive fern	2	3	1	3	9	L5
Ostrya virginiana	ironwood	2	3	2	2	9	L5
Oxalis stricta	common yellow wood-sorrel	3	1	1	1	6	L5
Parthenocissus inserta	thicket creeper	1	2	0	1	4	L5
Plantago rugelii	red-stemmed plantain	2	2	0	1	5	L5
Poa palustris	fowl meadow-grass	2	2	3	2	9	L5
Podophyllum peltatum	May-apple	1	3	3	3	10	L5
Populus tremuloides	trembling aspen	1	3	1	3	8	L5
Prunus serotina	black cherry	2	2	0	2	6	L5
Prunus virginiana ssp. *virginiana*	choke cherry	1	2	0	1	4	L5
Ranunculus abortivus	kidney-leaved buttercup	2	3	1	2	8	L5
Ribes americanum	wild black currant	2	3	2	2	9	L5
Rubus idaeus ssp. *melanolasius*	wild red raspberry	1	1	0	1	3	L5
Rubus occidentalis	wild black raspberry	2	1	0	1	4	L5
Rubus odoratus	purple-flowering raspberry	2	2	2	2	8	L5
Sanguinaria canadensis	bloodroot	2	3	0	3	8	L5
Solidago altissima	tall goldenrod	1	2	0	0	3	L5
Solidago flexicaulis	zig-zag goldenrod	2	1	3	2	8	L5
Solidago gigantea	late goldenrod	2	1	1	1	5	L5
Thalictrum dioicum	early meadow rue	2	3	3	2	10	L5
Tilia americana	basswood	1	4	2	3	10	L5
Ulmus americana	white elm	1	4	0	2	7	L5
Viola conspersa	dog violet	2	2	0	2	6	L5
Viola pubescens	stemmed yellow violet	2	3	1	2	8	L5
Viola sororia	common blue violet	2	2	0	2	6	L5
Vitis riparia	riverbank grape	1	1	0	0	2	L5
Crataegus spp. (two specimens at TRT herbarium)	hawthorn (2 additional species)						LU

Appendix 2: Teston and Pine Valley Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Acer platanoides	Norway maple	3				3	L+
Aegopodium podagraria	goutweed	4				4	L+
Aesculus hippocastanum	horse-chestnut	4				4	L+
Alliaria petiolata	garlic mustard	2				2	L+
Armoracea rusticana	horse-radish	5				5	L+
Berberis thunbergi	Japanese barberry	4				4	L+
Bromus inermis ssp. *inermis*	smooth brome grass	3				3	L+
Butomus umbellatus	flowering-rush	5				5	L+
Campanula rapunculoides	creeping bellflower	3				3	L+
Capsella bursa-pastoris	shepherd's purse	4				4	L+
Cerastium fontanum	mouse-ear chickweed	3				3	L+
Chelidonium majus	celandine	3				3	L+
Chenopodium album var. *album*	lamb's quarters	3				3	L+
Chrysanthemum leucanthemum	ox-eye daisy	3				3	L+
Cichorium intybus	chicory	3				3	L+
Cirsium arvense	creeping thistle	2				2	L+
Convallaria majalis	lily-of-the-valley	3				3	L+
Dactylis glomerata	orchard grass	3				3	L+
Daphne mezereum	daphne	5				5	L+
Daucus carota	Queen Anne's lace	3				3	L+
Elaeagnus angustifolia	Russian olive	3				3	L+
Elaeagnus commutata	silver-berry	5				5	L+
Epipactis helleborine	helleborine	3				3	L+
Euonymus alatus	winged spindle-tree	5				5	L+
Festuca pratensis	meadow fescue	3				3	L+
Forsythia viridissima	forsythia	5				5	L+
Glechoma hederacea	creeping Charlie	3				3	L+
Hedera helix	English ivy	5				5	L+
Hemerocallis fulva	orange day-lily	4				4	L+
Hesperis matronalis	dame's rocket	2				2	L+
Hieracium aurantiacum	orange hawkweed	4				4	L+
Hieracium caespitosum ssp. *caespitosum*	yellow hawkweed	3				3	L+
Hypericum perforatum	common St. Johnswort	3				3	L+
Inula helenium	elecampane	3				3	L+
Iris pseudacorus	yellow flag	4				4	L+
Iris sibirica	Siberian blue flag	5				5	L+
Larix decidua	European larch	4				4	L+
Leonurus cardiaca ssp. *cardiaca*	motherwort	3				3	L+
Linaria vulgaris	butter-and-eggs	3				3	L+
Lonicera morrowii	Morrow's honeysuckle	3				3	L+
Lonicera tatarica	Tartarian honeysuckle	4				4	L+
Lonicera x *bella*	shrub honeysuckle	3				3	L+
Lotus corniculatus	bird's foot trefoil	3				3	L+
Lysimachia nummularia	moneywort	4				4	L+
Malus pumila	apple	2				2	L+
Medicago lupulina	black medick	3				3	L+
Melilotus alba	white sweet clover	3				3	L+
Mentha spicata	spear mint	4				4	L+
Myosotis sylvatica	woodland forget-me-not	5				5	L+
Narcissus poeticus	narcissus	5				5	L+
Nasturtium microphyllum	small-leaved watercress	4				4	L+
Phleum pratense	timothy grass	3				3	L+
Pinus sylvestris	Scots pine	3				3	L+
Plantago lanceolata	English plantain	4				4	L+
Poa compressa	Canada blue grass	3				3	L+
Poa pratensis ssp. *pratensis*	Kentucky blue grass	3				3	L+
Polygonatum multiflorum	European Solomon's seal	5				5	L+
Polygonum cuspidatum	Japanese knotweed	4				4	L+
Polygonum persicaria	lady's thumb	3				3	L+
Potentilla recta	sulphur cinquefoil	3				3	L+
Pyrus communis	pear	4				4	L+
Quercus robur	English oak	5				5	L+

Appendix 2: Teston and Pine Valley Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Ranunculus acris	tall buttercup	3				3	L+
Ranunculus repens	creeping buttercup	4				4	L+
Rhamnus cathartica	common buckthorn	2				2	L+
Ribes rubrum	garden red currant	3				3	L+
Robinia pseudoacacia	black locust	3				3	L+
Rosa canina	dog rose	5				5	L+
Rosa multiflora	multiflora rose	3				3	L+
Rumex crispus	curly dock	3				3	L+
Salix alba var. *vitellina*	weeping willow	5				5	L+
Salix x *sepulcralis*	weeping willow	4				4	L+
Scilla siberica	Siberian squill	4				4	L+
Sedum telephium	live-forever	5				5	L+
Solanum dulcamara	bittersweet nightshade	3				3	L+
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	5				5	L+
Sorbaria sorbifolia	false spiraea	4				4	L+
Sorbus aucuparia	European mountain-ash	3				3	L+
Stellaria media	common chickweed	5				5	L+
Syringa vulgaris	common lilac	3				3	L+
Taraxacum officinale	dandelion	3				3	L+
Trifolium hybridum	alsike clover	5				5	L+
Trifolium pratense	red clover	3				3	L+
Trifolium repens	white clover	3				3	L+
Tulipa sylvestris ssp. *sylvestris*	garden tulip	5				5	L+
Tussilago farfara	coltsfoot	2				2	L+
Typha angustifolia	narrow-leaved cattail	3				3	L+
Veronica serpyllifolia ssp. *serpyllifolia*	thyme-leaved speedwell	5				5	L+
Viburnum opulus	European highbush cranberry	3				3	L+
Vicia cracca	cow vetch	3				3	L+
Vinca minor	periwinkle	4				4	L+
Acer negundo	Manitoba maple	2	0	0	2	4	L+?
Agrostis stolonifera	creeping bent grass	3				3	L+?
Geranium robertianum	herb Robert	3				3	L+?
Phalaris arundinacea	reed canary grass	3				3	L+?
Phragmites australis	common reed	3				3	L+?
Nymphaea odorata ssp. *odorata*	fragrant water-lily	4	4	5	4	17	pL2
Osmunda regalis var. *spectabilis*	royal fern	2	5	5	5	17	pL2
Phlox divaricata	wild blue phlox	4	4	4	5	17	pL2
Pinus resinosa	red pine	2	5	5	5	17	pL2
Senecio aureus	golden ragwort	5	5	4	4	18	pL2
Viburnum trilobum	American highbush cranberry	4	5	4	4	17	pL2
Abies balsamea	balsam fir	2	3	4	5	14	pL3
Adiantum pedatum	northern maidenhair fern	2	3	5	5	15	pL3
Aquilegia canadensis	wild columbine	2	4	3	5	14	pL3
Carex crinita	fringed sedge	2	4	4	4	14	pL3
Larix laricina	tamarack	2	4	4	4	14	pL3
Lilium michiganense	Michigan lily	2	4	3	5	14	pL3
Lobelia siphilitica	great blue lobelia	2	3	4	5	14	pL3
Picea glauca	white spruce	1	5	4	4	14	pL3
Polystichum acrostichoides	Christmas fern	1	3	5	5	14	pL3
Uvularia grandiflora	large-flowered bellwort	1	4	5	5	15	pL3
Maianthemum canadense	Canada mayflower	1	4	1	5	11	pL4
Symplocarpus foetidus	skunk cabbage	3	2	4	3	12	pL4
Sambucus canadensis	common elderberry	2	3	2	2	9	pL5
Viburnum lentago	nannyberry	2	3	1	2	8	pL5
Berberis aquifolium	Oregon-grape	5				5	pL+
Brunnera macrophylla	Siberian bugloss						pL+
Juniperus x *media*	pfitzer juniper	5				5	pL+
Picea abies	Norway spruce	5				5	pL+
Picea pungens	Colorado spruce	5				5	pL+
Saururus cernuus	lizard's tail						pL+
Tradescantia virginiana	Virginia spiderwort	5				5	pL+
Trillium sessile	toadshade trillium						pL+

Appendix 2: Teston and Pine Valley Flora Species (2009)							
		Local	Popn.	Hab.	Sens.	Total	Rank
		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Mertensia virginica	Virginia bluebells	5				5	pL+?

Appendix 3: Fauna List for Teston and Pine Valley Study Area.

Common Name	Code	Scientific Name	Number of territories	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
Survey Species: species for which the TRCA protocol effectively surveys.													
Birds													
bobolink	BOBO	*Dolichonyx oryzivorus*	2	0	3	3	3	1	1	5	1	17	**L3**
pine warbler	PIWA	*Dendroica pinus*	1	1	2	2	4	1	3	3	0	16	**L3**
barn swallow	BARS	*Hirundo rustica*	x	0	2	3	1	1	2	1	0	10	**L4**
common yellowthroat	COYE	*Geothlypis trichas*	x	0	2	2	1	2	1	4	0	12	**L4**
eastern bluebird	EABL	*Sialia sialis*	x	3	2	2	2	1	2	2	0	14	**L4**
eastern kingbird	EAKI	*Tyrannus tyrannus*	x	0	4	2	2	1	1	3	0	13	**L4**
eastern meadowlark	EAME	*Sturnella magna*	x	0	3	2	3	1	1	3	0	13	**L4**
field sparrow	FISP	*Spizella pusilla*	2	0	3	2	2	1	1	4	0	13	**L4**
great-crested flycatcher	GCFL	*Myiarchus crinitus*	x	0	2	2	3	1	2	2	0	12	**L4**
green heron	GRHE	*Butorides virescens*	1	0	3	2	2	1	2	4	0	14	**L4**
grey catbird	GRCA	*Dumetella carolinensis*	x	0	2	2	1	1	1	3	0	10	**L4**
indigo bunting	INBU	*Passerina cyanea*	x	0	2	2	1	1	2	4	0	12	**L4**
northern flicker	NOFL	*Colaptes auratus*	x	0	3	2	1	1	2	3	0	12	**L4**
red-eyed vireo	REVI	*Vireo olivaceus*	x	0	2	2	2	1	1	3	0	11	**L4**
savannah sparrow	SAVS	*Passerculus sandwichensis*	x	0	3	2	1	1	1	4	0	12	**L4**
tree swallow	TRES	*Tachycineta bicolor*	x	0	2	2	1	1	2	2	0	10	**L4**
white-breasted nuthatch	WBNU	*Sitta carolinensis*	x	0	2	2	3	1	2	2	0	12	**L4**
willow flycatcher	WIFL	*Empidonax traillii*	x	0	4	2	1	1	1	3	0	12	**L4**
American Crow	AMCR	*Corvus brachyrhynchos*	x	0	1	2	1	1	0	0	0	5	**L5**
American goldfinch	AMGO	*Carduelis tristis*	x	0	2	2	1	1	0	1	0	7	**L5**
American robin	AMRO	*Turdus migratorius*	x	0	1	2	1	1	0	1	0	6	**L5**
Baltimore oriole	BAOR	*Icterus galbula*	x	0	2	2	1	1	0	1	0	7	**L5**
black-capped chickadee	BCCH	*Parus atricapillus*	x	0	1	2	1	1	0	1	0	6	**L5**
blue jay	BLJA	*Cyanocitta cristata*	x	0	4	2	1	1	0	1	0	9	**L5**
brown-headed cowbird	BHCO	*Molothrus ater*	x	0	2	2	1	1	0	1	0	7	**L5**
cedar waxwing	CEDW	*Bombycilla cedrorum*	x	0	1	2	1	1	0	1	0	6	**L5**
chipping sparrow	CHSP	*Spizella passerina*	x	0	2	2	1	1	0	2	0	8	**L5**
common grackle	COGR	*Quiscalus quiscula*	x	0	3	2	1	1	0	1	0	8	**L5**
house wren	HOWR	*Troglodytes aedon*	x	0	2	2	1	2	1	1	0	9	**L5**
mallard	MALL	*Anas platyrhynchos*	x	0	2	2	1	2	0	1	0	8	**L5**
mourning dove	MODO	*Zenaida macroura*	x	0	2	2	1	1	0	0	0	6	**L5**
northern cardinal	NOCA	*Cardinalis cardinalis*	x	0	2	2	1	1	1	2	0	9	**L5**

Appendix 3: Fauna List for Teston and Pine Valley Study Area.

Common Name	Code	Scientific Name	Number of territories	LO	PTn	PTt	AS	PIS	HD	StD	+	TS	L-Rank
red-winged blackbird	RWBL	*Agelaius phoeniceus*	x	0	2	2	1	1	0	2	0	8	**L5**
song sparrow	SOSP	*Melospiza melodia*	x	0	2	2	1	2	0	2	0	9	**L5**
yellow warbler	YWAR	*Dendroica petechia*	x	0	1	2	1	1	1	3	0	9	**L5**
European starling	EUST	*Sturnus vulgaris*	x										**L+**
rock dove	ROPI	*Columba livia*	x										**L+**
Herpetofauna													
grey treefrog	TGTF	*Hyla versicolor*	cc=3	1	3	3	3	4	2	5	1	22	**L2**
northern spring peeper	SPPE	*Pseudacris crucifer crucifer*	cc=3	0	2	3	3	4	3	5	1	21	**L2**
striped chorus frog	MICF	*Pseudacris triseriata*	cc=2	2	3	3	2	4	3	5	1	23	**L2**
wood frog	WOFR	*Rana sylvatica*	cc=3	0	2	3	3	4	3	5	1	21	**L2**
northern leopard frog	LEFR	*Rana pipiens*	cc=1	0	3	2	1	4	2	5	1	18	**L3**
green frog	GRFR	*Rana clamitans*	cc=2	0	2	2	1	3	1	4	0	13	**L4**
Incidental Species: species that are reported on as incidental to the TRCA protocol.													
Mammals													
northern short-tailed shrew	NSTS	*Blarina brevicauda*	1	1	2	2	1	2	2	4	0	14	**L4**
red squirrel	RESQ	*Tamiasciurus hudsonicus*	x	0	2	2	1	3	1	2	0	11	**L4**
white-tailed deer	WTDE	*Odocoileus virginianus*	x	0	2	1	3	2	2	1	0	11	**L4**
grey squirrel	GRSQ	*Sciurus carolinensis*		0	2	2	1	3	0	0	0	8	**L5**
Herpetofauna													
midland painted turtle	MPTU	*Chrysemys picta marginata*	1	1	2	2	1	5	1	4	1	17	**L3**
Invertebrates													
"chimney" crayfish	CHCR	*Fallicambarus fodiens*	2	2	3	3	1	4	2	5	1	21	**L2**
LEGEND													
LO = local occurrence		PIS = Patch Isolation Sensitivity		cc= call code (chorus intensity)									
PTn = population trend, continent-wide		STD = sensitivity to development											
PTt = population trend, TRCA		+ = additional points											
HD = habitat dependence		TS = total score											
AS = area sensitivity		L-rank = TRCA Rank, October, 2008											