



Beechwood Wetland and Cottonwood Flats

Terrestrial Biological Inventory and Assessment

December, 2010

Table of Contents

page

1.0 Introduction 1
1.1 TRCA's Terrestrial Natural Heritage Program 1
2.0 Study Area Description 2
3.0 Inventory Methodology 3
3.1 Landscape Analysis 4
3.2 Vegetation Community and Species 5
4.0 Results and Discussion 6
4.1 Regional Context 6
4.2 Habitat Patch Findings for Beechwood Wetland and Cottonwood Flats 7
4.2.1 Quality Distribution of Natural Cover 7
4.2.2. Quantity of Natural Cover 8
4.3 Vegetation Community Findings at Beechwood Wetland and Cottonwood Flats 8
4.3.1 Vegetation Community Representation 8
4.3.2 Vegetation Communities of Concern 9
4.4 Flora Species Findings for Beechwood Wetland and Cottonwood Flats 10
4.4.1 Flora Species Representation 10
4.4.2 Flora Species of Concern 10
4.4.3 Plantings 12
4.4.4 Invasive Species 12
4.5 Fauna Species Findings for Beechwood Wetland and Cottonwood Flats 13
4.5.1 Fauna Species Representation 13
4.5.2 Fauna Species of Concern 13
5.0 Recommendations 15
5.1 Site Highlights 15
5.2 Site Recommendations 16
6.0 References 20

page

List of Tables

Table 1: Habitat patch quality, rank and species response 5
Table 2: Schedule of biological surveys at Beechwood Wetland and Cottonwood Flats 6

List of Maps

Map 1: Beechwood Wetland and Cottonwood Flats in Context of Regional Natural Cover 23
Map 2: Beechwood Wetland and Cottonwood Flats 24
Map 3: Regional Natural System Habitat Patch Quality 25
Map 4: Distribution of Fauna Regional Species of Concern 26
Map 5: Scores for Matrix Influence and Flora Sensitivity to Development 27
Map 6: Habitat Patch Quality – Beechwood Wetland and Cottonwood Flats 28
Map 7: Vegetation Communities with Local Ranks 29
Map 8: Flora Species of Concern – Beechwood Wetland and Cottonwood Flats 30
Map 9: Flora Species Habitat Dependence Scores 31
Map 10: Locations of Frog Observations at Beechwood Wetland and Cottonwood Flats 32
Map 11: Locations of Green Frog and American Toad Observations across City of Toronto 33

List of Appendices

Appendix 1: List of Vegetation Communities 34
Appendix 2: List of Flora Species 35

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This report may be referenced as:

Toronto and Region Conservation Authority (TRCA). 2010. Beechwood Wetland and Cottonwood Flats Terrestrial Biological Inventory and Assessment.

1.0 Introduction

In 2009 and 2010 the Toronto Region Conservation Authority (TRCA) conducted a flora and fauna inventory of the Beechwood Wetland and Cottonwood Flats for the City of Toronto. The study area is located in the lower Don Valley, adjacent to the Don Valley Parkway (Map 1 and 2). Although nearby areas such as Crothers Woods have been subject to inventory by several agencies, this site was not covered until fauna were surveyed by TRCA in 2009. Most of the fauna information is covered by the report on the Sun Valley and Snow Dump site, which covers a larger area that includes the former Sun Valley Landfill on the opposite (northwest) bank of the Don River in addition to Beechwood Wetland and Cottonwood Flats (TRCA 2009). The 2009 Sun Valley fauna report should be considered together with this one for a complete picture of the study area.

The purpose of the work conducted by the TRCA during the 2009 and 2010 field seasons was to *provide site-specific information* on this part of the Don Valley. This information can be used to identify relict natural features; to assess the success of past restoration projects, and guide future projects. In order to provide this advice, detailed field work was undertaken to *characterize the terrestrial natural heritage features* of Beechwood Wetland and Cottonwood Flats. Through the completion of this characterization, 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 Beechwood Wetland and Cottonwood Flats 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

Beechwood Wetland and Cottonwood Flats are located in the lower Don Valley in Toronto, the surveyed area covering about 11 hectares. It is encompassed within the larger Sun Valley Snow Dump area surveyed for fauna in 2009 (TRCA 2009). In this area, the Don Valley runs from northeast to southwest, diverted by a former sand bar of Lake Iroquois to the south in East York, before curving south again to Lake Ontario. Most of the study area is floodplain, with a small section of north-facing slope at its southern edge. The site lies within the Carolinian floristic region, the warm deciduous forest zone of south-western Ontario. At the coarse physiographic level, the site is just south of the old Iroquois shoreline that parallels the north wall of the valley. The surface geology has been highly altered by construction. The only area of original native soil (and vegetation) is a small section of slope south of the main trail where the valley wall juts away from the Don Valley Parkway; the soil here is clay loam derived from till but is well-drained due to the steep slope. Other areas have an anthropogenic fill base, although some of the land near the railway track may be original soil that has been moved a short distance.

The CNR railway line cut through the valley in the 19th century. The Don Valley Parkway, which forms the southern boundary of the study area, was constructed across the valley slope with cutting, excavation, and filling from 1958-1961 (Filey 2006). The area of floodplain around and

north of the railway track, between the track and the river was elevated by fill and piles of building rubble are still visible near the riverbank today. The section of floodplain between the railway and the Don River (the northwestern half of the study area) was used as a snow dump by the City of Toronto up until 2004. This area is known as Cottonwood Flats and is targeted for future ecological restoration. The area south of the railway, between the tracks and the Don Valley Parkway, is a blend of natural regeneration and planting sites. It includes an older linear pond and wetland feature near the railway, probably a mill-race dating from the 19th century (Routh 2010), and a much more recent constructed pond and wetland at the base of slope, which was built in 2002-2003 (City of Toronto 2010). This recent feature is Beechwood Wetland.

The study area was semi-derelict industrial and transportation corridor land until it became accessible to the public when the Domtar factory closed in the 1980s. A major bicycle route bisects the southern part of the site between the mill race pond and Beechwood Wetland. It is a paved path with heavy use. Nearby industrial buildings were demolished in the early 1990s. Some tree planting occurred after the Don Valley Parkway was built, but most planting and restoration work occurred from 2003-2004 around Beechwood Wetland. Currently, the study area is parkland with moderate to high public use, mostly from cyclists passing through, with some hikers and dog-walkers. Because of the mostly flat, semi-open landscape, there is much less mountain-bike activity here than at Crothers Woods.

3.0 Inventory Methodology

A biological inventory of the Beechwood Wetland and Cottonwood Flats 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 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 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 m from the edge of the forest patch, using 100 m increments. A recognized distance for deep interior conditions occurs at 400 m from the patch edge. Such conditions are a habitat requirement for several sensitive fauna species.

Quantity

The *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 minimum 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 for the site was conducted in 2010 (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.

Given that bird surveys were done in 2009 (TRCA 2009), the only fauna surveys conducted at the site in 2010 were frog surveys. These night-time surveys also record incidental observations of any early-spring nocturnal bird species (owls and American woodcocks). Additional fauna records were received from TRCA botanists who are present on site later in the summer than fauna biologists. Fauna species of regional and urban concern (species ranked L1 to L4) were mapped

as point data with each point representing a possible, probable or confirmed breeding fauna element.

Table 2. Schedule of TRCA biological surveys at Beechwood Wetland and Cottonwood Flats in 2010

Survey Item	Survey Dates	Survey Effort (hours)
Patch / Landscape	2007/2008 ortho-photos	21 hours
Vegetation Communities and Flora Species	25th May; 21st and 29th July 2010	12 hours
Frogs and Nocturnal Spring Birds	11th April and 25th May, 2010	1 hour

4.0 Results and Discussion

Information pertaining to Beechwood Wetland and Cottonwood Flats 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 some fauna). This Section provides the information collected and its analysis in the context of the TNHS Strategy.

4.1 Regional Context

Based on 2007/2008 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 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 16.5% 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 species of concern – especially fauna, which respond to land use changes more quickly than flora, 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.

Beechwood Wetland and Cottonwood Flats occupy a large and centrally-located section of the Don Valley and hence act as part of an important linear valley corridor extending from the Oak Ridges Moraine to Lake Ontario as part of the watershed terrestrial natural system. The

connectivity of habitat along the Don Valley has some significant interruptions, but efforts are being made to improve it through restoration projects such as the Beechwood Wetland.

4.2 Habitat Patch Findings for Beechwood Wetland and Cottonwood Flats

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 2007/2008 ortho-photos. Existing and proposed ecological restoration work, especially in the former snow dump, will add a significant patch of habitat to this part of the Don Valley and therefore should improve all landscape ecology parameters.

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

Beechwood Wetland and Cottonwood Flats consists of a mixture of successional habitat and meadow, with a small area of forest on the Don Valley slope, and two wetlands adjacent to the main trail. The largest forest patch is 1.5 hectares and as such scores “very poor” for patch size. The meadow habitat patches are considerably larger (the largest covers 3.9 hectares) and are scored as “fair” and “poor”.

The two largest forest habitat patches within the study area are scored “fair” for shape, whereas the largest meadow patch scores as “good”.

Habitat Patch Matrix Influence

Analysis based on the 2007/2008 ortho-photos shows that the majority of the habitat in the study area is ranked as “poor” for matrix influence, i.e. scores two out of a possible five points (Map 5).

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 “poor” matrix influence on the site, and the mix of “good” to “very poor” for habitat patch size and shape, results in an overall “poor” or L4 ranking for habitat patch quality (Map 6).

4.2.2. Quantity of Natural Cover

The Don River watershed as a whole covers approximately 35800 hectares containing 15.3% natural cover (2007-2008 data), including 2825 hectares as forest (7.9%), 2070 hectares as meadow (5.8%) and 42 hectares as wetland (0.1%). Beechwood Wetland and Cottonwood Flats make up 12.8 hectares of which 11.0 hectares are natural cover including 1.4 hectares of forest (1.1 hectares of which is plantation), 4.2 hectares of successional, 0.5 hectares of wetland (including treed swamp), 1.4 hectares aquatic and 3.5 hectares of meadow. The remaining 1.7 hectares are associated with wide, paved paths and utilities. The study area amounts to 0.2% of the total natural cover in the Don River watershed.

4.3 Vegetation Community Findings at Beechwood Wetland and Cottonwood Flats

4.3.1 Vegetation Community Representation

A total of 19 different ELC vegetation community types were described for the site (listed in Appendix 1). There were three forest communities (including one remnant native patch), seven successional communities, four wetlands, three aquatic communities (one of which is the unvegetated Don River), and two meadows. One successional community exists only as a couple of inclusions within another community. Disturbed open and semi-open communities dominate, reflecting the long history of topographic alteration and industrial, utility, and transportation corridor land uses.

The site has 1.4 hectares of forest cover, just 13% of the whole study area land base. A very small patch (barely over 0.1 hectare) of original deciduous forest clings to an area of valley wall that was never topographically altered, because it juts north and away from the Don Valley Parkway. It is a Dry-Fresh Sugar Maple – Oak Deciduous Forest (FOD5-3) typical of the less altered parts of the lower Don Valley.

Much of the rest of the slope adjacent to the Don Valley Parkway is Black Locust Deciduous Plantation (CUP1-c), and a small area of Fresh-Moist Manitoba Maple Lowland Deciduous Forest (FOD7-a). These are disturbed, exotic-dominated forest communities. The Black Locust Plantation covers 1.1 hectares.

Seven types of successional semi-woody habitat cover 4.2 hectares (38% of the natural cover). They occur across the site: near the trail across the southern half, and forming a strip of riparian vegetation along the Don River and fringing the open Cottonwood Flats. The areas near the trail tend to be more native-dominated; with Native Deciduous Cultural Woodland (CUW1-A3) and Sumac Deciduous Thicket (CUT1-1). Cottonwood (*Populus deltoides*) is prominent, and there are even scattered mature basswood (*Tilia americana*) and bur oak (*Quercus macrocarpa*). One open-grown bur oak is estimated to be about 150 years old (City of Toronto 2010). Cottonwood is also moving into part of the former snow dump (the “flats” named after it). The riparian strip tends to be more dominated by exotic willow (*Salix* x *rubens*) and Manitoba maple (*Acer negundo*), although natives are also present. This area also has Rubble Successional Woodland (CUW2-A) present on

old dumped building materials. Meadow areas cover 3.5 hectares, distributed across disturbed parts of the site, including the former snow dump. They are dominated by European cool-season grasses (CUM1-b) or forbs (CUM1-c).

Wetland and vegetated aquatic communities cover just 0.8 hectare but are a very important feature here. They are associated with two features: the linear pond running between the railway tracks and the main trail; and the more recent Beechwood Wetland project itself. The linear mill race pond dating from the 19th century, supports a Pondweed Submerged Shallow Aquatic community (SAS1-1) with a very small area of Reed Canary Grass Mineral Meadow Marsh (MAM2-2) at one end. Most of the vegetation here colonized naturally. Beechwood Wetland, dug out in the early 2000s, supports a Water Lily Mixed Shallow Aquatic community (SAM1-A), with a fringe of Manitoba Maple Mineral Deciduous Swamp on one side, and (invasive) Common Reed Mineral Shallow Marsh (MAS2-a) at the upstream (eastern) end. The Beechwood Wetland communities and surrounding successional areas have many plantings. There is also a patch of Willow Mineral Thicket Swamp (SWT2-2) at the base of the slope downstream of but not connected to the Beechwood Wetland itself. The high quality of the wetland features, with abundant aquatic vegetation, is likely due to the fact that they have no direct connection with either any storm water outfalls or the Don River. They are currently completely off-line.

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. Beechwood Wetland and Cottonwood Flats lie within the urban landscape and are demonstrably altered by historical land uses, so L4 communities are of conservation concern. On the other hand, community ranks do not take into account the intactness or quality of individual examples of communities; thus, a common type of vegetation community may be of conservation concern at a particular site because of its age, intact native ground layer, or other considerations aside from rank. Communities are listed with ranks in Appendix 1; location and boundaries are shown on Map 7.

Two communities are of regional conservation concern, with a rank of L3. The Water Lily Mixed Shallow aquatic community (SAM1-A) was successfully established in the Beechwood Wetland pond, in spite of the proximity of the Don Valley Parkway and its runoff which contains salt and some sediment. However, sediment and nutrient input in this long-established urban area appears to be low enough to allow aquatic vegetation. The other community of regional concern is an artificial one: Rubble Successional Woodland (CUW2-A). Although artificial, the old discarded building materials provide an interesting substrate and possibly a hibernation area for snakes. The community is also ‘rare’ because it is restricted to older fill and ‘brownfield’ sites that are not usually covered by biological inventories.

Five communities are of conservation concern in the urban landscape (i.e. have a rank of L4). These include the small remnant of Dry-Fresh Sugar Maple – Oak Forest (FOD5-3), Manitoba

Maple Mineral Deciduous Swamp (SWD3-4), Willow Mineral Thicket Swamp (SWT2-2), and the Pondweed Submerged Shallow Aquatic (SAS1-1) community in the old mill race pond. The Manitoba Maple swamp qualifies for the rank of L4 because of its structure and treed wetland function, even though the dominant canopy species is weedy and invasive. There is also a White Pine Successional Savannah (CUS1-A2) derived from 20-30 year old tree plantings. Like the Rubble Successional Woodland, this community is really an artefact rather than a result of natural succession.

The communities of regional and urban conservation concern (L1 to L4) occupy 1.2 hectares, 11% of the total natural cover. This is a very small area, but the presence of relatively successful and diverse wetland and aquatic communities is a worthy achievement by the restorationists. In addition, the small patch of relict forest could become a seed source for expanding native communities if there is some work done on the surrounding landscape.

4.4 Flora Species Findings for Beechwood Wetland and Cottonwood Flats

4.4.1 Flora Species Representation

Beechwood Wetland and Cottonwood Flats had a total of 251 species of vascular plants recorded in 2010 (see Appendix 2). These included 211 naturally-occurring species and at least 40 planted species. Of the non-planted species, 97 are native (46%). Species richness is thus mid-range to high for the small area surveyed, but the majority of occurrences are of exotic species. This can be attributed to the history of disturbance. The majority of the plantings were explicitly intended for ecological restoration and hence, aside from a few mistakes, are native species.

4.4.2 Flora Species of Concern

Of the naturally-occurring or naturally-colonized species (i.e. not planted), nine are of regional conservation concern (rank L1 to L3) and an additional 13 are of urban conservation concern with a rank of L4 (ranks described in Section 3.0). Appendix 2 lists plant species by ranks and locations are shown on Map 8. 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.

One species – wild coffee (*Triosteum aurantiacum*), is regionally rare (found in six or fewer of the 44 10x10 UTM km grid squares that cover the TRCA jurisdiction). It does occur in other semi-open areas in the lower Don, such as near the Brickworks.

Most of the flora species of concern (19 of 22) are sensitive to development, being vulnerable to at least one kind of disturbance that is associated with land use changes (see Map 5 for sensitivity to development scores). This is a fairly high number considering how disturbed the site actually is. The main sensitivity is competition from invasive species. This particularly affects slower-growing natives such as white oak (*Quercus alba*) and wild snowberry (*Symphoricarpos albus* var. *albus*)

that are likely to become outcompeted or at least, prevented from reproducing successfully. Wild coffee and wild bergamot (*Monarda fistulosa*) are in open areas that are vulnerable to take-over by dog-strangling vine (*Cynanchum rossicum*). American bittersweet (*Celastrus scandens*) is gradually becoming swamped by oriental bittersweet (*Celastrus orbiculatus*) in parts of the TRCA jurisdiction; all the plants currently observed at Beechwood are native, but the non-native could be introduced at any time by planting or bird dispersal.

Nutrient and salt inputs also can affect the wetlands and bottomland; invasive species such as common reed (*Phragmites australis*) are present in one part of the wetland and could spread. There is inevitably runoff from the Don Valley Parkway affecting the wetland, but no storm water outfalls.

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. There are some informal trails near the river and the wetland fortunately, this seems to be affecting few flora species.

Habitat fragmentation can lead to increased populations of herbivores such as white-tailed deer (*Odocoileus virginianus*) and grey squirrels (*Sciurus caroliniana*); deer browse does occur in the Don Valley, but the effects are difficult to assess. High squirrel populations in the City of Toronto are a factor that reduces oak regeneration.

Two tree species – butternut (*Juglans cinerea*) and American beech (*Fagus grandifolia*), are declining across their range due to introduced diseases. The individuals (three butternut, one beech tree) observed at Beechwood Wetland and Cottonwood Flats, however, are relatively healthy.

Of the 22 flora species of concern, 19 can be considered habitat specialists, scoring relatively high in *habitat dependence*. Habitat dependence scores are shown on Map 9. 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. Five of the species of concern are associated with the tiny forest remnant: white oak, red oak (*Quercus rubra*), witch-hazel (*Hamamelis virginiana*), snowberry, beech, and wild geranium (*Geranium maculatum*). There are four wetland specialists that probably occur naturally rather than through plantings: coontail (*Ceratophyllum demersum*), leafy and sago pondweeds (*Potamogeton foliosus* and *P. pectinatus*), and silver maple (*Acer saccharinum*). The largest share of habitat specialists – nine, are associated with semi-open and open areas. These include American bittersweet, butternut, wild coffee, Holmes' and long-spined hawthorns (*Crataegus holmesiana* and *C. macracantha*), cut-leaved avens (*Geum laciniatum*), wild bergamot, early goldenrod (*Solidago juncea*), and switch grass (*Panicum virgatum*). Bur oak is found both as open-grown mature trees in the semi-open habitats and in the forest remnant. Riverbank wild rye (*Elymus riparius*) grows near the Don River.

4.4.3 Plantings

Plantings are a very prominent feature of this site, especially at Beechwood Wetland proper. These include 40 species, 13 of which are of regional concern and 15 of urban concern. There are a few species of trees that were planted two or three decades ago, but the majority of plantings occurred with and shortly after the construction of Beechwood Wetland in 2002-2005. Five exotics were planted due to misidentification (e.g. Virginia rose, *Rosa virginiana* instead of Carolina rose, *Rosa carolina*) or miscalculating a plant's native range (e.g. redbud, *Cercis canadensis*). Most of the plant material, especially the herbaceous species, was locally-sourced from nurseries such as the Ontario Native Plant Company and Acorus. A number of the wetland species were regenerating well from the plantings, such as tuberous white water-lily (*Nymphaea odorata* ssp. *tuberosa*) and Canada bluejoint (*Calamagrostis canadensis*). The tuberous water-lily is doing remarkably well considering how close the pond is to the Don Valley Parkway. This subspecies seems to favour more alkaline water (FNA 2002a) and therefore may be relatively tolerant of higher dissolved salts. It is often seen in lower valleys and coastal marshes in TRCA (though not inland, where ssp. *odorata* is found). Likewise, southern blue flag (*Iris virginica*), frequently sold and used in wetland plantings, actually is probably within range and appropriate for the lower Don Valley and lakeshore areas. The Flora of North America shows its range including the immediate north shore of Lake Ontario in the TRCA jurisdiction although not inland (FNA 2002b). Southern blue flag populations that look to be more natural than planted have been found by TRCA at Petticoat Creek and Humber Marshes.

Stewardship volunteers have been maintaining the site and controlling invasive species with good results (Munro 2010, Routh 2010). But a few species remain problematic and a threat to the long-term flourishing of the wetland.

4.4.4 Invasive Species

Not surprisingly given the site's generally disturbed character, there are significant infestations of invasive exotic plants. Over half of the vegetation polygons were classified as having severe invasive disturbance, although the polygons directly associated with the Beechwood Wetland and vicinity were in better condition. Two of the invasive species noted by the City of Toronto in 2002-2003 at the Beechwood Wetland appear to have much-reduced populations: tree-of-heaven (*Ailanthus altissima*) and Japanese knotweed (*Fallopia japonica* [syn. *Polygonum cuspidatum*]). (It should be noted that some of the Japanese knotweed is actually a hybrid: *Fallopia* x *bohemica* [syn. *Polygonum* x *bohemicum*]). Excavation of invasive-laden soil for the wetland and re-planting with natives followed by stewardship seems to have been an effective strategy.

The most severely affected polygons are the black locust plantations along the Don Valley Parkway embankment, which have not been subject to restoration or stewardship work. Black locust is itself mildly invasive, forming suckering stands; but it alters the environment because it is a legume that increases nitrate in the soil. Urban ravines are already loaded with nitrate from atmospheric deposition; excess nitrate is associated with declines in biodiversity and increases in

nitrophilous invasive species (Gilliam 2006). Black locust itself has been directly correlated with the presence of other invasive species (von Holle *et al*. 2006).

Dog-strangling vine is the dominant or subdominant herbaceous plant in many of the plantations and successional areas, being recorded as such in 15 out of 23 polygons. The vine is able to invade and overrun areas due to its prolific seed production, high seed viability, and competitive growth (TRCA 2008). At present, there are no effective control measures for large populations, although research on possible biological control using several European insects is underway.

Garlic mustard (*Alliaria petiolata*) is widespread and moderately abundant; as with dog-strangling vine, control of large populations is generally not feasible. However, biological control is promising in the medium-term, and one weevil already present in southern Ontario appears to be spontaneously adapting to attack garlic mustard (Yates and Murphy 2008). Other invasives that are widespread but in low-to-moderate abundance across the study area include Morrow's honeysuckle (*Lonicera morrowii*), dame's rocket (*Hesperis matronalis*), common buckthorn (*Rhamnus cathartica*), and reed canary grass (*Phalaris arundinacea*). The woody species among these may be controllable.

Other invasives are still localized and direct attempts at removal of the populations could be parts of a management plan. For example, remaining populations of Japanese knotweed occur in a few patches and could be excavated. European alder (*Alnus glutinosa*) was introduced to the site through plantings; this species is commonly mislabelled in the nursery trade and therefore finds its way into restoration projects. It is invasive in wetland and riparian zones. This alder is also a nitrogen-fixer and likely to cause the same issues as black locust. Common reed is intensely dominant in just one marshy area; however, this marsh is at the northeast end of the Beechwood Wetland, and so the reed is a serious threat to spread into the restored area. Removal of the common reed would therefore likely be both feasible and effective in protecting the wetland.

4.5 Fauna Species Findings for Beechwood Wetland and Cottonwood Flats

4.5.1 Fauna Species Representation

A fauna survey was conducted by the TRCA at a study area incorporating the Beechwood Wetland and Cottonwood Flats site in 2009. A report of the findings of this survey was submitted to the City of Toronto in 2009 (TRCA 2009). New findings from survey work conducted in 2010 and from incidental observations made by TRCA botanists are reported here.

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 3.0. Since the subject site is situated within the urban zone this report also considers those species ranked as L4, i.e. those species that are of concern in urban landscapes. As with flora, this is a proactive,

preventive approach, identifying where conservation efforts need to be made before a species becomes rare.

The TRCA spring frog surveys did not report any frog activity in the area. The apparent absence of American toad (*Bufo americanus*) is surprising given the species presence at other Don Valley locations both to the north and south of the study area. Persistent traffic noise from the Don Valley Parkway may have an influence on calling activity (and on the detectability of such activity) but seems not to have affected such activity elsewhere in the Don Valley. Reports of green frog (*Rana clamitans*) were received from botanists visiting the site later in the season and from a member of the public who maintains a web-page detailing observations from the area (Routh 2010). These reports were of animals found in the linear mill pond, and more significantly, egg-masses found in the created wetland at Beechwood. The survey conducted by TRCA staff in 2009 reported two sightings of green frog, one on the east bank of the main river, the other in the vicinity of the old mill race (Map 10).

Additional incidental fauna reports were received from the TRCA botanists: an eastern gartersnake (*Thamnophis sirtalis*) was observed along the paved cycle path at the centre of the site; and an eastern chipmunk (*Tamias striatus*) was observed in trees to the south of Beechwood Wetland.

All three of the species mentioned are ranked as L4 and are considered species of concern within the urban zone. None of the species are considered regionally rare and are generally fairly well-represented in areas of natural cover throughout the urban landscape (see Map 11 for locations of green frog and American toad within the City of Toronto). However, each of the species scores relatively high in the two ranking criteria, *sensitivity to development* and *patch isolation sensitivity*.

Green frog is a fairly typical amphibian in that it is sensitive to many of the negative influences associated with an urban matrix. Deterioration of water quality in breeding ponds is a particularly obvious and significant impact: salt pollution from the nearby Don Valley Parkway could easily cancel out any likelihood of breeding success in the created Beechwood wetland. A less obvious matrix influence is the increased population of “subsidized predators” that occurs in the urban landscape. These are species that maintain an unnaturally high population in the landscape due to easy access to supplemental food provided either intentionally or unintentionally by humans. Such subsidized predators include cats, skunks and raccoons, all of which are known to prey on frogs at various life stages. Removal of adults, tadpoles and egg-masses from breeding ponds can seriously deplete local populations of the species especially where other urban pressures already place the population under stress.

Although green frogs are relatively sedentary compared to many other amphibian species, they do occasionally cross terrain in dispersing between breeding ponds and wintering ponds. In doing this they are exposed to potential predation and also to the possibility of roadkill on paved and unpaved trail surfaces. Bicycle traffic kills considerably fewer animals than motorised traffic, but still needs to be considered a stressor on local frog populations particularly since a paved bicycle trail runs between the two wetland locations on site.

Eastern gartersnake is also quite susceptible to roadkill on paved and unpaved surfaces particularly at times when animals are moving to and from winter hibernacula. Snakes are especially prone to roadkill since they are also attracted to bare, open surfaces to enhance thermoregulation at cooler times of the season. Depending on the location of winter hibernacula there is considerable potential for multiple roadkill events on the paved trail that intersects the Beechwood site.

Many of the same negative matrix influences that impact green frog populations are also a concern for snake populations, particularly the issue of subsidized predators reducing newborn survival. Snakes also suffer higher rates of intentional mortality from humans who for various reasons consider snakes as dangerous and/or undesirable (Ashley 2007).

On the other hand, eastern chipmunks are generally favoured wherever they occur in the urban landscape, so much so that in fact they rate as one of the aforementioned “subsidized predators”, although primarily taking young birds and eggs. They in turn fall prey on a regular basis to the ubiquitous house cat. As with the other two species, eastern chipmunk scores high in the patch isolation sensitivity criterion, but since the animal is extremely fast moving and tends not to linger on paved surfaces, the possibility of mortality on the Beechwood bicycle path is negligible.

5.0 Recommendations

The recommendations for the Beechwood Wetland and Cottonwood Flats 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.

5.1 Site Highlights

- Centrally-located part of the Don Valley, forming part of a corridor extending from the Oak Ridges Moraine to Lake Ontario, passing through the centre of Toronto
- 11.0 hectares of natural cover present (0.2% of Don watershed natural cover)
- 1.4 hectares of forest, 4.2 hectares successional, 0.5 hectare wetland, 0.3 hectare vegetated aquatic, 3.5 hectares meadow
- 19 vegetation types observed, including post-industrial regeneration, restoration projects, and small area of natural relict forest
- Pond and wetland features are of relatively high quality with abundant vegetation, probably because there is no direct contact with storm water outfalls or the Don River
- 251 flora species observed (40 of them planted); 22 naturally-occurring L1 to L4 plants; flora are distributed between successional semi-open communities, wetland, and remnant forest
- Nine planted flora species of concern (L1 to L4) were observed to be established and reproducing, mostly in the vicinity of the Beechwood Wetland restoration project
- Green frog and gartersnake observed in 2010.

5.2 Site Recommendations

Protect and Maximize Contribution of Beechwood Wetland and Cottonwood Flats 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 more that natural cover is retained at the study area and vicinity, the better it can support a healthy level of biodiversity. Development or other activities 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 resilient the associated fauna and flora communities are to developments within the landscape or to increased user pressure.

- The main area that presents an opportunity for increased natural cover is Cottonwood Flats, the former snow dump, which is currently a meadow of mostly non-native, salt-tolerant species. Converting this land to more natural vegetation communities will result in a relatively large, round patch of natural cover in this part of the Lower Don.

- There should also be an emphasis on allowing existing patches of natural vegetation (e.g. both the tiny remnant forest on site and Crothers Woods nearby) to seed in naturally to restored areas. Control of invasive species will help this process.

Minimize Negative Matrix Influence

The heavily urban matrix influence at the site implies significant management issues. On the other hand, the site is relatively separated from direct contact with backyards and neighbourhoods due to the Don Valley Parkway and railway lines, so there may be less diffusion of new invasive plants and subsidized predators from residential areas. The main disturbances are due to the large number of visitors to the site for recreational activities, and invasive plants already established on site due to past land uses. This visitor pressure is unlikely to relax in the future, although fencing and dense scrubby vegetation has helped to keep people and dogs out of the wetlands. Water quality issues can also be a problem, i.e. runoff from the Don Valley Parkway or potential input of the Don River during high water. Future maintenance and restoration should keep ongoing control of invasive plants as a high priority, targeting those species and situations where effective control is feasible.

- Dog leash restrictions should be enforced, especially in the vicinity of the existing and future wetlands.

- Additional trails and other infrastructure should be kept at a limited, modest scale in any plans for Cottonwood Flats.

- Existing wetlands such as the linear pond or Beechwood Wetland, and any future wetlands, should be kept off-line, with no high-water inputs from the Don River or storm water outfalls.

- Rich topsoil or nutrient-rich soil amendments should not be imported to restoration areas as these will likely facilitate invasives at the expense of native species that actually do better on poorer soils. Where soil needs to be imported, a light sandy loam is more likely to help native plants.

- The following localized invasive species populations should be controlled as top priority:

    - The common reed patch at the northeast end of Beechwood Wetland is intense but localized. It is an immediate threat to the wetland and should be removed through excavation, followed up by spot herbicide application of re-sprouts.

    - Similar treatment should be used on the remaining patches or stems of Japanese knotweed.

    - Tree-of-heaven is now sparse and can likely be easily eliminated from the site.

    - European alder that got planted by mistake should be removed before it becomes more established.

- Moderately common invasives such as reed canary grass, buckthorn, honeysuckle, and Manitoba maple should be removed where they are in the immediate vicinity of restoration plantings and from the small remnant of upland natural forest.

- Consideration should be given to guiding the succession of the black locust plantations by under-planting with shade-tolerant native species that will eventually replace the locust.

- More abundant invasive species such as dog-strangling vine and garlic mustard should be addressed through controlling sources of disturbance such as erosion (in forest environments), nutrient input, and trampling. Direct control is not currently feasible and infested areas should not be targeted for restoration plantings unless the soil containing them is removed. Competitive and screening plantings may play a role in containing exotic invasions, and biological control may act in the longer term.

Improve Connectivity to Nearby Habitat

The creation and maintenance of a continuous natural connection along the Don Valley is of considerable importance at the regional scale. Beechwood Wetland and Cottonwood Flats

occupy a wide section of the Lower Don valley and have the potential to enhance this habitat corridor that cuts through the centre of Toronto.

- In the immediate locality, consideration should be given to providing amphibian tunnels under the Don Valley Parkway to connect portions of the valley that are cut off from the main valley by this highway. On the other hand, this may merely facilitate movement of subsidized predators. (The low-traffic underpass of Beechwood Drive may already provide some degree of connectivity).

Although, given the high visitor pressure, there is little likelihood of increasing the number of sensitive nesting bird species at the site, there is however enormous potential for improving the foraging and shelter opportunities for transient migrant songbirds.

- Fruit-bearing shrub cover should be planted at the edges of forested areas, creating important foraging opportunities for migrating songbirds.

Improve Habitat Quality

Efforts should be made to improve the quality of existing habitat at Beechwood Wetland and Cottonwood Flats, and to ensure that restoration projects are effective. Restoration plans need to take account of existing site conditions and biota and work with them.

- Vegetation for restoration areas should be targeted according to topography and drainage. For example, the substrate and drainage conditions for Cottonwood Flats are still largely unknown. These need to be assessed carefully (i.e. through borehole sampling) before deciding on what to plant here. For example, swamp forest would only be possible if the surface has a sufficiently impermeable layer to retain water.

- There are existing flora species of concern that favour open or semi-open habitats on the site. These are concentrated around the linear mill race pond, and on a small area of tableland between the Don Valley Parkway and the remnant natural forest. Examples include hawthorn species, wild coffee, wild bergamot, and American bittersweet. These areas should be left open rather than planted with more trees and shrubs. Because of these remnant flora species, re-grading of the mill race pond area as suggested in TRCA (2009) should be avoided.

- The black locust plantations close to the Don Valley Parkway should be subject to careful interplanting of later-successional trees to encourage the growth of a diverse native forest that expands the small remnant adjacent to them. However, the presence of a nitrate-enriched, dense ground layer of severe invasives – along with road salt inputs, could complicate such efforts.

- Vernal pools for amphibians should be created in Cottonwood Flats if substrate conditions are conducive.

- The concrete slabs and other building rubble near the Don River should be left *in situ* if it is determined that they are already fulfilling a habitat function (e.g. snake hibernaculum) or if not, they can be rearranged so as to provide better function (e.g. extend rubble pile below ground for more effective hibernaculum). However, hibernacula in such a public site need to be carefully located so as to minimize the potential for disturbance by humans.

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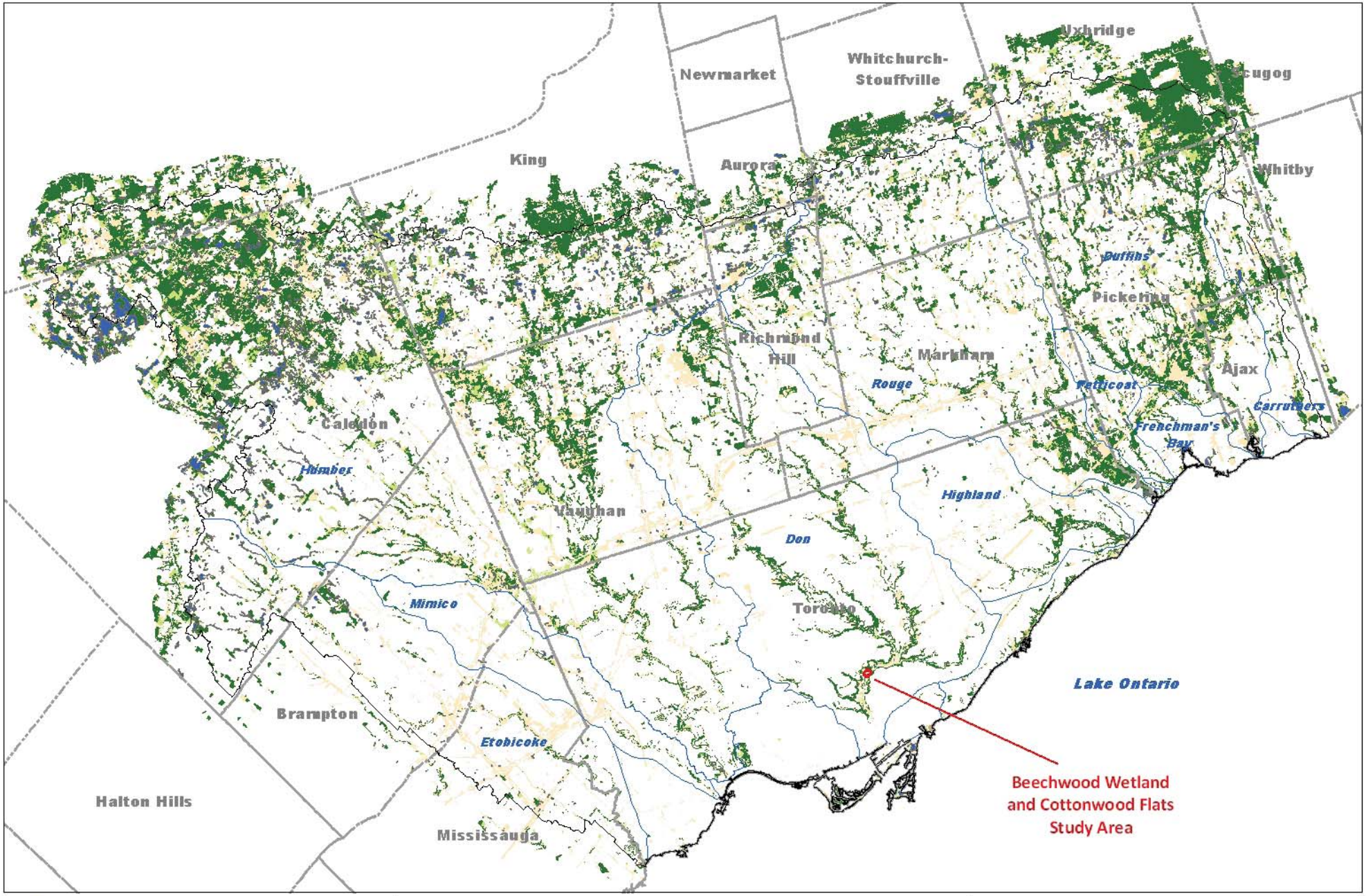


TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: December 2010

* Landscape analysis based on 2007/2008 Orthophotography

Map 1:
Beechwood Wetland and Cottonwood Flats Study Area in the Context of Regional Natural Cover

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

Legend
- Beechwood Wetland and Cottonwood Flats Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

TORONTO AND REGION Conservation for The Living City

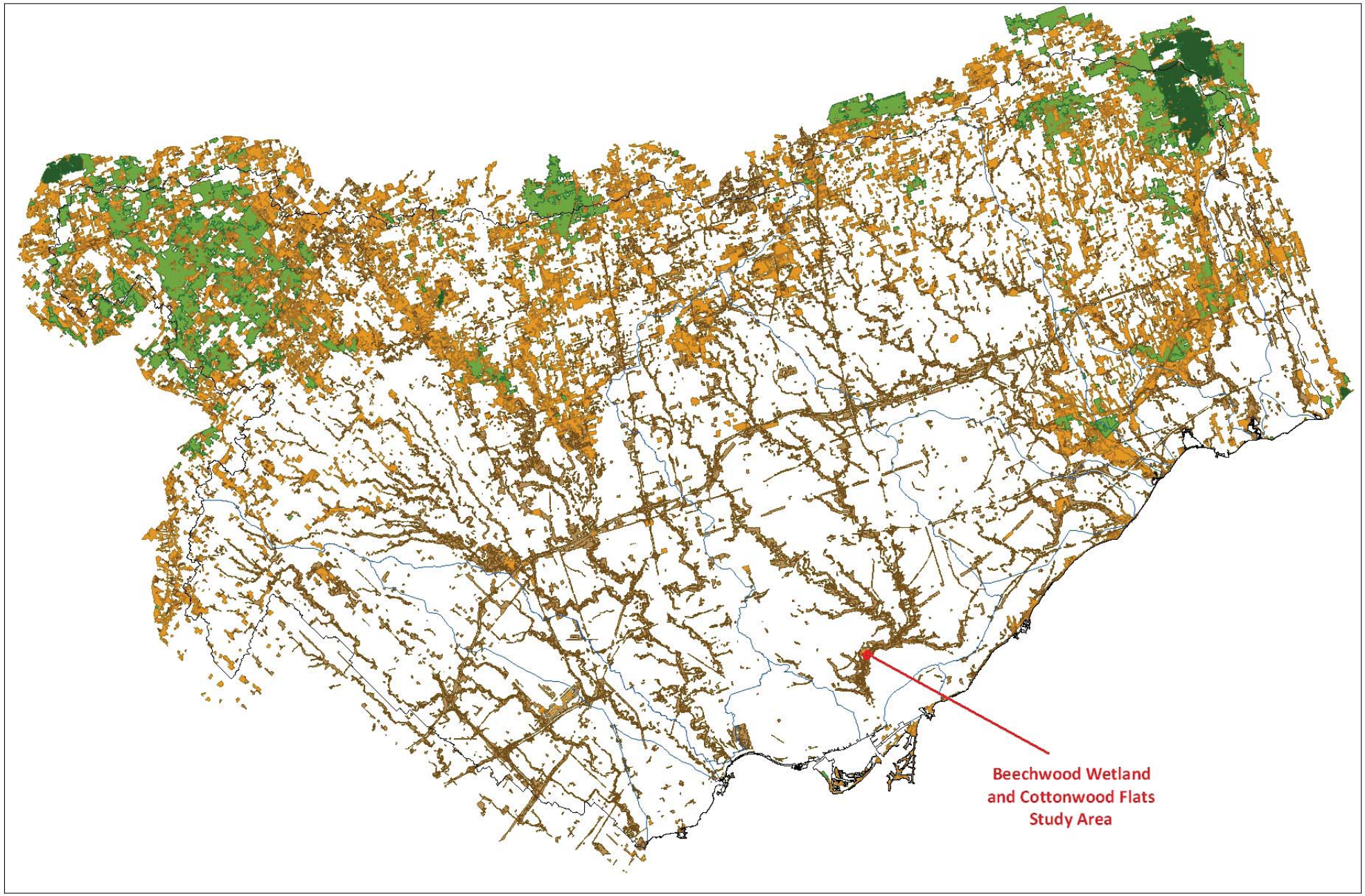
0 25 50 100 150 Meters

Date: November 2010
Orthophoto: Spring 2007, First Base Solutions Inc.

Map 2:
Beechwood Wetland and Cottonwood Flats Study Area

Legend

Study Area



TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

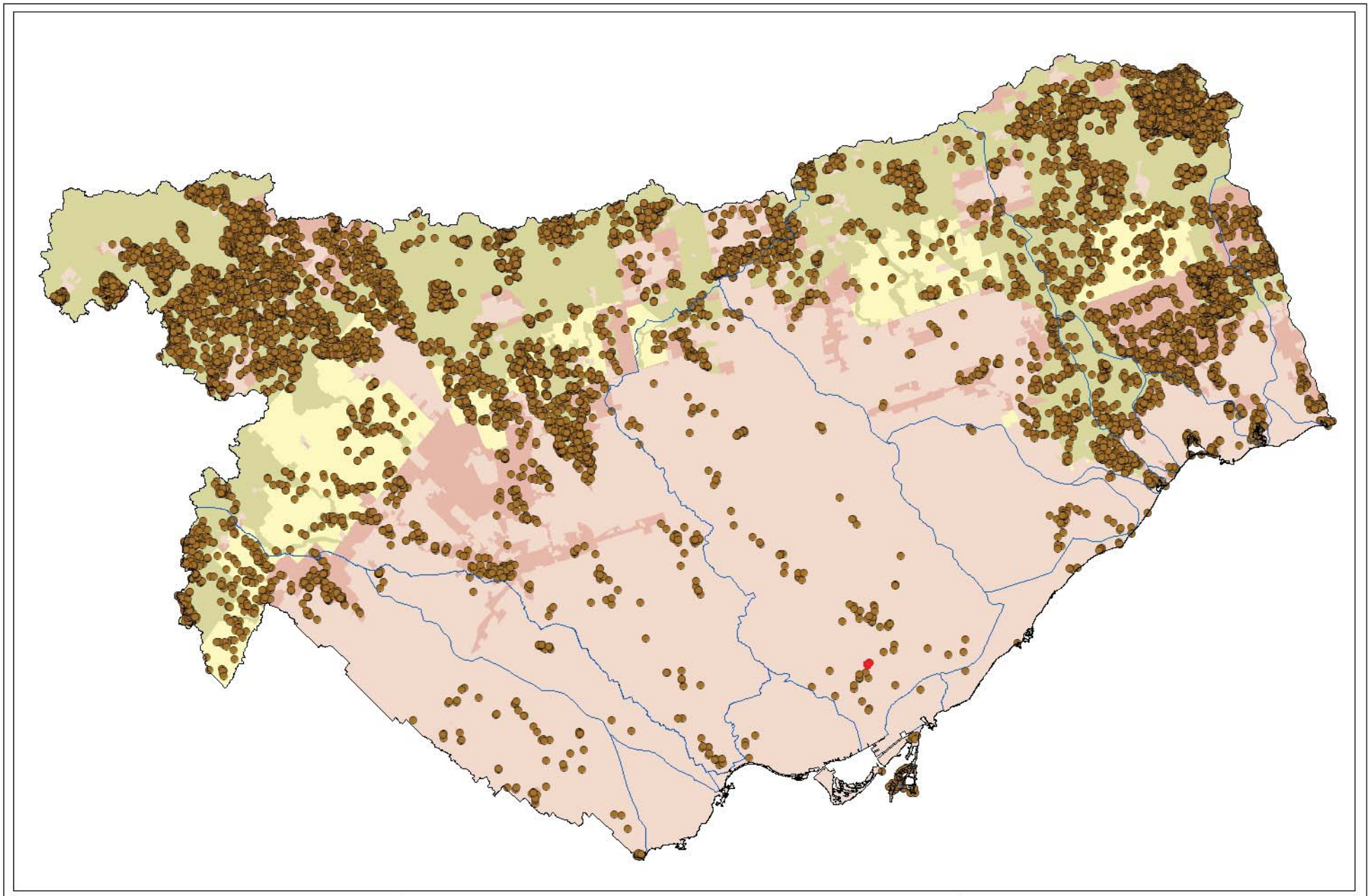
Date: December 2010
* Landscape analysis based on 2007/2008 Orthophotography

Map 3:
Regional Natural System
Habitat Patch Quality

Legend

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

- Beechwood Wetland and Cottonwood Flats Study Area
- TRCA Jurisdiction
- Watershed



TORONTO AND REGION Conservation for The Living City

0 2.5 5 10 15 20 Kilometers

Date: December 2010

Map 4:
Distribution of Fauna
Regional Species of Concern

Legend

- Fauna Species of Concern (L1 - L3)
- Beechwood Wetland and Cottonwood Flats Study Area
- TRCA Jurisdiction
- Watershed
- Agricultural & Rural Area
- Built-up Area
- Designated Greenfield Area
- Greenbelt Area

Flora Sensitivity to Development Scores

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

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

- Flora Species
- Planted Flora Species

Toronto and Region Conservation for The Living City

N

0 25 50 100 150 Meters

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

Map 5: 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

Beechwood Wetland and Cottonwood Flats Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

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

Map 6: Habitat Patch Quality

Legend

Habitat Patch Quality *

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

Beechwood Wetland and Cottonwood Flats Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: December 2010
Orthophoto: Spring 2007, First Base Solutions Inc.

Map 8: Location of Flora Species of Concern

Legend

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

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

Beechwood Wetland and Cottonwood Flats Study Area

Flora Habitat Dependence Scores

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

- Flora Species
- Planted Flora Species

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

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: December 2010
Orthophoto: Spring 2007, First Base Solutions Inc.

Map 9: Flora Habitat Dependence Scores

Legend

Beechwood Wetland and Cottonwood Flats Study Area

TORONTO AND REGION Conservation for The Living City

N

0 25 50 100 150 Meters

Date: December 2010
Orthophoto: Spring 2007, First Base Solutions Inc.

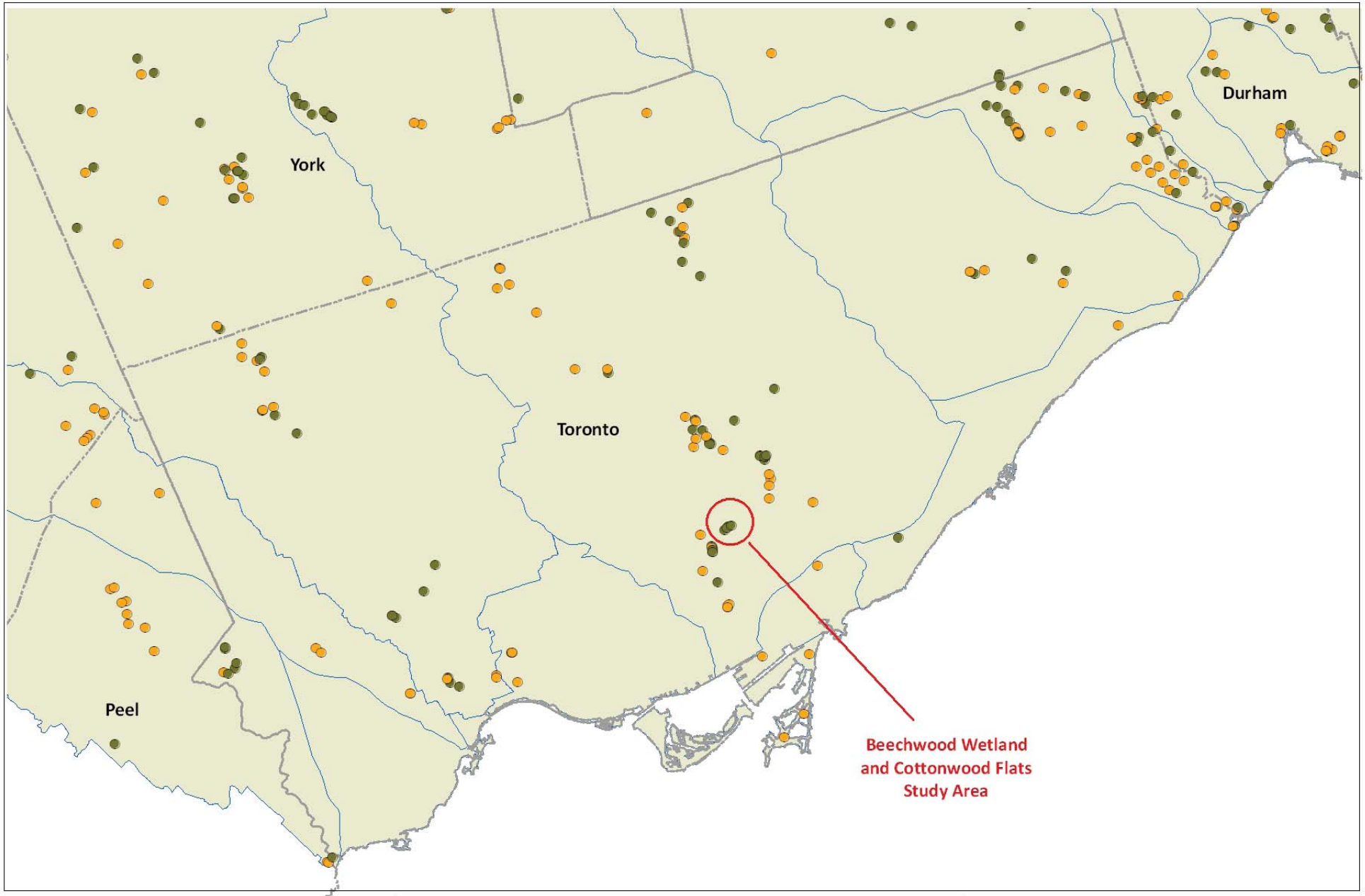
Map 10:
Location of Frog Observations within the Study Area

Legend

Frog Species of Concern (L1-L4)

L1 L3
L2 L4

Beechwood Wetland and Cottonwood Flats Study Area



TORONTO AND REGION Conservation for The Living City

0 2.5 5 10 Kilometers

Date: December 2010

Map 11:
Location of Green Frog and American Toad records across the City of Toronto

Legend

- American toad (*Bufo americanus*)
- green frog (*Rana clamitans*)
- Municipal Boundary
- Watershed
- TRCA Juridiction

Appendix 1: Vegetation Communities at Beechwood Wetland and Cottonwood Flats, 2010

ELC Code	Vegetation Type (* indicates present as inclusion and/or complex only)	Tot. area # ha	Scores: Local Occur.	Scores: Geophy. Requir.	Scores: Total Score	Local Rank (2010-04)
	Forest					
FOD5-3	Dry-Fresh Sugar Maple - Oak Deciduous Forest	0.1	1.5	2.0	3.5	L4
FOD7-a	Fresh-Moist Manitoba Maple Lowland Deciduous Forest	0.2	1.5	0.0	1.5	L5
CUP1-c	Black Locust Deciduous Plantation	1.1	2.5	0.0	2.5	L+
	Successional					
CUT1-1	Sumac Deciduous Thicket	0.3	2.0	0.0	2.0	L5
CUT1-c	Exotic Deciduous Thicket	0.1	2.0	0.0	2.0	L+
CUS1-A1	Native Deciduous Successional Savannah	0.8	1.5	0.0	1.5	L5
CUS1-A2	White Pine Successional Savannah	0.4	2.5	1.0	3.5	L4
CUW1-A3	Native Deciduous Successional Woodland	1.6	1.5	0.0	1.5	L5
CUW1-b	Exotic Successional Woodland	0.9	1.5	0.0	1.5	L+
*CUW2-A	*Rubble Successional Woodland		5.0	0.0	5.0	L3
	Wetland					
SWD3-4	Manitoba Maple Mineral Deciduous Swamp	0.1	3.0	1.0	4.0	L4
SWT2-2	Willow Mineral Thicket Swamp	0.3	2.0	2.0	4.0	L4
MAM2-2	Reed Canary Grass Mineral Meadow Marsh	0.04	1.0	1.0	2.0	L+
MAS2-a	Common Reed Mineral Shallow Marsh	0.1	3.0	0.0	3.0	L+
	Aquatic					
SAS1-1	Pondweed Submerged Shallow Aquatic	0.2	2.0	2.0	4.0	L4
SAM1-A	Water Lily - Bullhead Lily Mixed Shallow Aquatic	0.1	3.0	2.0	5.0	L3
OAO1-T	Turbid Open Aquatic (disturbed unvegetated)	1.1	2.0	0.0	2.0	L+
	Meadow					
CUM1-b	Exotic Cool-season Grass Graminoid Meadow	3.1	1.0	0.0	1.0	L+
CUM1-c	Exotic Forb Meadow	0.4	1.5	0.0	1.5	L+

Total Natural Cover (including 1.1 ha of Don River)	11.0	
Total Forest cover (ha and %)	1.4	13%
Total Successional Cover (ha and %)	4.2	38%
Total Wetland Cover (ha and %)	0.5	5%
Total Aquatic (1.1 ha of which is unvegetated Don River) (ha and %)	1.4	12%
Total Meadow Cover (ha and %)	3.5	32%
Total L3 community cover (ha and %)	0.1	1%
Total L4 community cover (ha and %)	1.1	10%
Total L5 community cover (ha and %)	3.0	27%
Total L+ community cover (incl. 1.1 ha unveg Don River) (ha and %)	6.9	62%

Appendix 2: Flora Species at Beechwood Wetland and Cottonwood Flats 2010							
		Local	Popn.	Hab.	Sens.	Total	Rank
N.B. "p" = planted; "pr"= planted but regenerating from planting.		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Quercus alba	white oak	3	5	4	5	17	L2
Celastrus scandens	American bittersweet	2	4	3	5	14	L3
Ceratophyllum demersum	coontail	2	3	5	4	14	L3
Hamamelis virginiana	witch-hazel	2	4	4	4	14	L3
Juglans cinerea	butternut	1	5	4	4	14	L3
Panicum virgatum	switch grass	3	2	5	5	15	L3
Potamogeton foliosus	leafy pondweed	2	3	5	4	14	L3
Symphoricarpos albus var. *albus*	eastern snowberry	3	4	4	5	16	L3
Triosteum aurantiacum	wild coffee	4	5	4	3	16	L3
Acer saccharinum	silver maple	1	2	5	3	11	L4
Crataegus holmesiana	Holmes' hawthorn	3	3	4	3	13	L4
Crataegus macracantha	long-spined hawthorn	2	2	4	3	11	L4
Elymus riparius	riverbank wild rye	2	2	4	4	12	L4
Fagus grandifolia	American beech	1	4	3	4	12	L4
Geranium maculatum	wild geranium	3	3	4	3	13	L4
Geum laciniatum	cut-leaved avens	3	3	4	2	12	L4
Monarda fistulosa	wild bergamot	3	3	2	3	11	L4
Potamogeton pectinatus	sago pondweed	2	2	5	3	12	L4
Prunella vulgaris ssp. *lanceolata*	heal-all (native)	4	2	3	2	11	L4
Quercus macrocarpa	bur oak	2	4	3	3	12	L4
Quercus rubra	red oak	1	4	2	4	11	L4
Solidago juncea	early goldenrod	3	3	4	2	12	L4
Acalypha virginica var. *rhomboidea*	three-seeded mercury	3	1	2	0	6	L5
Acer saccharum ssp. *saccharum*	sugar maple	1	3	0	2	6	L5
Achillea millefolium ssp. *lanulosum*	woolly yarrow	2	2	0	1	5	L5
Alisma plantago-aquatica	water-plantain	2	2	4	2	10	L5
Ambrosia artemisiifolia	common ragweed	2	1	3	0	6	L5
Ambrosia trifida	giant ragweed	4	1	4	0	9	L5
Anemone virginiana	common thimbleweed	2	3	0	3	8	L5
Apocynum cannabinum	hemp dogbane	2	2	2	2	8	L5
Asclepias syriaca	common milkweed	2	2	0	2	6	L5
Aster ericoides ssp. *ericoides*	heath aster	2	1	2	1	6	L5
Aster lanceolatus ssp. *lanceolatus*	panicled aster	1	2	3	1	7	L5
Aster lateriflorus var. *lateriflorus*	calico aster	2	2	3	2	9	L5
Aster novae-angliae	New England aster	1	2	2	1	6	L5
Bidens frondosus	common beggar's-ticks	2	1	4	0	7	L5
Calystegia sepium	hedge bindweed	3	2	3	2	10	L5
Carex blanda	common wood sedge	2	2	1	2	7	L5
Carex cristatella	crested sedge	2	2	4	1	9	L5
Carex granularis	meadow sedge	2	2	1	3	8	L5
Carex vulpinoidea	fox sedge	2	2	4	1	9	L5
Chenopodium simplex	maple-leaved goosefoot	4	2	3	1	10	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
Conyza canadensis	horse-weed	3	1	2	0	6	L5
Cornus alternifolia	alternate-leaved dogwood	2	2	1	2	7	L5
Crataegus punctata	dotted hawthorn	2	2	3	3	10	L5
Cryptotaenia canadensis	honewort	2	2	4	1	9	L5
Desmodium canadense	showy tick-trefoil	2	2	3	3	10	L5
Erigeron annuus	daisy fleabane	2	2	0	1	5	L5
Erigeron philadelphicus ssp. *philadelphicus*	Philadelphia fleabane	2	2	0	1	5	L5
Erythronium americanum ssp. *americanum*	yellow trout-lily	2	3	3	2	10	L5
Eupatorium rugosum	white snakeroot	2	2	2	1	7	L5
Euthamia graminifolia	grass-leaved goldenrod	2	1	4	1	8	L5
Fragaria virginiana	wild strawberry	2	2	0	2	6	L5
Fraxinus americana	white ash	1	2	0	3	6	L5
Fraxinus pennsylvanica var. *pennsylvanica*	red ash	2	2	2	3	9	L5
Fraxinus pennsylvanica var. *subintegerrima*	green ash	2	2	2	3	9	L5
Geum canadense	white avens	2	2	1	2	7	L5

Appendix 2: Flora Species at Beechwood Wetland and Cottonwood Flats 2010							
		Local	Popn.	Hab.	Sens.	Total	Rank
N.B. "p" = planted; "pr"= planted but regenerating from planting.		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Hackelia virginiana	Virginia stickseed	2	2	0	2	6	L5
Helianthus tuberosus	Jerusalem artichoke	3	1	2	0	6	L5
Heracleum lanatum	cow-parsnip	3	2	3	2	10	L5
Juglans nigra	black walnut	2	1	2	1	6	L5
Juncus articulatus	jointed rush	2	2	4	2	10	L5
Juncus tenuis	path rush	2	2	1	1	6	L5
Juniperus virginiana	red cedar	2	1	4	1	8	L5
Lemna minor	common duckweed	2	2	4	2	10	L5
Lysimachia ciliata	fringed loosestrife	2	2	2	2	8	L5
Maianthemum stellatum	starry false Solomon's seal	2	2	1	3	8	L5
Oenothera biennis	common evening-primrose	2	1	1	1	5	L5
Ostrya virginiana	ironwood	2	3	2	2	9	L5
Oxalis stricta	common yellow wood-sorrel	3	1	1	1	6	L5
Parthenocissus inserta	thicket creeper	1	2	0	1	4	L5
Plantago rugelii	red-stemmed plantain	2	2	0	1	5	L5
Poa palustris	fowl meadow-grass	2	2	3	2	9	L5
Populus deltoides	cottonwood	2	1	4	1	8	L5
Prunus serotina	black cherry	2	2	0	2	6	L5
Prunus virginiana ssp. *virginiana*	choke cherry	1	2	0	1	4	L5
Rhus radicans ssp. *rydbergii*	poison ivy (shrub form)	2	2	0	2	6	L5
Rhus typhina	staghorn sumach	2	1	2	2	7	L5
Rubus allegheniensis	common blackberry	2	3	0	1	6	L5
Rubus idaeus ssp. *melanolasius*	wild red raspberry	1	1	0	1	3	L5
Rubus occidentalis	wild black raspberry	2	1	0	1	4	L5
Rubus odoratus	purple-flowering raspberry	2	2	2	2	8	L5
Salix exigua	sandbar willow	2	1	5	2	10	L5
Solanum ptychanthum	American black nightshade	4	1	4	0	9	L5
Solidago altissima	tall goldenrod	1	2	0	0	3	L5
Solidago canadensis var. *canadensis*	Canada goldenrod	2	2	0	1	5	L5
Solidago flexicaulis	zig-zag goldenrod	2	1	3	2	8	L5
Solidago gigantea	late goldenrod	2	1	1	1	5	L5
Solidago nemoralis ssp. *nemoralis*	grey goldenrod	2	2	2	2	8	L5
Tilia americana	basswood	1	4	2	3	10	L5
Ulmus americana	white elm	1	4	0	2	7	L5
Verbena hastata	blue vervain	2	2	4	2	10	L5
Verbena urticifolia	white vervain	2	2	2	2	8	L5
Viburnum lentago	nannyberry	2	3	1	2	8	L5
Vitis riparia	riverbank grape	1	1	0	0	2	L5
Agrostis gigantea	redtop	3				3	L+
Ailanthus altissima	tree-of-heaven	5				5	L+
Alliaria petiolata	garlic mustard	2				2	L+
Arctium lappa	great burdock	3				3	L+
Arctium minus ssp. *minus*	common burdock	3				3	L+
Artemisia vulgaris	common mugwort	4				4	L+
Asparagus officinalis	asparagus	4				4	L+
Barbarea vulgaris	winter cress	3				3	L+
Bromus inermis ssp. *inermis*	smooth brome grass	3				3	L+
Bromus tectorum	downy chess	4				4	L+
Campanula rapunculoides	creeping bellflower	3				3	L+
Capsella bursa-pastoris	shepherd's purse	4				4	L+
Cardamine impatiens	balsam bitter cress	5				5	L+
Centaurea maculosa	spotted knapweed	4				4	L+
Cerastium fontanum	mouse-ear chickweed	3				3	L+
Chenopodium album var. *album*	lamb's quarters	3				3	L+
Chrysanthemum leucanthemum	ox-eye daisy	3				3	L+
Cichorium intybus	chicory	3				3	L+
Cirsium arvense	creeping thistle	2				2	L+
Cirsium vulgare	bull thistle	3				3	L+
Coronilla varia	crown vetch	4				4	L+
Cynanchum rossicum	dog-strangling vine	3				3	L+
Dactylis glomerata	orchard grass	3				3	L+

Appendix 2: Flora Species at Beechwood Wetland and Cottonwood Flats 2010							
		Local	Popn.	Hab.	Sens.	Total	Rank
N.B. "p" = planted; "pr"= planted but regenerating from planting.		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Daucus carota	Queen Anne's lace	3				3	L+
Dianthus armeria	Deptford pink	4				4	L+
Dipsacus fullonum ssp. *sylvestris*	teasel	4				4	L+
Echinochloa crusgalli	barnyard grass	4				4	L+
Echium vulgare	viper's bugloss	4				4	L+
Elaeagnus angustifolia	Russian olive	3				3	L+
Elymus repens	quack grass	3				3	L+
Epilobium parviflorum	small-flowered willow-herb	4				4	L+
Epipactis helleborine	helleborine	3				3	L+
Euonymus europaea	European spindle-tree	4				4	L+
Festuca pratensis	meadow fescue	3				3	L+
Festuca rubra ssp. *rubra*	red fescue	3				3	L+
Galium verum	yellow bedstraw	4				4	L+
Geum urbanum	urban avens	3				3	L+
Glechoma hederacea	creeping Charlie	3				3	L+
Gleditsia triacanthos	honey locust	5				5	L+
Hemerocallis fulva	orange day-lily	4				4	L+
Hesperis matronalis	dame's rocket	2				2	L+
Hieracium piloselloides	smooth yellow hawkweed	3				3	L+
Hordeum jubatum ssp. *jubatum*	squirrel-tail barley	4				4	L+
Hypericum perforatum	common St. Johnswort	3				3	L+
Juncus compressus	round-fruited rush	4				4	L+
Juniperus chinensis	Chinese juniper	5				5	L+
Linaria vulgaris	butter-and-eggs	3				3	L+
Lithospermum officinale	Eurasian gromwell	4				4	L+
Lonicera morrowii	Morrow's honeysuckle	3				3	L+
Lotus corniculatus	bird's foot trefoil	3				3	L+
Lythrum salicaria	purple loosestrife	3				3	L+
Malus pumila	apple	2				2	L+
Malus x *robusta*	crab-apple	5				5	L+
Matricaria matricarioides	pineappleweed	5				5	L+
Medicago lupulina	black medick	3				3	L+
Melilotus alba	white sweet clover	3				3	L+
Morus alba	white mulberry	4				4	L+
Nepeta cataria	catnip	3				3	L+
Phleum pratense	Timothy grass	3				3	L+
Plantago lanceolata	English plantain	4				4	L+
Plantago major	common plantain	3				3	L+
Poa compressa	flat-stemmed blue grass	3				3	L+
Poa pratensis ssp. *pratensis*	Kentucky blue grass	3				3	L+
Polygonum aviculare	prostrate knotweed	4				4	L+
Polygonum convolvulus	black bindweed	4				4	L+
Polygonum cuspidatum	Japanese knotweed	4				4	L+
Polygonum persicaria	lady's thumb	3				3	L+
Polygonum x bohemicum	hybrid giant knotweed						L+
Populus alba	white poplar	4				4	L+
Portulaca oleracea	purslane	5				5	L+
Potamogeton crispus	curly pondweed	4				4	L+
Potentilla recta	sulphur cinquefoil	3				3	L+
Puccinellia distans	alkali grass	4				4	L+
Pyrus communis	pear	4				4	L+
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 multiflora	multiflora rose	3				3	L+
Rumex crispus	curly dock	3				3	L+
Salix fragilis	crack willow	4				4	L+
Salix x *rubens*	European tree willow	3				3	L+
Saponaria officinalis	bouncing Bet	4				4	L+

Appendix 2: Flora Species at Beechwood Wetland and Cottonwood Flats 2010							
		Local	Popn.	Hab.	Sens.	Total	Rank
N.B. "p" = planted; "pr"= planted but regenerating from planting.		Occur.	Trend	Dep.	Dev.	Score	TRCA
Scientific Name	Common Name	1-5	1-5	0-5	0-5	2-20	(03/2009)
Setaria glauca	yellow foxtail	5				5	L+
Setaria verticillata var. *verticillata*	bristly foxtail	5				5	L+
Setaria viridis	green foxtail	4				4	L+
Silene pratensis	evening lychnis	4				4	L+
Solanum dulcamara	bittersweet nightshade	3				3	L+
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	5				5	L+
Syringa vulgaris	common lilac	3				3	L+
Tanacetum vulgare	tansy	4				4	L+
Taraxacum officinale	dandelion	3				3	L+
Torilis japonica	hedge-parsley	4				4	L+
Tragopogon dubius	lemon-yellow goat's beard	3				3	L+
Tragopogon pratensis ssp. *pratensis*	meadow goat's beard	3				3	L+
Trifolium pratense	red clover	3				3	L+
Trifolium repens	white clover	3				3	L+
Typha angustifolia	narrow-leaved cattail	3				3	L+
Typha x *glauca*	hybrid cattail	3				3	L+
Ulmus pumila	Siberian elm	4				4	L+
Urtica dioica ssp. *dioica*	European stinging nettle	4				4	L+
Valeriana officinalis	common valerian	4				4	L+
Verbascum thapsus	common mullein	3				3	L+
Verbena bracteata	creeping vervain	5				5	L+
Vicia cracca	cow vetch	3				3	L+
Acer negundo	Manitoba maple	2	0	0	2	4	L+?
Agrostis stolonifera	creeping bent grass	3				3	L+?
Chamaesyce maculata	spotted spurge	5				5	L+?
Eragrostis pectinacea var. *pectinacea*	tufted love grass	5				5	L+?
Lepidium densiflorum	common pepper-grass	5				5	L+?
Phalaris arundinacea	reed canary grass	3				3	L+?
Phragmites australis	common reed	3				3	L+?
Potentilla norvegica	rough cinquefoil	4				4	L+?
Platanus occidentalis	sycamore	5	5	5	4	19	pL1
Decodon verticillatus	swamp loosestrife	4	5	4	5	18	pL2
Pinus resinosa	red pine	2	5	5	5	17	pL2
Sorghastrum nutans	Indian grass	5	4	5	4	18	pL2
Iris virginica	southern blue flag	5				5	pL3
Larix laricina	tamarack	2	4	4	4	14	pL3
Picea glauca	white spruce	1	5	4	4	14	pL3
Salix lucida	shining willow	2	4	5	3	14	pL3
Salix nigra	black willow	3	2	5	4	14	pL3
Scrophularia lanceolata	lance-leaved figwort	5	3	4	2	14	pL3
Spartina pectinata	prairie cord grass	4	3	5	3	15	pL3
Sphenopholis intermedia	slender wedge grass	3	3	4	4	14	pL3
Amelanchier arborea	downy serviceberry	3	2	4	3	12	pL4
Betula papyrifera	paper birch	1	4	2	4	11	pL4
Elymus canadensis	Canada wild rye	3	2	5	3	13	pL4
Pinus strobus	white pine	1	4	3	4	12	pL4
Rudbeckia hirta	black-eyed Susan	1	4	4	3	12	pL4
Salix discolor	pussy willow	2	3	4	3	12	pL4
Spiraea alba	wild spiraea	2	4	4	3	13	pL4
Thuja occidentalis	white cedar	1	4	1	5	11	pL4
Tsuga canadensis	eastern hemlock	1	4	3	5	13	pL4
Cornus stolonifera	red osier dogwood	1	2	0	3	6	pL5
Populus tremuloides	trembling aspen	1	3	1	3	8	pL5
Sambucus canadensis	common elderberry	2	3	2	2	9	pL5
Thalictrum dioicum	early meadow rue	2	3	3	2	10	pL5
Alnus glutinosa	European alder	4				4	pL+
Cercis canadensis	redbud						pL+
Echinacea purpurea	purple coneflower	5				5	pL+
Rudbeckia fulgida	orange coneflower	5				5	pL+
Rosa virginiana	Virginia rose	5				5	pL+?
Nymphaea odorata ssp. *tuberosa*	tuberous water-lily	5	4	5	3	17	prL2

Appendix 2: Flora Species at Beechwood Wetland and Cottonwood Flats 2010

N.B. "p" = planted; "pr"= planted but regenerating from planting.

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)
Calamagrostis canadensis	Canada blue joint	1	3	4	4	12	prL4
Eupatorium perfoliatum	boneset	1	3	4	3	11	prL4
Juncus balticus	Baltic rush	4	2	5	2	13	prL4
Juncus torreyi	Torrey's rush	2	3	4	2	11	prL4
Rudbeckia laciniata	cut-leaved coneflower	3	2	4	2	11	prL4
Scirpus validus	soft-stemmed bulrush	2	2	5	3	12	prL4
Silphium perfoliatum	cup-plant	5	1	3	2	11	prL4
Anemone canadensis	Canada anemone	2	2	2	2	8	prL5
Eupatorium maculatum ssp. *maculatum*	spotted Joe-Pye weed	2	2	3	3	10	prL5

Total species count	**251**
Not Planted	211
Natives (not planted)	97
Exotics (not planted)	114
% native (not planted)	46.0%
% exotic (not planted)	54.0%
L1-L3 (not planted)	9
L4 (not planted)	13
Planted	30
Planted with regen	10
L1-L3 planted	13
L4 planted	16