Oak Ridges Moraine Corridor Park

Terrestrial Monitoring Baseline Conditions Report

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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) has developed and is implementing a long-term Regional Watershed Monitoring Program (RWMP) that is designed to assess the health of the region's watersheds and natural heritage features. In 2008, this program was augmented with the addition of a number of terrestrial long-term fixed plots to detect regional trends and changes in the vegetation, breeding birds, amphibians and Plethodontid salamander communities over time.

TRCA biologists established fixed plots at the Oak Ridges Moraine Corridor Park (ORMCP) in 2008 through funds obtained by the Oak Ridges Moraine Foundation (see Map 1). Plots were placed in forest, wetland and meadow habitat types using the TRCA's Long Term Monitoring Project (LTMP) protocol. Such habitats were identified across the entire park in 2006 when it was subject to an inventory of vegetation communities, flora, and fauna species according to the TRCA field inventory protocol (TRCA 2007). This biological inventory provided a one-time picture of the flora and fauna across the park. The purpose of the LTMP plots is to detect changes and trends in the flora and fauna communities over time. Through the use of standardized scientific data collection protocols, the response of the terrestrial system to various landscape changes such as increased natural cover through reforestation efforts or to increased use of the natural area due to recent nearby urbanization can be quantitatively documented. The assessment of changes in these natural systems can then be used to better guide management actions on site with the aim of improving overall biodiversity.

The purpose of this report is to characterize the fauna and flora communities at ORMCP at the time of initial plot set-up and data collection (2008 and 2009). These two years of data collection will represent the baseline conditions at ORMCP. As the purpose of monitoring is to detect change, several years of data (at least five) are required in order to have a data set that is large enough to conduct analysis and to start to identity any trends. It will be important then, to secure additional funding in order to continue monitoring at this location.

2.0 Methodology

The monitoring methodology employed at ORMCP is the same as that used for the TRCA's regional terrestrial long-term monitoring initiative. By implementing the same monitoring protocols at ORMCP, a larger data set is available for comparison. This is truly advantageous as the data collected at ORMCP can be validated by being placed into a larger regional context which is important during the data analysis stages. For the full monitoring methodology used by TRCA for its forest, wetland, and meadow stations please refer to TRCA (2009).

2.1 Selection of Site Quality Indicators

Before plots were set up, several indicators needed to be chosen in order to interpret site quality. While measures of tree health are self-explanatory, how does one measure and interpret species richness and biodiversity?
Species richness and the relative dominance of native or exotic species are important indicators of ecosystem health. A closer look at the native flora and fauna present at a site reveals that they vary in their degrees of tolerance to disturbance. Some are indicators of high-quality remnant habitat, thus of successful preservation or restoration efforts. They are of greater conservation concern. Others occur in a wide range of disturbed habitats. Various methods of assessment can be used to interpret any observed changes in composition of plants or animals. TRCA has developed a local ranking system for flora and fauna species; this ranking system was designed to reflect the ability of each species to thrive in the changing landscape of the Toronto region. The ranks range from the extremely sensitive species (L1) to the largely urban tolerant species (L5), with an additional L-rank for exotic (non-native) species (L+). Ranks are reviewed annually and subject to updates (TRCA 2010). Species with ranks of L1 to L3 are considered to be of concern throughout the TRCA jurisdiction, while those ranked L4 are of intermediate sensitivity and are of conservation concern within urban and suburban landscapes such as those that prevail around ORMCP.

An additional ranking system for plants, the coefficient of conservatism (CC) was used for calculating Floristic Quality Index (FQI) of the plots. The CC is assigned to native plants and is a measure of a plant's fidelity to high-quality remnant habitats (with 10 being the most sensitive score and 0 the lowest). This system is used for various regions across North America (Masters 1997). It therefore provides us with a continent-wide standard for assessing site biodiversity and quality. TRCA uses the CC values assigned for southern Ontario plants by Oldham *et al*. (1995).

Breeding bird diversity will be tracked by referring to habitat guild-groupings; these guild groupings are listed in Appendix 6 and were produced primarily through staff biologists' understanding of the various species' nesting requirements.

2.2 Forest Monitoring Methodology

Forest monitoring plots at ORMCP were established to identify the health and condition of the vegetation and bird communities associated with this habitat feature and to track changes in their condition over time. The data will broaden the understanding of the effects of local land use and management decisions. For example, if this monitoring reveals declines in tree health and floristic quality, an attempt will be made to identify the causes of such declines and adjustments may be made to the management policies to reverse these trends.

Specifically, vegetation monitoring within the forest plot is designed to:

- Determine the health of forests at ORMCP

- Determine regeneration rates in the understory of saplings
- Determine if the population and abundance of flora species, including those of conservation concern, are changing over time
- Determine the floristic quality of the site.
- Determine the rate of spread of selected invasive species, and
- To determine if non-native invasive species are replacing native species.

The purpose of establishing bird monitoring stations in the forest patches at the ORMCP is to facilitate management decisions regarding future restoration efforts. The fact that the TRCA is concurrently running a regional monitoring project means that any trends identified through the monitoring of local bird species' populations and richness at the ORMCP can be compared to the broader regional trends. This comparison enables the TRCA to identify whether trends are due to local influences or not. Either way, future management decisions can then be steered to address these trends.

2.2.1 Vegetation Plots

Forest plots were set up according to standards developed by Environment Canada's Ecological Monitoring and Assessment Network (EMAN 2004a, EMAN 2004b, Roberts-Pichette and Gillespie 1999), with slight modifications. This is the same protocol used by TRCA to monitor a network of forest plots through the RWMP, and is almost identical to that used by the Credit Valley Conservation in its forest plot monitoring (CVC 2010).

Detailed information on plot set-up can be found in TRCA (2009). In summary, each forest plot consists of one 20 x 20 m square plot (i.e. 400 m^2) for monitoring tree health; and five 2 x 2 m subplots (i.e. 4 m^2) for monitoring saplings and shrubs. Four of the subplots are placed 1 m outside the perimeter of the 20 x 20 m tree health plot, and the fifth is located in its centre. Ground vegetation is measured in a 1 x 1 m subsection (1 m^2) of each subplot at its southwest quarter (Figure 1). Two visits are conducted per year: in the spring and in early-to-mid summer.

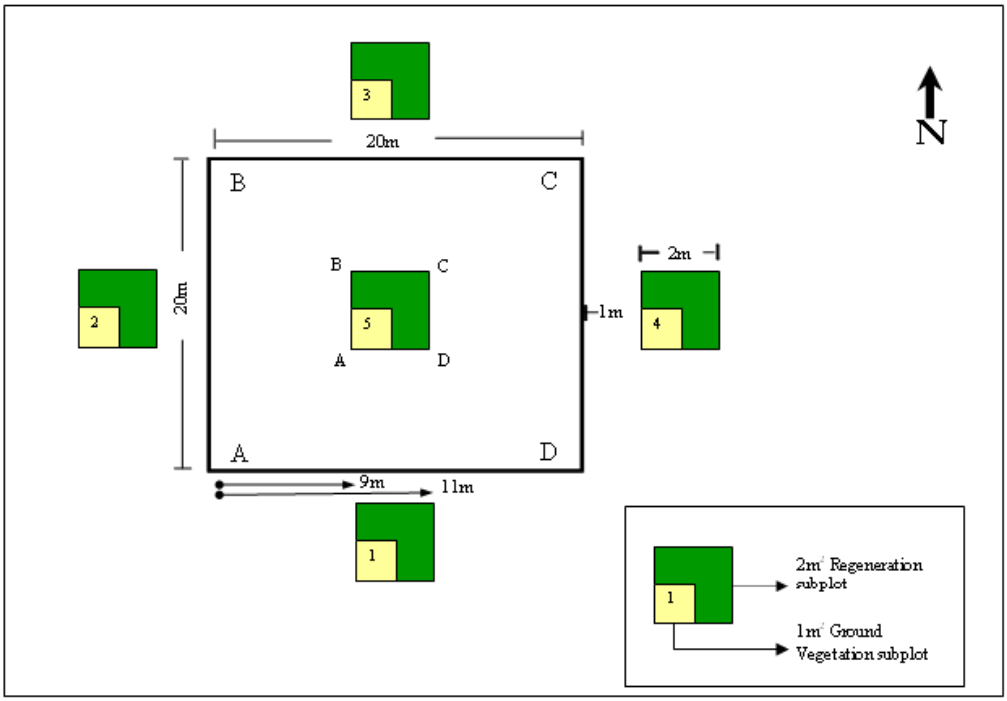

Figure 1. Forest plot design (not to scale)

Variables Monitored and Monitoring Frequency

Tree health is assessed in early-to-mid summer (late June to early August) when trees are in full leaf but prior to any late summer onset of natural senescence. Tree health is monitored in the 20 x 20 m plot. All trees >10 cm diameter at breast height (dbh) are assessed. Tree health assessment includes a variety of measures including; age, tree height, tree diameter, condition, crown class, crown vigour and stem defects. A detailed summary of the measures taken and their frequency is shown in Table 1.

Tree regeneration and shrub assessment is done during the main early-to-mid summer visit (late June to early August). Assessments are undertaken in each of the 4 m^2 subplots and include all woody plants (including vines) that are over 16 cm in height but less than 10 cm dbh. Stem counts by 6 height classes (16-35, 36-55, 56-75, 76-95, 96-200 cm and over 2 m) are recorded for each species. In addition, surveyors obtain a percentage cover estimate based on those stems that originate within the subplot. Tree saplings and shrubs are measured at the same time but are separated for analysis purposes because saplings represent the future tree canopy, while shrubs always remain in the understorey. Woody vines are counted with the shrubs.

Ground vegetation assessment is conducted twice per year (Table 1). The first visit in May captures spring ephemerals, while the second assessment in summer at the same time as the sapling and shrub assessment captures herbaceous species that emerge more slowly and remain visible through the growing season. Ground vegetation measurements in the 1 m^2 subsections include percentage cover of vascular plants by species and also mosses and liverworts as

groups. Cover assessment includes overhanging leaves as well as stems originating from within the subsection.

Finally, a total list of all vascular plant species is taken every year for each plot. This includes all types and sizes found within the 400 m^2 tree health plot as well as the subplots. The species list yields the following information:

- Total species richness (number of species)
- Number of native versus exotic species
- Occurrence of species of regional (or urban) concern (ranks L1 to L3 (L4))
- Mean coefficient of conservatism – see Masters (1997) for explanation
- Floristic Quality Index (FQI) – calculated from native species richness and mean coefficient of conservatism (TRCA 2009).

Table 1. Forest vegetation monitoring variables and frequency

Indicator	Variable	Details	Frequency
Tree Health	Age of Stand	Cores taken from 5 trees outside plot	Once at plot set-up
	Tree Height and Diameter	Height as measured with range-finder and diameter at breast height	At plot set-up, then every 5 years; new recruits as they appear
	Tree Status and Condition	Living/dead/damaged/leaning etc.	Annually
	Crown Class	Dominant, co-dominant, intermediate, suppressed	Annually
	Crown Vigour	Fullness of canopy, presence of dieback	Annually
	Stem Defects	Wounds, scars, seams, decay, disease, insect damage	Annually
Tree Regeneration	Stem Counts	By species in 6 height classes	Annually
	% Cover by Species	Based on all stems that originate within the subplots	Annually
Shrubs and Woody Vines	Stem Counts	By species in 6 height classes	Annually
	% Cover by Species	Based on all stems that originate within the subplots	Annually
Ground Vegetation	% Cover	Cover estimates including overhang for all species found in 1 m^2 subplot	Twice annually (spring and summer)
All Vascular Plants	Total Species Richness	All species recorded in main tree health plot plus subplots	Annually (pool both visits)
	# Native vs. Exotic	Separation of species identified into native (L1-L5) and exotic (L+)	Annually
	Occurrence of Species of Conservation Concern	Native species are subdivided into species of regional concern (L1-L3), species of urban concern (L4), and species not of concern (L5)	Annually

A photo of the forest plot is taken for documentation purposes. It is taken from the southwest corner of the tree health plot (post A) diagonally toward the northeast (post C). GPS co-ordinates for the plot were taken (Appendix 1).

2.2.2 Forest Bird Stations

Forest birds were monitored using the Forest Bird Monitoring Program (FBMP) protocol designed by the Ontario Ministry of Natural Resources. This protocol was originally developed for use in large forest patches across the Province and plots are generally centred at least 100 m inside the edge of the forest patch in order to target forest bird species. This is not possible in many parts of the TRCA jurisdiction due to historic forest loss and fragmentation. Nevertheless, the protocol provided by the FBMP still works very well as a monitoring technique at the site level.

Despite extensive fragmentation at ORMCP, two station locations have been selected which satisfy the 100 metre requirement although the forest definition has been extended to include treed swamp for one of the locations. A third station is located in a forest patch that is too small to accommodate a 100 metre radius survey area, but adjacent lands have been recently planted with trees and in time the forest patch will become considerably larger.

The centre of each plot is marked with a piece of rebar hammered into the ground (with the top 2-5 cm remaining above ground) in order to be able to repeat the monitoring from exactly the same location in future visits. This location is referenced using a GPS unit to ensure repeatability at that location (see Appendix 1 for the UTM coordinates of each station).

The forest bird stations are monitored twice per year at times considered optimum for recording forest bird breeding species. The first count is conducted between 24th May and 17th June; the second count should be conducted no sooner than 10 days after the first visit and between the dates 13th June and 10th July. Many species that are recorded before the first week of June may still be passing through the area as migrants, therefore registering a second observation in late June or July supports the indication of a territorial, and likely breeding individual. All counts should be completed between 05:00 and 10:00. The second visit should maintain the same timing for each station, and likewise an attempt should be made to maintain the same schedule of visits in subsequent years for as long as the project runs.

Counts are conducted in weather conditions that optimize the detection of songbird species. Ideally there should be very little to no wind, and precipitation should be at most a light rain. Overnight rainfall will also potentially have considerable impact on the ability of the recorder to hear bird song and calls since the noise from dripping trees may be enough to mask quieter species.

The FBMP requires the biologist to plot every individual bird observed and heard within a 100 m circle centred on the point station over a ten minute period. In addition, any birds identified at distances beyond the 100 m circle are mapped at their approximate position. The count period is divided into two five minute segments with the observations divided between them. The following metadata are recorded on the field forms: date and start time of count period, weather conditions (wind speed and direction, cloud cover and precipitation), and observer.

2.3 Wetland Monitoring Methodology

Wetland monitoring plots at ORMCP were established to identify the health and condition of the wetland habitats through the monitoring of selected indicators. This data will broaden the understanding of the effects of local land use and management decisions. For example if this monitoring reveals declines in wetland floristic quality then adjustments may be made to the management policies to reverse these trends. Three parameters including vegetation, birds and frogs will be used to document change over time in wetland ecosystems. Specifically, wetland monitoring will address the following:

- To determine the health of wetlands at ORMCP
- To determine if the population and abundance of flora and fauna species, including those of conservation concern, are changing over time
- To determine the floristic quality of the site
- To determine the rate of spread of selected invasive species
- To determine if non-native invasive species are replacing native species.

2.3.1 Vegetation Transects

Wetland vegetation is monitored along a 50 m transect, capturing a gradient of conditions (terrestrial to aquatic) that occur in most wetlands. Where possible, the first post lies immediately outside the wetland in an adjacent terrestrial system polygon, while the remainder of the transect is in wetland vegetation.

Posts (lengths of white PVC pipe) are placed at 10 m intervals along the transect, and vegetation monitoring subplots occur 5 m on either side of each post. Thus, there are paired subplots at the 0, 10, 20, 30, 40 and 50 m points along the transect: 12 in total. Subplots for tree regeneration and shrubs are 2 x 2 m (4 m^2), while the rear outer quarter (1 x 1 m subsections) of each 4 m^2 subplot is used for ground vegetation) (Figure 2). Detailed information on wetland transect layout can be found in TRCA (2009).

Six transects were set up at ORMCP (WV-7, WV-7A, WV-7B, WV-7C, WV-7D and WV-7E) in order to capture the range of wetland types present in the park (one transect – WV-7 Radio Tower Wetland – is also part of the regional monitoring network). The exception was the highly sensitive kettle peatland communities found at the south end of Philips Lake and north of Bond Lake. It was feared that the trampling disturbance caused by permanent plot set-up and yearly sampling would damage these communities. Instead of setting up plots, TRCA staff will visit these critically-important sites every five years to conduct an inventory of flora species and a rough population estimate of the more sensitive species. They were most recently visited as part of the biological inventory of the entire ORMCP in 2006. Transect locations were mapped with GPS readings (Appendix 1; Map 1).

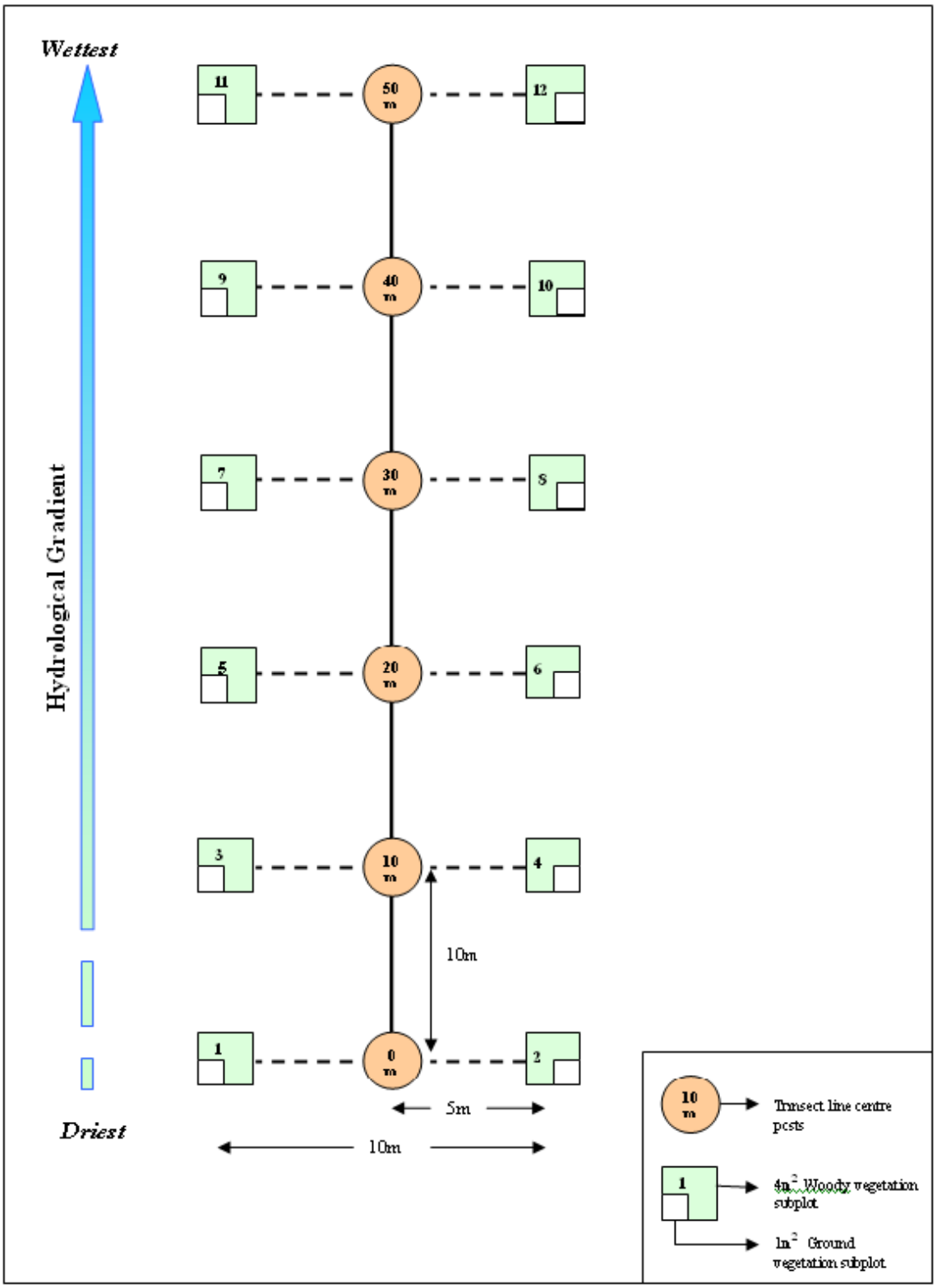

Figure 2. Wetland transect design (not to scale)

All wetland vegetation data are collected concurrently, in mid-to-late summer (late July to mid-September). This corresponds with full vegetation expansion before autumnal die-back and with relatively low water levels. The timing also harmonizes with the schedule for the forest plots, which are sampled earlier in the season.

Variables Monitored and Monitoring Frequency

Physical characteristics are assessed along with various vegetation parameters on the transect (see Table 2). Water depth is measured yearly at each of the 10 m intervals on the transect (0 to 50 m). Soils are sampled at 3 of the 10 m intervals along the transect (0 m, 30 m, 50 m) on a 5-year rotation. The depth of the organic horizon (peat or muck, if any) is recorded, as well as the presence of carbonates. Carbonates are detected by the fizzing reaction when the soil sample is treated with muriatic acid.

Trees are sampled at the 20 m post of each wetland plot. The data are simply a count of stems (living or dead) that are greater than 10 cm diameter at breast height (dbh). Tree data are collected every five years. Surveyors use a forestry prism to record tree stems.

Tree saplings, woody vines, and shrubs are counted in each of the twelve 2 x 2 m subplots if they are >2 m in height but less than 10 cm dbh. However, only 3 height classes are taken: 16-95 cm, 96-200 cm and over 2 m. Cover estimates (percentage) of all species (using those stems that originate within the plot) are also taken. This is done annually.

Data on herbaceous plants (and woody seedlings <16 cm in height) are recorded within the 1 x 1 m subsections of each of the 12 subplots (Figure 2). Percent cover estimates are taken for each vascular species, as well as mosses, liverworts, and algae by group.

The total list of vascular plants includes all woody and non-woody plants found within the subplot surveys plus any trees captured by the prism sweep. Species richness, proportion of native and exotic species, coefficients of conservatism, and floristic quality indices are derived from the species list.

Table 2. Wetland vegetation monitoring variables and frequency

Indicator	Variable	Details	Frequency
Physical Environment	Water depth	At 10 m intervals along the transect	Annually
	Soil organic layer	Depth of organic horizon at 0, 30, 50 m post on transect	Every 5 years
	Soil carbonates	Presence of calcium carbonate at 0, 30, 50 m post on transect	Every 5 years
	Cover	Based on all stems that originate within subplots	Annually
Herbaceous Plants	Cover	Cover estimates including overhang for all species found in 1 m^2 subplot	Annually
All Vascular Plants	Total Species Richness	All species recorded in prism sweep plus subplots	Annually
	# Native vs. Exotic	Separation of species identified into native (L1-L5) and exotic (L+)	Annually
	Occurrence of Species of Conservation Concern	Native species are subdivided into species of regional concern (L1-L3), species of urban concern (L4), and species not of concern (L5)	Annually

2.3.2 Wetland Bird Stations

Monitoring stations were set-up following the Marsh Monitoring Program (MMP) protocol that was established by Bird Studies Canada (BSC). This protocol provides a convenient method for conducting long term monitoring of both birds and frogs in marshes of a wide variety of size and quality (BSC 2008).

Plot set-up involves the placement of a permanent marker (e.g. iron re-bar, or wooden stake) at the centre of the long axis of the mapped count-semi-circle. This location is geo-referenced using a GPS unit (See Appendix 1 for list of UTM coordinates). There is a requirement in the protocol for all bird-stations on a route to be distanced at least 250 m from each other.

Observations and counts are undertaken in a semi-circle from the station marker since in general, stations are located at the edge of the wetland. It is therefore important to ensure that the orientation of the semicircle is constant from visit to visit. Orientation is documented using a compass (see Appendix 1 for the UTM coordinates and orientation of each wetland station).

The wetland stations are monitored twice per year at times considered optimum for recording wetland bird breeding species. The first count is conducted between 20th May and 5th July; the second count should be conducted no sooner than 10 days after the first visit.

Counts are conducted in weather conditions that optimize the opportunity for the biologist to hear and observe wetland bird species. Ideally, there should be no wind (very light wind is acceptable), and precipitation should be light rain at the very most. The surveys are conducted in the morning hours a half hour before sunrise and end by 10:00 during appropriate weather conditions for bird activity.

The variables assessed and the timing/frequency of data collected is indicated in Table 3.

Table 3. Wetland fauna monitoring variables and frequency

Indicator	Variable	Details	Frequency
Frog population	chorus intensity	code assigned to intensity of chorus (c = 1, 2 or 3)	three times per year
Bird population	number of individuals of each species	count of number of adults observed using the habitat within the count area	twice per year

The MMP counts are conducted in a similar manner to the protocol used in the forest habitat. There are two main differences: first, a small suite of focal species (birds that rely on marshes as breeding habitat, i.e. obligate marsh breeders) are mapped separately. This is simply to aid in the tracking of these particular species at the broader continental scale since the MMP is an international project. Second, individuals observed beyond the 100 m count boundary are merely noted by species and neither counted nor mapped individually. Two additional items of metadata are recorded on the field forms: a measure of background noise, and the orientation of the count semicircle (it is very important that this orientation is constant for each visit).

2.3.3 Frog Stations

Frogs are an effective monitoring indicator since they are habitat dependent and respond relatively rapidly to changes in environmental quality. Frog monitoring stations established in the wetlands at the ORMCP will enable land managers to track changes in habitat quality and make decisions that will improve the condition of the local natural environment.

Plots were set-up and monitored following the MMP in the same manner as wetland birds. The frog stations are 100 m semi-circles with orientation noted and maintained on each visit; these frog stations need to be at least 500 m apart.

The determination of the appropriate time to conduct amphibian surveys is primarily dictated by local weather and temperature conditions. Surveys are conducted on relatively warm and moist nights that have little to no wind (based on the Beaufort Wind Scale). Not only will strong winds dry out the skin of the amphibian causing them to remain under water and hinder calling activity but it will also impair the ability of the observer to effectively listen to any calling/singing.

Temperature guidelines change with each visit. For the first visit in the spring, night temperatures should be above 5°C, at least 10°C for the second visit and at least 17°C for the third and final visit. Surveys begin one half hour after sunset and end before midnight. When deciding on the date to conduct a survey, night air temperatures and lack of wind are the most important factors to consider (BSC 2008).

The same metadata are collected on the field data forms for frogs as for wetland birds. However, reporting and mapping of the frogs themselves is entirely different. A point is mapped on the field sheet representing the position of separate choruses audible from the station. These choruses are mapped both within and beyond the count semi-circle. The intensity of each chorus is indicated by a number-code associated with each observation:

1. Code 1 indicates that activity is very low with individual calls readily differentiated with no overlap.
2. Code 2 indicates that activity is moderate with enough individuals calling such that calls overlap with each other, but not to the extent that the number of individuals cannot be distinguished.
3. Code 3 indicates a full chorus; so many individuals are calling that an accurate count is not possible.

Monitoring for frogs and toad species are done three times annually during the peak breeding times for the individual species. The early breeders (chorus frog, *Pseudacris triseriata*, wood frog, *Rana sylvatica*, and spring peeper, *Pseudacris crucifer*) are captured during April visits, the mid-breeders (American toad, *Bufo americanus*, northern leopard frog, *Rana pipiens*, and pickerel frog, *Rana palustris*) during May visits and the late breeders (gray treefrog, *Hyla versicolor*, mink frog, *Rana septentronalis*, green frog, *Rana clamitans*, and bullfrog, *Rana catesbeiana*) during June visits. Each visit is separated by at least 15 days.

2.4 Meadow Monitoring Methodology

Only one parameter – bird population - was used to document change over time in the meadow ecosystem within the study area.

Meadow Bird Stations

In the absence of any bird monitoring protocols designed specifically for meadow habitat it was decided to simply use the FBMP protocol and to adjust the suite of target species during analysis.

Variables Monitored and Monitoring Frequency

Meadow habitat bird species tend to acquire territories and nest a little earlier than forest habitat species, therefore the timing of the two visits is likewise earlier. Each station is sampled twice per

year with the first visit occurring between May 15th and May 30th, and the second visit between May 30th and June 15th, with at least 10 days between visits. Counts are conducted between 05:00 and 10:00, and at approximately the same time of day on subsequent visits from year to year.

The same metadata and variables are collected on the field data forms for the meadow site as for the forest sites.

3.0 Results

The findings documented in this report cover the first two years of monitoring during 2008 and 2009. Therefore, what is presented here represents the baseline conditions at ORMCP. Statistical analysis can commence when there is a sufficient timeline of data (5 years). At present, ORMCP data can be compared roughly with regional results collected by the nearby Credit Valley Conservation Authority monitoring program (CVC 2010).

3.1 Forest Monitoring

3.1.1 Vegetation

History and Age

Given the small amount of existing forest habitat present at ORMCP, a single forest plot (FV26-A) was set up in 2009. This plot appeared to have two main age classes. There were a few older trees (diameter over 25 cm) and an abundance of tall but less mature trees (diameter mostly 11-20 cm). One older sugar maple (*Acer saccharum* ssp. *saccharum*) was sampled with an age of 75 years; the other four ranged in age from 19 to 36 years. This structure, together with the presence of declining shade-intolerant pin cherry (*Prunus pensylvanica*), suggests that the woodlot was heavily logged around the late 1970s. Only a few older trees would have been left standing and the open areas between quickly filled in with saplings.

Tree Composition

In 2009, the 20 m x 20 m tree health plot contained 32 live trees of ≥10 cm diameter. Two trees were dead, one of which had fallen between November 2008 and July 2009. Twenty-four of the live trees (75% of the total 32) were sugar maple. There were also three (i.e. 9% of the total) white ash (*Fraxinus americana)* three pin cherry, one black cherry (*Prunus serotina*) and one American beech (*Fagus grandifolia*). The ELC vegetation type is Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1), as supported by both the 2006 ELC survey data and the forest plot data.

Tree Health

All of the trees with the exception of pin cherry were healthy, with little or no crown dieback (<10%). This accounts for 88% of the total. The proportion of declining trees is well below the threshold of concern (25%) established by EMAN (Sajan 2006). On the other hand, two of the three pin cherry trees were in severe decline and one in moderate decline. (A fourth one was dead).

Twenty-three of the 32 live trees had no stem defects recorded at all. Five had open wounds (mostly minor) and two had closed wounds. One tree had a frost crack. One sugar maple exhibited *Eutypella* canker, which is usually a mild affliction and is not a threat to overall forest health or the success of the maple species it usually affects.

Sapling and Shrub Composition

Shrubs and saplings are scarce in this plot. Three of the five subplots had no shrubs or regeneration in 2009. Two subplots had a sugar maple sapling (>2 m height class) and one had a white ash seedling (16-35 cm height class). One subplot had nine pin cherry suckers. These were etiolated (i.e. pale, weak, and straggling) and had emerged from the root system of older trees; there is insufficient light to sustain growth. Overall, the cohort of youngish sugar maple trees has dominated resources to the extent that there are few saplings or shrubs.

Ground Vegetation Composition

Ground vegetation was also sparse. Only one of the subplots had over 50% cover, largely due to a patch of blue cohosh (*Caulophyllum giganteum*). Yellow trout-lily (*Erythronium americanum*) was widely but unevenly present with a range of less than 1% to 37% cover in the spring. Otherwise, there was a minimal presence (<1%) of Jack-in-the-pulpit (*Arisaema triphyllum*), various tree seedlings, and mosses.

Species Richness and Floristic Quality

Floristic quality, based on the species list for the whole plot (tree health plot plus subplots), was revealed by several indicators: native species richness and proportion of native species; the presence and number of species of regional concern (TRCA L-rank L1 to L3); the mean coefficient of conservatism (CC) of the native species found within the plot, and the plot Floristic Quality Index (FQI) derived from native species richness and mean CC. In addition, mean percent cover of exotic species within the subplots can serve as an indicator of invasion disturbance.

The forest plot at ORMCP exhibits low diversity but also low invasion. It is dominated by only a few species, but these tend to be native species; 83% of the total is native (Table 4). There were no L1 to L3 species found within the plot, and the mean coefficient of conservatism was 4.1. The FQI was 18.1. These values are well within the range reported by the Credit Valley Conservation

Authority at its forest plots (CVC 2010); and they are also comparable to the values observed in the ORMCP wetland transects.

Table 4. ORMCP baseline forest monitoring plot floristic quality 2009

Plot	Number of Species	Number of Native Species	Percent of Native Species	Number of L1 to L3 Species	Mean Coefficient of Conservatism	Floristic Quality Index
FV-26A	24	20	83	0	4.1	18.1

Although four exotic species were recorded as occurring within the plot, none of them was found in any of the subplots (cover in the subplots is 100% native). Common buckthorn (*Rhamnus cathartica*), herb Robert (*Geranium robertianum*), European highbush cranberry (*Viburnum opulus*), and dandelion (*Taraxacum officinale*) are currently very minor components of the flora and have not succeeded in becoming invasive. Herb Robert and especially European buckthorn can be serious invasive pests but even they require a certain amount of light and canopy opening to get established.

3.1.2 Forest Birds

The three forest bird monitoring stations that are installed in forest habitat are indicated as FB-26A, stations 1, 2 and 3, on Map 2. The most westerly of these stations is situated in the square annexe of forest which is at the south-west corner of the treed swamp, north of the Bathurst Glen golf course; the second station is located at the edge of the same treed swamp approximately 250 metres to the east. The third station is located in what is known locally as Sandbanks Park, the forest patch associated with the several kettle wetlands to the south of Lake Wilcox.

Over half of the 31 species recorded at the forest stations (all records, both within and beyond the count areas) are from the group of L5 ranked species (Table 5), i.e. those species that are considered to be secure within the urban landscape of the Toronto region. A third of the species are ranked L4 (species of concern in urban landscapes), with just two species (American redstart, *Setophaga ruticilla*, and yellow-billed cuckoo, *Coccyzus americanus*) ranked as L3 (species of regional concern).

Table 5. Total number of bird species recorded at the three forest bird stations (combined 2008-2009)

Forest Station (FB26A)	Distance	Number of L3 Ranked Species	Number of L4 Ranked Species	Number of L5 Ranked Species	Number of L+ Ranked Species	Total number of Species
Station 1	<100 m	1	6	10	1	18
	all (includes >100 m)	1	8	11	1	21
Station 2	<100 m	0	9	14	0	23
	all (includes >100 m)	0	9	16	0	25
Station 3	<100 m	1	6	8	0	15
	all (includes >100 m)	1	6	9	0	16
Total Number of Different Species for all Stations	<100 m	2	11	17	1	31
	all (includes >100 m)	2	11	17	1	31

Table 6 shows the breakdown of species recorded from the forest monitoring stations according to their habitat-use guilds. These guilds are based on both habitat preference (forest, forest-edge, meadow and wetland) of the species, and the preferred canopy level at which the species' nest is placed. As might be expected, the species are primarily generalist (54.8%) in their habitat requirements, with only six species (19.4%) considered to be forest specialists. A further five species found (16.1%) are considered to be forest-edge specialists, and three that are wetland habitat specialists. A generalist species is one that is not considered to be specifically associated with any one habitat type, and as such can be found nesting in a range of different habitat types. A specialist species on the other hand, is associated with only a small number of habitat types and only nests in very specific habitats.

Table 6. Species list for the three forest bird stations showing habitat guilds and L-ranks, combined for the two year monitoring period (2008 and 2009 – all records)

Guild	Species	Scientific names	L-rank
Forest mid-level nester	red-eyed vireo	*Vireo olivaceus*	L4
Forest upper level nester	Cooper's hawk	*Accipiter cooperii*	L4
	eastern wood-pewee	*Contopus virens*	L4
	great-crested flycatcher	*Myiarchus crinitus*	L4
	hairy woodpecker	*Piccoides villosus*	L4
	white-breasted nuthatch	*Sitta carolinensis*	L4
Forest-edge mid-level nester	American redstart	*Setophaga ruticilla*	L3
	downy woodpecker	*Picoides pubescens*	L5
	indigo bunting	*Passerine caerulescens*	L4
	rose-breasted grosbeak	*Pheucticus ludovicianus*	L4
	yellow-billed cuckoo	*Coccyzus americana*	L3
Wetland low-level nester	common yellowthroat	*Geothlyphis trichas*	L4
	mallard	*Anas platyrhynchos*	L5
	swamp sparrow	*Melospiza georgiana*	L4
Generalist low-level nester	song sparrow	*Melospiza melodia*	L5
Generalist mid-level nester	American goldfinch	Carduelis tristis	L5
	American robin	*Turdus migratorius*	L5
	black-capped chickadee	*Poocetes atricapillus*	L5
	cedar waxwing	*Bombycilla cedrorum*	L5
	common grackle	*Quiscalus quiscula*	L5
	grey catbird	*Dumetella carolinensis*	L4
	house finch	*Carpodacus mexicanus*	L+
	house wren	*Troglodytes aedon*	L5
	northern cardinal	*Cardinalis cardinalis*	L5
	red-winged blackbird	*Agelaius phoeniceus*	L5
	yellow warbler	*Dendroica petechia*	L5
Generalist upper-level nester	American crow	*Corvus brachyrhynchos*	L5
	Baltimore oriole	*Icterus galbula*	L5
	blue jay	*Cyanocitta cristata*	L5
	red-tailed hawk	*Buteo jamaicensis*	L5
Generalist special case*	brown-headed cowbird	*Molothrus ater*	L5

*brown-headed cowbird is a brood parasite, i.e. does not nest

Figure 3 shows the proportions of forest-guild representation at the three forest stations (years 2008 and 2009 have been combined). The three forest-habitat guilds have been combined (forest mid-level nesters, forest upper level nesters and forest-edge mid-level nesters), and all non-forest guilds have been combined, creating two different sets. The combined totals are derived by considering all three stations as one, such that each species is only counted once but all individuals are counted in the total.

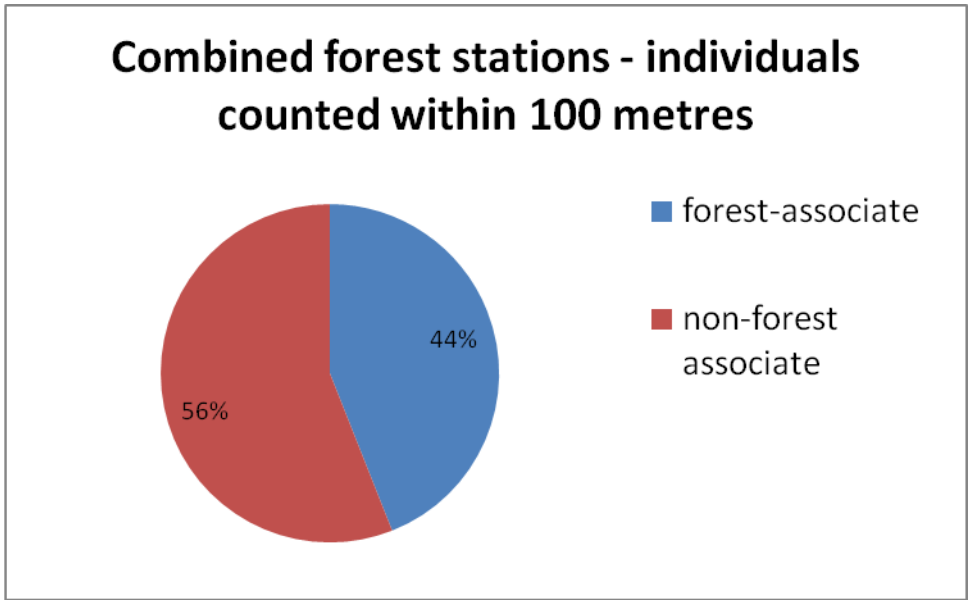

Figure 3. Comparison between the proportion of forest-associated breeding birds and non-forest-associated bird species at the three forest stations for 2008 and 2009 combined

3.2 Wetland Monitoring

3.2.1 Physical Parameters

Water depth

Water depth varied according to a) transect; b) location along transect, and c) year, i.e. 2008 or 2009 (Table 7). All of the wetland transects show some degree of seasonal saturation and/or inundation. Location of maximum depth on some transects varied slightly between 2008 and 2009. Plots WV-7 (Radio Tower Wetland) and WV-7A (off Kingshill north of the Bathurst Glen Golf Club) appear to have permanent water along much of their length, as shown by the presence of aquatic vegetation communities in addition to water depth over 40 cm in both 2008 and 2009; likewise, WV-7C (at Philips Lake) has an aquatic community in the moat or "lag zone" around the floating peat mat (10 m post).

The year 2009 appeared to show higher water levels than 2008, though no statistical tests were taken due to the shortness of the time interval. This was particularly marked in transects WV-7, WV-7A, and WV-7E. Water levels were likely higher than long-term baseline because of very heavy precipitation in 2008; Toronto Pearson Airport recorded its wettest year (1050 mm) on record in 2008 (Environment Canada 2010). Vernally-flooded areas remained submerged. Water levels continued to rise in 2009, which was also a fairly wet year with a cool summer that reduced evapotranspiration.

Table 7. Observed water depth in wetland transects (cm) 2008-2009

Post / year / plot		WV-7	WV-7A	WV-7B	WV-7C	WV-7D	WV-7E
0 m	2008	19	0	0	0	0	0
	2009	28	4	0	0	0	0
10 m	2008	48	**48**	0	**45**	8	0
	2009	65	96	0	**90**	14	20
20 m	2008	55	46	**11**	12	13	0
	2009	86	**100**	**5**	0	**21**	20
30 m	2008	46	33	0	0	5	0
	2009	75	89	0	0	12	20
40 m	2008	55	0	5	0	12	0
	2009	73	22	0	0	**15**	20
50 m	2008	**93**	0	1	0	0	0
	2009	**110**	34	0	0	1	20

Soil Organics and Carbonates

Deep organic soils are present in WV-7B, WV-7C (the peatland at the northeast end of Philips Lake) and WV-7D, at least once one has entered the wetland proper beyond the 0 m post (Table 8). WV-7E also has a deep organic horizon, but this was capped by 5-10 cm of clayey silt that had obviously been recently deposited. WV-7 and WV-7A are largely aquatic systems with a very narrow fringe of terrestrial vegetation.

Carbonates were present through WV-7A and at the base of the transect at WV-7B (Table 8). These wetlands had a history of agriculture very close to the edge, although WV-7B is a more extensive wetland. The anomalous wetland was WV-7E, which had a fringe of mature forest but also had the cap of recent silty clay deposits. These showed carbonates at the 30 and 50 m posts on the transect. This wetland has clearly received significant amounts of silt from nearby recent development.

Table 8. Soils data in wetland transects (2008)

Post / type / plot		WV-7	WV-7A	WV-7B	WV-7C	WV-7D	WV-7E
0 m	organic	6	0	0	0	<10	0
	carbonate	-	+	+	-	-	-
30 m	organic	9	5	>120	>100	>120	>120
	carbonate	-	+	-	-	-	+
50 m	organic	11	3	>100	>100	>120	94
	carbonate	-	+	-	-	-	+

3.2.2 Vegetation

Wetland Type and Tree Cover

The six transects covered a range of wetland vegetation communities (Table 9). Deciduous and thicket swamps and shallow aquatic communities are represented, although marsh types are not. The plot WV-7C at the north end of Philips Lake is largely on a floating peat mat and has a number of kettle bog species although the dominant ELC vegetation community is a thicket swamp.

Trees were found in prism sweeps of W7-B, W7-D, and W7-E. Only a single tree was identified at W7-C, and no trees were found at WV-7 and WV-7A (Table 9). These wetland features have significant deciduous swamp coverage (rather than a very narrow fringe as at WV-7 where no trees were observed at 20 m). Swamp maple (*Acer* x *freemanii*) and silver maple (*Acer saccharinum*) are the dominant trees, with silver maple being the only tree species observed at WV-7D. WV-7B is more diverse. It is interesting to note that all five trees observed at WV-7E were dead.

Table 9. Wetland transect vegetation communities (2006) and tree species – prism sweep at 20 m mark (2008)

Plot	Vegetation Communities along Transect	Tree Species (# stems)
WV-7	FOD8-1 (Fresh-Moist Poplar Deciduous Forest) SWD3-2 (Silver Maple Mineral Deciduous Swamp) SAM1-4 (Pondweed Mixed Shallow Aquatic)	none
WV-7A	FOD7-a (Fresh-Moist Manitoba Maple Deciduous Forest) SAM1-2 (Duckweed Mixed Shallow Aquatic) SWT2-2 (Willow Mineral Thicket Swamp)	none
WV-7B	FOD8-1 (Fresh-Moist Poplar Deciduous Forest) SWD6-3 (Swamp Maple Organic Deciduous Swamp)	*Acer* x *freemanii* (4) *Betula alleghaniensis* (1) *Fraxinus nigra* (2) *Populus tremuloides* (1) deciduous snag (1)
WV-7C	CUW1-A2 (White Pine Successional Woodland) SAM1-2 (Duckweed Mixed Shallow Aquatic) SWT3-2 (Willow Organic Thicket Swamp)	*Betula papyrifera* (1)
WV-7D	FOD6-5 (Fresh-Moist Sugar Maple – Hardwood Forest) SWD6-2 (Swamp Maple Mineral Deciduous Swamp)	*Acer saccharinum* (11)
WV-7E	FOD6-5 (Fresh-Moist Sugar Maple – Hardwood Forest) SWT3-7 (Winterberry Organic Thicket Swamp) SWD6-3 (Swamp Maple Organic Deciduous Swamp)	deciduous snag (5)

Sapling and Shrub Composition

Shrub and tree saplings were relatively abundant in WV-7B, WV-7C, and WV-7E (Table 10). WV-7A, WV-7C and WV-7E have a significant component of thicket swamp, while WV-7B is largely a

deciduous swamp with relatively open canopy. Shrubs and saplings were sparse in WV-7 and WV-7D. WV-7 is a largely aquatic transect, while WV-7D is a silver maple swamp with a dense tree canopy, limiting the growth of lower layers of vegetation.

Table 10. Number of species and average percent cover saplings and shrubs in wetland transects

Transect I.D.	Number of Species		Average % Cover	
	2008	2009	2008	2009
WV-7	1	2	3	2
WV-7A	9	14	21	22
WV-7B	14	19	25	32
WV-7C	15	18	46	38
WV-7D	6	6	3	4
WV-7E	9	10	21	25

A total of 25 shrub, 3 woody vine and 16 tree species (stems >16 cm tall but under 10 cm dbh) were found in the wetland transects in 2008 and 2009 (Appendix 2). The most frequent shrub / woody vine species were two exotic species: buckthorn and climbing nightshade (*Solanum dulcamara*). They were found in all six transects. On the other hand, these and other non-native species did not account for a large share of the total relative cover; exotic species accounted for just 6% of the total relative cover in 2009 (Figure 4). Non-native woody species' contribution to total relative cover was negligible in transects WV-7, WV-7B, and WV-7C.

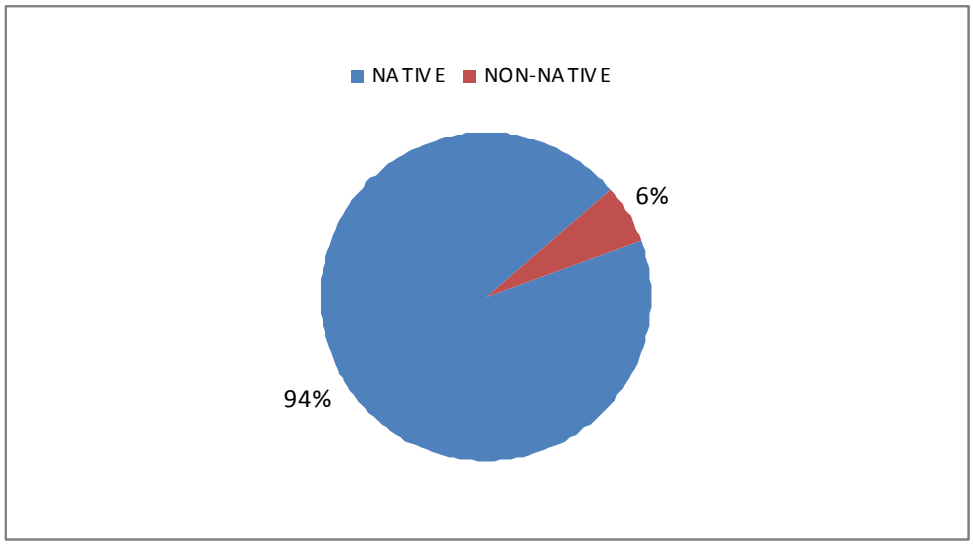

Figure 4. Relative cover of native versus exotic woody plant species in the ORMCP wetland transects, 2009

The most frequent native species were riverbank grape (*Vitis riparia*) and red osier dogwood (*Cornus stolonifera*), which were present in five transects; and slender willow (*Salix petiolaris*), winterberry holly (*Ilex verticillata*), and choke cherry (*Prunus virginiana*), each of which was present in four transects. The four highest cover values were for red osier dogwood, leatherleaf (*Chamaedaphne calyculata*), slender willow and winterberry (Appendix 2). Relative cover values for these four species ranged from 11-23% and together they accounted for 67% of the total relative cover in both 2008 and 2009. Leatherleaf was found only in transect WV-7C but was extremely dense there.

Tree seedlings and saplings were less common, with swamp maple, silver maple, and white ash being found in three transects. White elm (*Ulmus americana*), sugar maple, and paper birch (*Betula papyrifera*) were found in two transects. Sugar maple and white ash are upland species which were clustered in the first two subplots at the start of each transect (0 m post set at upland end of gradient). The two species with highest relative cover were black ash (*Fraxinus nigra*) at 4.6% and swamp/silver maple at about 3-4%. White cedar (*Thuja occidentalis*) was the only conifer recorded in the transects, and it was found only at WV-7B.

Ground Vegetation Composition

Overall ground vegetation cover (including all aquatic and terrestrial herbaceous species and woody seedlings <16 cm high) was highest in WV-7 with over 75% average cover in both years of observation (Table 11). This transect is largely an aquatic community, and there is a significant aquatic component to WV-7A as well. Terrestrial wetland herbs were moderately abundant in WV-7B, WV-7C, and WV-7E. The ground was virtually bare in the densely shaded silver maple swamp at WV-7D.

Table 11. Number of species and average percent cover ground vegetation in wetland transects

Transect I.D.	Number of Species		Average % Cover	
	2008	2009	2008	2009
WV-7	26	38	81	76
WV-7A	31	31	48	54
WV-7B	27	34	33	36
WV-7C	29	57	23	27
WV-7D	6	15	7	1
WV-7E	20	23	35	27

A total of 152 ground vegetation species were found in the ORMCP transects in 2008 and 2009, including aquatic and emergent species (Appendix 3). Species diversity was highest at Philips Lake, WV-7C, with 60 species recorded over the two-year period. Most frequently encountered species were orange touch-me-not (*Impatiens capensis*) and common duckweed (*Lemna minor*). These were found in all six transects. Water-plantain (*Alisma plantago-aquatica*), northern

bugleweed (*Lycopus uniflorus*), and pseudocyperus sedge (*Carex pseudocyperus*) were found in four transects each. All of these are common, fairly adaptable species. Four exotic species were moderately frequent, found in three transects: urban avens (*Geum urbanum*), dandelion (*Taraxacum officinale*) reed canary grass (*Phalaris arundinacea*), and Kentucky bluegrass (*Poa pratensis*). Of these, only reed canary grass has the potential to be a serious invasive species in wetlands, assuming that what is present is the aggressive European ecotype. It was found in WV-7, WV-7A, and WV-7E. Hybrid cattail (*Typha* x *glauca*), which often forms monocultures in disturbed, nutrient-rich wetlands (Galatowitsch *et al*. 1999), was only found in two transects: WV-7 and WV-7A. Purple loosestrife (*Lythrum salicaria*) was found in only one transect, WV-7.

Cover was also overwhelmingly native: 96% of total relative cover in 2009 (Figure 5). The highest relative cover values were flat-stemmed pondweed (*Potamogeton zosteriformis*) (9.6% in 2008, 20.9% in 2009) and floating-leaved pondweed (*P. natans*) (20.1% in 2008, 12.9% in 2009), concentrated in the largely-aquatic transects WV-7 and WV-7A. Sensitive fern (*Onoclea sensibilis*) had a relative cover of 8.5% in 2008 and 11.2% in 2009. The emergent species northern manna grass (*Glyceria borealis*) was prominent in 2008 with a relative cover of 9.2% but dropped to only 0.2% in 2009 (Appendix 3). On the other hand, the floating-leaved plant common duckweed rose from 1.2% relative cover in 2008 to 8.8% in 2009.

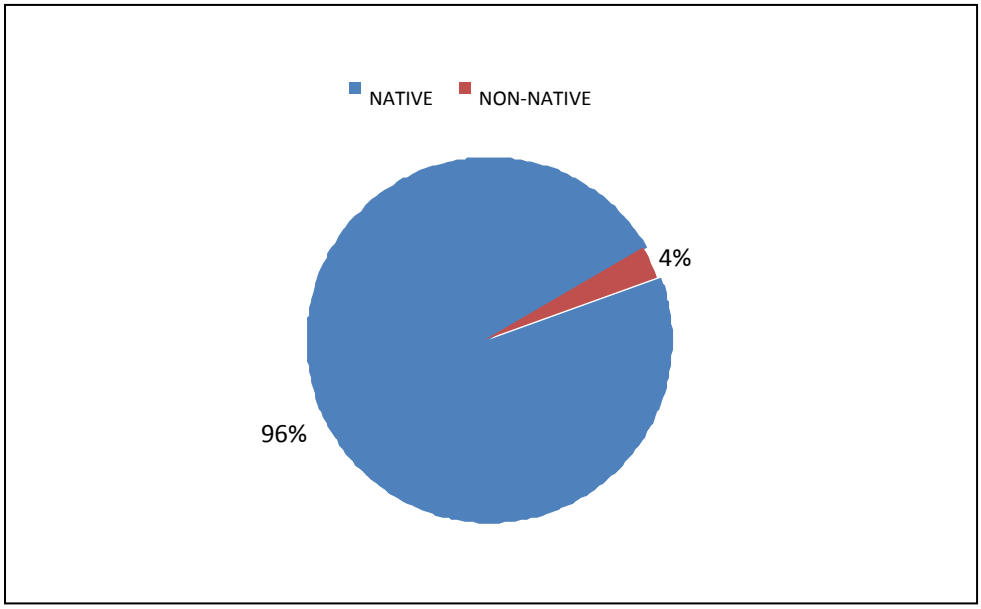

Figure 5. Relative cover of native versus exotic ground layer species in the ORMCP wetland transects, 2009

Discounting the results for climbing nightshade in 2008 (a semi-woody vine that was measured with the woody species starting in 2009), the highest-cover exotic ground species were urban avens (1.4-1.6% relative cover) and reed canary grass (0.5-1.7% relative cover).

Species Richness and Floristic Quality

Native species richness (i.e. the total number of native species present irrespective of plant type or cover) ranged from 12 to 53 across the six wetland transects (Appendix 4) with an average of 33 (Table 12, years separate). As might be expected over such a short period, values were very similar between 2008 and 2009. If both 2008 and 2009 are pooled, native species richness ranged from 20 to 60 (Appendix 5). The highest species richness was at WV-7C (Philips Lake peatland/thicket swamp) with 60 native species recorded. This transect also had by far the most species of regional conservation concern; 25 species with ranks of L1 to L3, 21 observed in 2008 and 20 observed in 2009. The lowest species richness was at WV-7D; this is a heavily shaded silver maple swamp with a very sparse ground layer. Every transect (with the exception of WV-7 in 2008) had over ⅔ native species, and all but WV-7 had at least 75% native species. Species richness values are equivalent to the mid-range of those observed by the Credit Valley Conservation Authority (CVC 2010). Their highest-quality plots exceeded WV-7C considerably, but the bogs at Bond Lake and Philips Lake may be equivalent.

Mean coefficients of conservatism ranged from 3.7 to 4.7 (Appendix 4; Table 12). The lowest was at WV-7 and the highest at W7-C. ORMCP transects as a whole had a mean CC of 4.2. These values are comparable to or slightly higher than the Credit watershed mean CC of 3.9. The most conservative species observed were leatherleaf, downy willow-herb (*Epilobium strictum*), tuckahoe (*Peltandra virginica*), and bog willow (*Salix pedicillaris*). These all have a CC of 9 and were found at W7-C. Round-leaved sundew (*Drosera rotundifolia*) had the highest L-rank of L1 and was also found at W7-C. Philips Lake is the only known location for tuckahoe in the TRCA jurisdiction aside from a few plants seen at Secord Pond in 2008.

The Floristic Quality Index (FQI), which combines species richness and conservatism, ranged from 14.1 at WV-7D in 2008 to 33.3 in WV-7C in 2009. The average for the six wetland transects ranged from 23.3 in 2009 to 24.4 in 2008 (standard deviation 6.3 and 6.7 respectively).

Table 12. ORMCP wetland transect mean floristic quality 2008-2009

ORMCP Wetland Transects	Year	Number of Species	Number of Native Species	Percent Native Species	Number of L1 to L3 Species	Mean Coefficient of Conservatism	Floristic Quality Index
Mean (± SD)	2008	41.8 (±15.2)	33.5 (±13.5)	79.3 (±9.6)	10.8 (±7.0)	4.3 (±0.3)	24.4 (±6.7)
	2009	39.7 (±15.5)	32.8 (±13.2)	83.3 (±9.3)	9.7 (±6.6)	4.1 (±0.3)	23.3 (±6.3)

3.2.2 Wetland Birds

The three bird stations that are installed in wetland habitat are indicated on Map 2 as WB-7, #1 and WB-7A, station # 2 and # 3. The first station (WB-7, #1) is located on the east bank of the Radio Tower Wetland, adjacent to the south-west corner of the Bathurst Glen golf course. The second station (WB-7A, #2) is located on the southern bank of the small wetland halfway along the northern edge of the golf-course. The third station (WB-7A, #3) is located halfway along the northern bank of Bond Lake bog, to the south of the new houses on Old Colony Road.

Fifteen of the 31 species that were recorded within 100 metres of the wetland stations are ranked as L1 to L4 (Table 13).

Table 13. Combined total number of bird species recorded during 2008 and 2009 at the three wetland bird stations

Distance	Number of L2 Species	Number of L3 Species	Number of L4 Species	Number of L5 Species	Number of L+ Species	Total Number of Species
<100 m	1	4	10	16	0	31
all (includes >100 m)	1	7	17	19	1	45

Table 14 shows the breakdown of species recorded from the wetland monitoring stations (for those species recorded within the 100 metre recording area) according to their habitat-use guilds. Of the 31 species recorded from the three wetland stations, 7 species (22.6%) are considered wetland obligates, while 16 species (51.6%) are considered generalist species.

Table 14. Species list for the three wetland bird stations showing habitat-use guilds and L-ranks (only species observed within 100 m)

Guild	Species	Scientific Name	L-rank
Forest mid-level nester	red-eyed vireo	*Vireo olivaceus*	L4
Forest upper-level nester	olive-sided flycatcher	*Contopus cooperi*	L2
	wood duck	*Aix sponsa*	L3
Forest-edge mid-level nester	American redstart	*Setophaga ruticilla*	L3
	downy woodpecker	*Picoides pubescens*	L5
	ruby-throated hummingbird	*Archilocus colubris*	L4
Meadow mid-level nester	willow flycatcher	*Empidonax traillii*	L4
Meadow upper-level nester	eastern kingbird	*Tyrannus tyrannus*	L4
Wetland low-level nester	Canada goose	*Branta canadensis*	L5
	common yellowthroat	*Geothlyphis trichas*	L4
	mallard	*Anas platyrhynchos*	L5
	pied-billed grebe	*Podilymbus podiceps*	L3
	swamp sparrow	*Melospiza georgiana*	L4
	Virginia rail	*Rallus limicola*	L3
Wetland mid-level nester	alder flycatcher	*Empidonax alnorum*	L4
Generalist low-level nester	song sparrow	*Melospiza melodia*	L5
Generalist mid-level nester	American goldfinch	*Carduelis tristis*	L5
	American Robin	*Turdus migratorius*	L5
	black-capped chickadee	*Poocetes atracapilla*	L5
	cedar waxwing	*Bombycilla cedrorum*	L5
	common grackle	*Quiscalus quiscula*	L5
	grey catbird	*Dumetella carolinensis*	L4
	house wren	*Troglodytes aedon*	L5
	mourning dove	*Zenaida macroura*	L5
	red-winged blackbird	*Agelaius phoeniceus*	L5
	tree swallow	*Tachycineta bicolor*	L4
	yellow warbler	*Dendroica petechia*	L5
Generalist upper-level nester	Baltimore oriole	*Icterus galbula*	L5
	warbling vireo	*Vireo gilvus*	L5
Generalist special case	brown-headed cowbird	*Molothrus ater*	L5
	northern rough-winged swallow*	*Stelgidopteryx serripennis*	L4

*northern rough-winged swallow is a cavity nester that habitually nests in human constructions

Figure 6 illustrates the fairly similar proportions of wetland associated breeding bird species at the three wetland sites. The proportions are noticeably rather low but again this is primarily because of the proximity of non-wetland habitats which results in the inclusion of a large number of non-wetland species in the calculations.

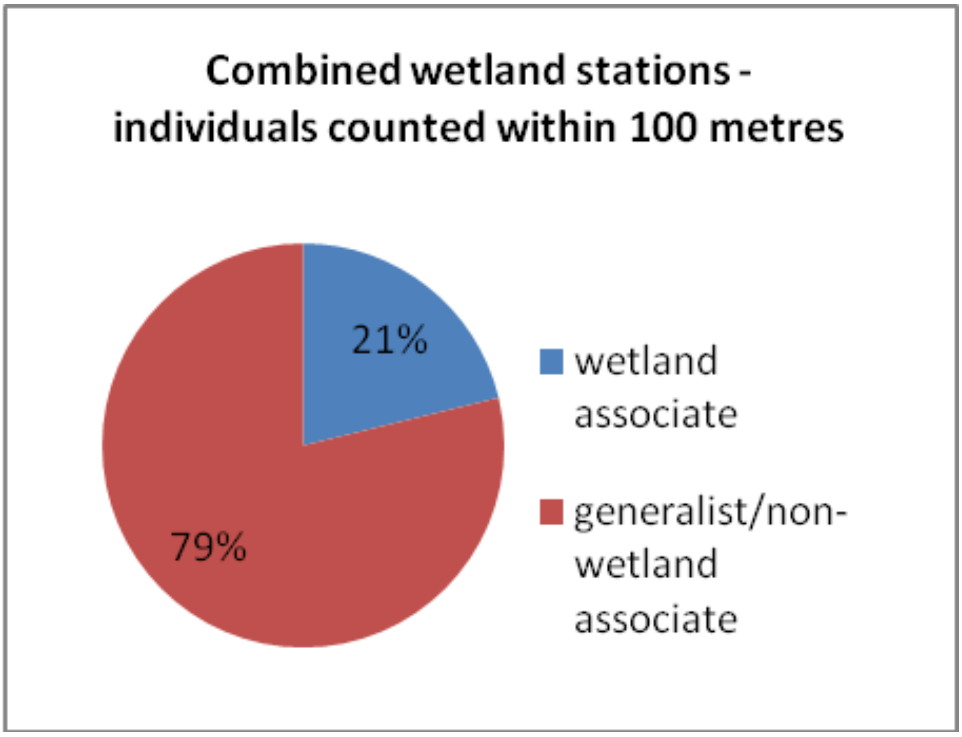

Figure 6. Number of individual breeding bird species that are wetland-associate species compared to the number of generalist species found at all three wetland stations from 2008 and 2009

3.2.3 Frogs

The three frog stations that are installed in wetland habitat are indicated as WF-18A, station #1, #2 and #3, on Map 2 All three stations are located at the same points as the corresponding wetland bird monitoring stations.

A total of five species of frogs/toads were recorded from all the three monitoring stations combined (Table 15). Only one station had all five species present (station #1) and the other two stations had four of the five species with American toad (*Bufo americanus*) being the one species that was missing (station #2 and #3). Call codes ranged in intensity, however wood frog was recorded at the highest intensity (3) at all three stations.

Table 15. Occurrence of frog species at three wetland stations showing the highest level of call code documented at each site

	2009		
Species	**Station 1 (within 100 m)**	**Station 2 (within 100 m)**	**Station 3 (within 100 m)**
American toad	1	0	0
green frog	1	1	1
spring peeper	3	3	3
grey tree-frog	3	1	2
wood frog	3	3	3

3.3 Meadow Monitoring

The four stations installed in meadow habitat are indicated as MB-8 (stations #1 and #2) and MB-8A (stations #3 and #4) on Map 2. With so much meadow habitat available in the site it was somewhat easier to select sites for meadow bird monitoring stations particularly for stations #1 and #2 which are located in a meadow patch that covers over 40 hectares.

Station #1 is located to the south of the western end of Bathurst Glen golf course with station #2 situated in a more upland location a few hundred metres east of the golf course. Stations # 3 and #4 are located further east and both include small portions of nearby forest edge habitat. Station #3 is in a small parcel of meadow habitat west of Yonge Street, opposite Bond Lake, an area that has recently been row-planted with tree seedlings; station #4 is considerably further to the east, closer to Bayview Avenue and to the south of the new stormwater pond associated with a new housing development.

Half of the breeding bird species recorded at the meadow stations are those that are ranked as L5 i.e. those species that are considered to be secure within the urban landscape of the Toronto region (Table 16). There were three L3 ranked species that were identified (bobolink, black-billed cuckoo and chestnut-sided warbler). An additional 16 species of urban concern were also identified.

Table 16. Total number of individuals and species birds recorded at the meadow bird stations (combined results for 2008 and 2009)

	Number of L3 Species	Number of L4 Species	Number of L5 Species	Number of L+ Species	Total Number of Individuals
<100 m	3	16	18	1	38
all	7	18	21	1	47

Twenty-two (57.9%) of the 38 species listed from the meadow monitoring stations (within the count circle, i.e. <100 m) are generalist species. Six of the species (15.8%) found represent meadow specialists (Table 17).

Table 17. Species list for the meadow bird stations showing habitat guilds and local-ranks (only species observed within 100 m)

GUILD	Species	Scientific name	L-rank
Forest mid-level nester	red-eyed vireo	*Vireo olivaceus*	L4
Forest upper-level nester	eastern wood-pewee	*Contopus virens*	L4
Forest-edge mid-level nester	black-billed cuckoo	*Coccyzus erythropthalmus*	L3
	chestnut-sided warbler	*Dendroica pensylvanica*	L3
	downy woodpecker	*Picoides pubescens*	L5
	great-crested flycatcher	*Myiarchus crinitus*	L4
	indigo bunting	*Passerina cyanea*	L4
	rose-breasted grosbeak	*Pheucticus ludovicianus*	L4
Meadow low-level nester	bobolink	*Dolichonyx oryzivorus*	L3
	eastern meadowlark	*Sturnella magna*	L4
	savannah sparrow	*Passerculus sandwichensis*	L4
	spotted sandpiper	*Actitis macularia*	L4
Meadow mid-level nester	willow flycatcher	*Empidonax traillii*	L4
Meadow upper-level nester	eastern kingbird	*Tyrannus tyrannus*	L4
Wetland low-level nester	common yellowthroat	*Geothlypis trichas*	L4
	mallard	*Anas platyrhynchos*	L5
Generalist low-level nester	killdeer	*Charadrius vociferus*	L5
	song sparrow	*Melospiza melodia*	L5
Generalist mid-level nester	American goldfinch	*Carduelis tristis*	L5
	American robin	*Turdus migratorius*	L5
	barn swallow	*Hirundo rustica*	L4
	black-capped chickadee	*Poocetes atracapillus*	L5
	cedar waxwing	*Bombycilla cedrorum*	L5
	common grackle	*Quiscalus quiscula*	L5
	Eurasian starling	*Sturnus vulgaris*	L+
	grey catbird	*Dumetella carolinensis*	L5
	house wren	*Troglodytes aedon*	L5
	mourning dove	*Zenaida macroura*	L5
	red-winged blackbird	*Agelaius phoeniceus*	L5
	tree swallow	*Tachycineta bicolor*	L4
	yellow warbler	*Dendroica petechia*	L5
Generalist upper-level nester	American crow	*Corvus brachyrhynchos*	L5
	American kestrel	*Falco sparverius*	L4
	Baltimore oriole	*Icterus galbula*	L5
	blue jay	*Cyanocitta cristata*	L5
	cliff swallow	*Petrochelidon pyrrhonota*	L4
	northern flicker	*Colaptes auratus*	L4
Generalist special case*	brown-headed cowbird	*Molothrus ater*	L5

*brown-headed cowbird is a brood parasite, i.e. does not nest

There is considerable variation in the percentage of meadow associate to non-meadow associate species that were recorded across all four monitoring stations (Table 18 and Figure 7). The first two stations are embedded in the most extensive open habitat, and have very little non-meadow

habitat within the count circle. The other two stations are situated in close proximity to forest edges and as such the proportion of individuals associated with such treed habitat is much higher at these two stations.

It should be noted that at the station with the highest proportion of meadow-associated individuals – station # 2 – this habitat-use guild is represented by just three species: bobolink, savannah sparrow and eastern meadowlark. These are true open country obligates and the fact that their representation is so high at this station suggests that the meadow habitat here is functioning at a relatively high level.

Table 18. Percentage of individuals of meadow associate to non-meadow associate bird species recorded at each of the four monitoring stations

Station Number	Percent Meadow Associate Individuals Present	Percent Non-meadow Associate Individuals Present
1	30%	70%
2	50%	50%
3	12%	88%
4	3%	97%

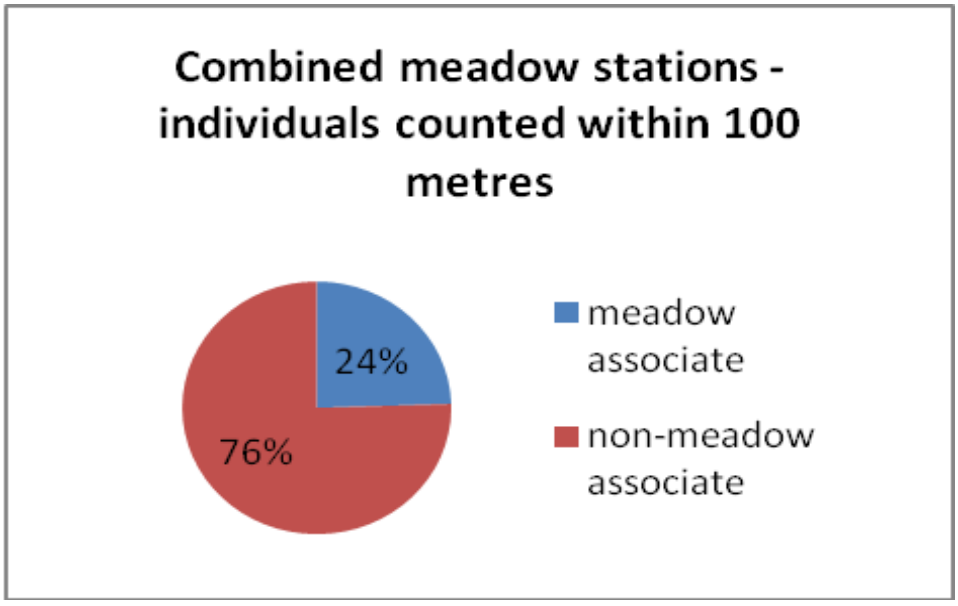

Figure 7. Percentage of meadow-associated and non-meadow associated breeding birds for all four meadow stations combined

4.0 Discussion

4.1 Forest Vegetation

At this point, the monitoring data do not yet have the ability to reveal the impacts of past agriculture and recent nearby urbanization on biodiversity and floristic quality at ORMCP. There have been only two seasons of quantitative monitoring (one season for the forest vegetation plot). They do, however, provide a baseline picture of the park very shortly after abandonment of agriculture within the park and the onset of urbanization on nearby lands.

The forest plot FV26-A is dominated by a fairly young cohort of sugar maples, probably the result of regeneration after partial logging in the 1970s based on the age samples. One notable tree species in the plot is in decline: pin cherry. This is a short-lived early-successional species that is intolerant of shade. It would likely have grown up after the logging disturbance and is now succumbing to competition with sugar maple. Its declining health within the plot is therefore an indicator of natural processes, not of declining forest health. Pin cherry is present in more open successional areas of the park. Heavy competition by the dense young cohort of sugar maples has also limited the presence and cover of understorey and ground layer vegetation. Of the few ground layer species present, natives seem better adapted to these conditions than even invasive exotics.

Two pests, however, can be expected to have an impact on this woodlot in the near future: beech bark disease and emerald ash borer (*Agrilus planipennis*). Beech bark disease is caused by a European beech scale (*Cryptococcus fagisuga*) which leaves wounds that are then infected by *Nectria* fungus. Beech bark disease has been in Ontario since the mid-to-late 1990s. The majority of beech trees in the Greater Toronto Area now appear to be infected; Credit Valley Conservation has noted that about two-thirds of their monitored beech show signs of the disease (CVC 2010). A large, but so far unknown proportion of infected trees ultimately die. Emerald ash borer recently arrived in southern Ontario, and was first reported in Toronto in 2008. It has not yet been observed in TRCA's forest health monitoring plots but has already virtually eliminated ash trees from large areas of southwestern Ontario and the adjacent United States.

On the other hand, forest cover is expected to increase in the park due to restoration and natural regeneration of the former agricultural fields. This will encourage the forest at FV26-A to advance toward maturity and perhaps allow for more diversification of the species composition. Invasive species such as garlic mustard may also advance due to nearby urban land uses and recreational impacts.

4.2 Wetland Vegetation

With the obvious exception of WV-7E which had recent siltation impacts, it is also too early to see development – or restoration – related changes to the wetland structure or vegetation at ORMCP.

WV-7E has a recent deposit of 5-10 cm of silty clay overlying the deep organic horizon. This was clearly the result of erosion from adjacent lands undergoing development. The silt entered this wetland in 2007 when a section of silt fence on the south side was down (pers. communication T. McKenzie). Carbonates were present in this new deposit at WV-7E as well as throughout WV-7A and at the base of the transect at WV-7B. The presence of carbonates indicates that unleached calcareous parent material is near the surface. Undisturbed areas tend to have lower carbonates because weathering has leached them from the upper soil horizons. Carbonates may indicate either heavy, highly calcareous soils that naturally do not leach quickly, erosion of the upper horizons or anthropogenic siltation or filling. WV-7A and WV-7B have had a history of agriculture very close to the edge of the wetland vegetation but WV-7B is a more extensive wetland.

Undisturbed soils accumulate a deep organic horizon due to the lack of decay of organic matter under saturated, low-oxygen conditions. Those that experience episodes of aeration, siltation, or erosion tend not to build up a deep organic horizon and remain mineral. Warmer temperatures also encourage oxidation of organic soils. Organic soils are often less nutrient-rich than mineral soils due to reduced contact with the parent material and low inputs. The deeper, cooler kettles may have peatlands that support a blend of bog and fen flora species. Organic soils also represent significant carbon storage that may be either a sink or source depending on conditions (continued accumulation or net loss of organic matter).

Water levels appeared to be rather high, based on observations of deep water in late summer 2008 and 2009. This is likely largely the result of unusually wet conditions in 2008 and cool and moderately wet conditions in 2009. Other factors, however, may lead to increased water levels over the long term. Those related to human activity might include:

- increased runoff to the wetlands from less-permeable surfaces in the wetland catchment area (paved roads, manicured lands, or soil compacted by grading equipment).
- increased input from irrigation: for example, Bathurst Glen Golf Course or backyard lawns adjacent to the park. Even where irrigation is drawing from ground water, more water is being brought to the surface, where it may collect in impermeable kettle wetland features.

One possible consequence of a couple of wet years with high water levels is the hint of a shift from emergent graminoids such as northern manna grass and Small's spike-rush (*Eleocharis smallii*) toward free-floating Lemnaceae: common duckweed, star duckweed (*L. trisulca*), and greater duckweed (*Spirodela polyrhiza*) between 2008 and 2009. The emergent graminoids were all in the range of 4-9% relative cover in 2008 but had much reduced cover in 2009, while the converse was true for the free-floating plants (Appendix 3). More years of data collection will be necessary to assess the significance or permanence of this shift in vegetation cover.

Based on comparison with similar monitoring transects in the nearby Credit watershed, the ORMCP transects appear to be in the general range of floristic quality of rural wetlands in the Greater Toronto Area. ORMCP FQI averaged 23.9 over the two years, while the mean FQI for wetland plots in the Credit watershed is 25 (CVC 2010). Exotics such as hybrid cattail, purple loosestrife, and reed canary grass are currently minor components of the vegetation, while native

shrubs are prominent. However, the wetlands have clearly had agricultural impacts (runoff containing nutrients and some silt) as exotics are widespread in the terrestrial fringe zone around the wetlands. Increases in nutrient loading and siltation since European settlement are indicated by pollen and diatom data from the nearby kettle Swan Lake (Watchorn *et al*. 2008) as well as suggested by the fact that a number of highly conservative bog species observed at Bond Lake in the early 20th century have not been seen recently (OMNR 2000). This palaeoecological and historic information forms a valuable background for the monitoring work at ORMCP. In spite of all these disturbances, however, the wetlands at Oak Ridges Moraine Corridor Park (including the recently heavily-silted WV-7E) remain largely dominated by native plants with moderate biodiversity and floristic quality. The siltation at WV-7E occurred too recently to determine impacts on vegetation, although the trees observed in the prism sweep there were dead. Provided that urban runoff remains firmly sequestered from the wetlands, one can be optimistic about the continuing floristic quality of the wetlands. Renaturalization of the surrounding fields can only help the hydrological and nutrient balance.

4.3 Fauna

The results of this monitoring project are analysed by grouping the birds reported from all stations into guilds. These guilds are based on broad habitat preferences of the bird species but also incorporate an indication of the preferred nest-height for each species. This is done to provide a surrogate indication of sensitivity, it being assumed that ground-nesting species are generally more prone to the negative impacts of human disturbance than those species nesting in the higher levels of the habitat. Appendix 6 also indicates a third and fourth consideration that may be used in future analyses: cavity-nesting species and aerial-feeding species. The latter has been included in order to pre-empt possible future declines in aerial feeding insectivores, a group of species that has already been identified as exhibiting persistent population declines across the continent over recent years.

It is important, early in the project, to properly identify the target species that the project intends to monitor. In many habitat specific monitoring projects, species that are known not to utilize the specific habitat type are automatically omitted from any analysis. However, the ORMCP project intends to monitor changes in the guilds of birds that are utilizing the park as a whole as the habitat blocks evolve, meadow succeeding to forest, etc. With this in mind it is important to maintain a record of all species recorded from each station both within and beyond the 100 m count circle. In this way changes in the habitat composition of the park and changes in visitor utilization will be reflected and tracked in the use of the broader landscape by a variety of birds from several different habitat guilds. Such variation in species use of a given habitat type is already indicated when comparing the baseline data from the different stations.

The presence of habitat–specific fauna species indicates that a particular station is situated on a site that is functioning – at least at the fauna level – appropriately as wetland, meadow or forest. Applying the species guilds to the baseline data it is possible to assess the 10 stations.

Table 19. Number of species in each guild occurring at each station – all habitats (totalled over the two years)

		Long Term Monitoring Stations									
		W#1	**W#2**	**W#3**	**M#1**	**M#2**	**M#3**	**M#4**	**F#1**	**F#2**	**F#3**
Guild	Wetland species	1	1	4			1	1		1	
	Meadow species		2		2	2	1				
	Forest species	1							3	3	2
	Forest-edge species						2	1	1	2	1
	Generalist species	6	6	4	3	2	5	3	5	10	5
	% generalist	75.0	66.7	50.0	60.0	50.0	55.6	60.0	55.6	62.5	62.5
	% non-spec*	87.5	88.9	50.0	60.0	50.0	88.9	100.0	55.6	68.75	62.5
	Total	**8**	**9**	**8**	**5**	**4**	**9**	**5**	**9**	**16**	**8**

*The rows titled "%non-spec" show the proportion of species or individuals that are not considered specific to that particular habitat although the species may be a specialist in another habitat type.

It is important to consider the different interpretation of results depending on whether one considers species richness (the number of species, see Table 18) or species representation (the number of individuals of each species, Table 19).

Table 20. Number of individuals from each guild occurring at each station (averaged over the two years)

		Long Term Monitoring Stations									
		W#1	**W#2**	**W#3**	**M#1**	**M#2**	**M#3**	**M#4**	**F#1**	**F#2**	**F#3**
Guild	Wetland species	1	1.5	6			1	1		1	
	Meadow species		2.5		5.5	10.5	3				
	Forest species	3							6.5	5.5	5
	Forest-edge species						2	2	2	2	1
	Generalist species	13.5	17.5	7.5	10.5	4	10.5	8.5	6.5	14.5	6
	% generalist	77.1	81.4	55.6	65.6	27.6	63.6	73.9	43.3	63.0	50.0
	% non-spec*	94.3	93.0	55.6	65.6	27.6	81.8	100.0	56.7	76.1	58.3
	Total	**17.5**	**21.5**	**13.5**	**16**	**14.5**	**16.5**	**11.5**	**15**	**23**	**12**

*The rows titled "% non-spec" show the proportion of species or individuals that are not considered specific to that particular habitat although the species may be a specialist in another habitat type.

Using the guild-based approach, it would seem that wetland #3, meadow #2 and forests #1 and #2 are functioning best within their respective habitat categories. Of all stations, Meadow #2 is functioning best within its own habitat category. This consideration is important in identifying the degree of success of any natural system management and restoration. These conclusions are borne out by approaching these same counts from the opposite direction by calculating the percent proportion of individuals representing generalist species at each station, and again by calculating the percent proportion of individuals not specifically associated with each respective habitat (i.e. "% non-spec").

Meadow stations #1 and #2 are to be maintained as meadow habitat in the final park design, and are situated somewhat further from the influence of forest and forest edge, thereby resulting in an elevated presence of meadow habitat specialists. Meadow stations #3 and #4 are already planted with rows of seedlings and are situated within close proximity to forest blocks, and therefore the influence of forest edge habitat is demonstrated in the elevated number of edge habitat species that have been reported, together with a diminished presence of the aforementioned meadow habitat specialists.

Tables 18 and 19 show clearly that forest station #2 accommodates both the highest species richness and the highest species representation. However, when considering only the guilds relevant to the forest habitat (i.e. the forest and forest-edge guilds) stations #1 and #2 are functioning at approximately the same level.

Wetland habitats provide their own built in buffer against many of the negative matrix influences associated with the urban landscape and therefore there should be a slightly higher proportion of species of regional concern (i.e. ranked L1 to L3) than at the forest habitat stations. The figures presented in Table 20 bear this out.

Table 21. Proportion of high ranking habitat-specific species recorded from each habitat type

	Total Number of Species	% of Species Specific to that Habitat	% of L1 – L3 Habitat Specific Species
Forest Stations	31	42%	6%
Wetland Stations	31	48%	16%
Meadow Stations	38	50%	8%

Wetlands in general, as a habitat type, provide very specific conditions that require particular adaptations on the part of fauna species inhabiting this environment. It is therefore rather surprising to find such a high proportion of generalist species at the wetland stations, but this is due to the fact that the count areas incorporate the treed edges of the wetlands, and so these generalists are probably more associated with the forest and forest-edge habitats at the border of the station count areas. Many generalist species readily thrive in forest, forest-edge and meadow type habitats, but do not possess the adaptations necessary for survival in the more demanding conditions of a wetland habitat. To avoid this anomaly in the data, the station would have to be positioned at a location where the count area did not overlap with other habitats. The small sizes of two of the wetlands at ORMCP tend to preclude this, and locating a station in the centre of the third wetland (Bond Lake Bog) would be labour-intensive and potentially cause considerable disturbance to the wetland.

Baseline conditions have not yet been established for wetland frog species as data has only been collected for a one year (2009) period. The complete absence of northern leopard frog from all of the three stations is surprising since the stations are set in a landscape that holds extensive open-habitat, ideal for foraging leopard frogs. A fauna inventory conducted by the TRCA in 2006 reported northern leopard frog in the vicinity of station #2 and there was an incidental observation

of yearling leopard frogs near to station #1 again in 2006. The fact that sensitive and highly mobile species (spring peeper, wood frog and grey tree-frog), which require functional connections between the different habitat types used at different stages of their life-cycle, are present at all three wetland stations is significant, and suggests that currently the landscape matrix is able to support all life-cycle stages for these species.

At ORMCP the highest functioning habitat type currently is the meadow habitat, however this will likely change as reforestation progresses and as user impacts come to bear upon typical meadow fauna (thereby reducing the function of this habitat).

The Oak Ridges Corridor Park Management Plan (TRCA, 2006) has proposed a park design that will considerably alter the habitat composition of the park, creating larger blocks of forest habitat within the currently largely open landscape. Given this particular path for land management at the ORMCP, the following expectations are in order for the fauna of the park:

- An overall reduction in the number of open country species as the park changes from a largely open landscape to a more closed forested landscape. Resulting in a reduction in number of pairs of savannah sparrows and bobolinks.

- A temporary increase in the number of shrub-nesting species as planted areas succeed to more mature forest. Species such as chestnut-sided warbler, mourning warbler, brown thrasher and field sparrow should show increases in their representation on the site.

- An eventual overall increase in the number of forest specialists. Species such as scarlet tanager and ovenbird should be recruited as breeding species into the more extensive forest patches.

- Successful recruitment of new nesting species into the park will depend largely on the changes in visitor use of the park and trail system. It is possible, given the expected increase in trail use and increase in negative matrix influence, that any recruitment of nesting birds into the forest bird community will be weighted in favour of the canopy and sub-canopy nesters such as scarlet tanager and wood thrush, and against the recruitment of ground-nesters such as ovenbird and ruffed grouse.

5.0 Next Steps

The most important step to take is to ensure that annual monitoring continues using the same protocol(s). A minimum of five years of data are needed in order to start seeing meaningful results. The following are a few possible trends we should be looking for in particular, while continuing the overall monitoring program:

- Changes in the proportion of native to exotic species cover in the forest and wetland vegetation plots. These could result from natural succession and competitive pressures; intensification of land use, climate change, etc.

- Changes in species richness and Floristic Quality Index in the forest and wetland vegetation plots

- Changes in bird species richness and abundance recorded from the forest, meadow and wetland stations, and changes in frog richness and abundance from the wetland stations

- Population trends in particular individual native flora species of concern (e.g. northern manna grass) or invasive species (e.g. common buckthorn or reed canary grass)

- Any incursion or colonization by additional invasive species not yet observed in the plot or transects (e.g. dog-strangling vine *Cynanchum rossicum*, or common reed, *Phragmites australis*)

- Impacts of emerald ash borer, or any other pests or pathogens that may irrupt

- Changes due to any restoration efforts undertaken on the ORMCP lands.

- Comparison between trends observed at the ORMCP stations/plots and those observed concurrently through the TRCA's regional Long Term Monitoring Project.

An additional consideration is to add forest plots in areas where trees have been planted for restoration purposes. These plots would initially show only ground vegetation and new saplings, but provide valuable information on the success and development of new forest cover at ORMCP. This is particularly true because there is currently only one forest plot, and new plots would increase the sample size to allow for better analysis in the future.

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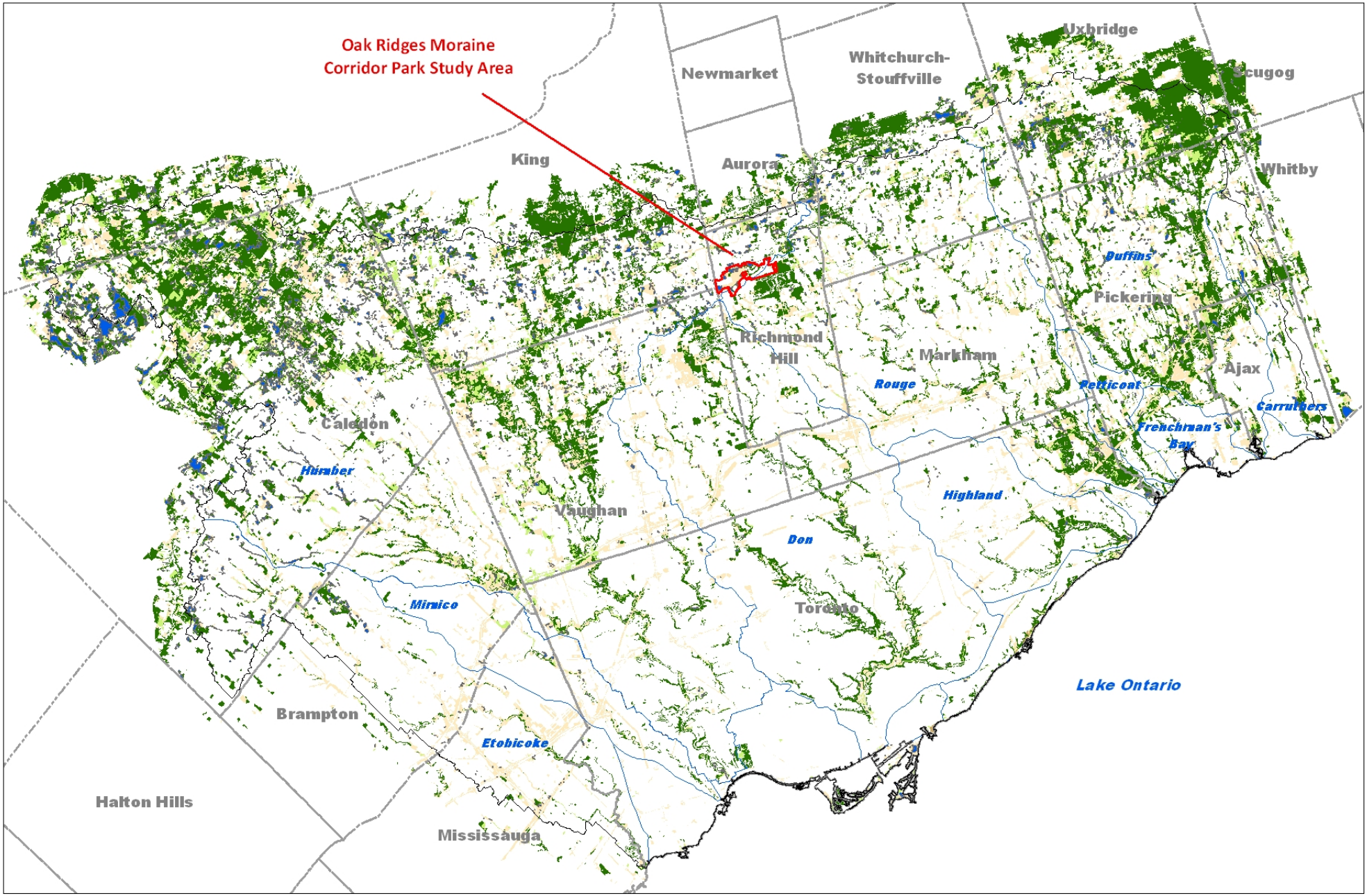

TORONTO AND REGION Conservation for The Living City

N

0 2.5 5 10 15 20 Kilometers

Date: December 2010

* Landscape analysis based on 2007/2008 Orthophotography

Map 1:
Oak Ridges Moraine Corridor Park Study Area in the Context of Regional Natural Cover

Legend

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

- Oak Ridges Moraine Corridor Park Study Area
- TRCA Jurisdiction
- Watershed
- Municipal Boundary

Toronto and Region Conservation for The Living City

N

0 125 250 500 750 1,000 Meters

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

Map 2:
Terrestrial Monitoring Plots Located within the Oak Ridges Moraine Corridor Park Study Area

Legend

- Forest Bird Station
- Meadow Bird Station
- Wetland Frog & Bird Stations
- Forest Vegetation Plot
- Wetland Vegetation Transect
- Oak Ridges Moraine Corridor Park Study Area

Appendix 1: Locations of Monitoring Plots and Stations at ORMCP

Monitoring Plot / Transect / Station Type	Plot Number	UTM co-ordinates (m) NAD-83	
		Easting	Northing
forest vegetation	FV-26A	623004	4865425
wetland vegetation	WV-7	622335	4864686
"	WV-7A	622694	4865249
"	WV-7B	623179	4865648
"	WV-7C	623570	4864730
"	WV-7D	623845	4865966
"	WV-7E	625540	4866412
forest bird	FB-26A #1	623081	4865462
"	FB-26A #2	623246	4865668
"	FB-26A #3	625516	4866507
wetland bird	WB-7 #1	622523	4864554
"	WB-7A #2	622819	4865293
"	WB-7A #3	624452	4866202
wetland frog	WF-7 #1	622523	4864554
"	WF-7A #2	622819	4865293
"	WF-7A #3	624452	4866202
meadow bird	MB-8 #1	622702	4864690
	MB-8 #2	623549	4865131
"	MB-8A #3	623894	4865813
"	MB-8A #4	625571	4865564

Appendix 2: Wetland Transect Woody Vegetation 2008-2009 Frequency and Cover					
Species Scientific Name (tree saplings, shrubs, woody vines >16 cm and <10 cm dbh)	**Species Common Name**	**L-rank**	**Frequency (# plots) 2008-2009**	**Relative Cover (%) NOTE: * = trace**	
				2008	**2009**
Cornus stolonifera	red osier dogwood	L5	5	20.27%	22.59%
Rhamnus cathartica	common buckthorn	L+	5	1.55%	3.60%
Vitis riparia	riverbank grape	L5	5	0.42%	0.27%
Ilex verticillata	winterberry	L3	4	11.47%	12.69%
Prunus virginiana ssp. *virginiana*	choke cherry	L5	4	3.52%	0.81%
Salix petiolaris	slender willow	L4	4	16.33%	17.37%
Acer saccharinum	silver maple	L4	3	1.34%	2.37%
Acer x *freemanii*	hybrid swamp maple	L3	3	2.53%	1.02%
Fraxinus americana	white ash	L5	3	0.35%	1.36%
Sambucus canadensis	common elderberry	L5	3	1.27%	1.09%
Solanum dulcamara	bittersweet nightshade	L+	3		1.83%
Acer saccharum ssp. *saccharum*	sugar maple	L5	2	0.49%	0.61%
Aronia melanocarpa	black choke-berry	L2	2	0.77%	0.75%
Betula papyrifera	paper birch	L4	2	1.76%	2.58%
Ribes cynosbati	prickly gooseberry	L5	2	0.07%	
Rubus pubescens	dwarf raspberry	L4	2	1.06%	0.81%
Salix lucida	shining willow	L3	2	0.42%	2.04%
Spiraea alba	wild spiraea	L4	2	3.10%	1.97%
Ulmus americana	white elm	L5	2		*
Viburnum opulus	European highbush cranberry	L+	2	0.14%	*
Acer spicatum	mountain maple	L4	1	4.50%	3.39%
Chamaedaphne calyculata	leatherleaf	L3	1	18.79%	14.59%
Crataegus sp.	hawthorn species	L5	1	0.14%	0.07%
d_*Salix* sp.	dead willow (shrub)	n/a	1	0.07%	
Fraxinus nigra	black ash	L4	1	4.64%	4.61%
Fraxinus pennsylvanica	red ash	L5	1	0.07%	
Fraxinus sp.	ash species	L5	1	0.35%	
Parthenocissus inserta	thicket creeper	L5	1	0.35%	0.27%
Populus tremuloides	trembling aspen	L5	1		*
Prunus serotina	black cherry	L5	1	*	*
Rhus typhina	staghorn sumach	L5	1	0.14%	

Appendix 2: Wetland Transect Woody Vegetation 2008-2009 Frequency and Cover					
Species Scientific Name (tree saplings, shrubs, woody vines >16 cm and <10 cm dbh)	**Species Common Name**	**L-rank**	**Frequency (# plots) 2008-2009**	**Relative Cover (%) NOTE: * = trace**	
				2008	**2009**
Ribes americanum	wild black currant	L5	1	0.21%	
Ribes rubrum	garden red currant	L+	1		0.27%
Rubus idaeus ssp. *melanolasius*	wild red raspberry	L5	1	0.35%	0.07%
Salix amygdaloides	peach-leaved willow	L4	1		0.07%
Salix bebbiana	Bebb's willow	L4	1	0.56%	0.47%
Salix discolor	pussy willow	L4	1	2.39%	0.88%
Salix eriocephala	narrow heart-leaved willow	L5	1		0.41%
Salix pedicellaris	bog willow	L2	1	0.28%	1.15%
Thuja occidentalis	white cedar	L4	1	0.28%	

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover

Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	Species Common Name	L-rank	Frequency (# plots) 2008-2009	Relative Cover (%) NOTE: * = trace 2008	2009
Impatiens capensis	orange touch-me-not	L5	6	1.06%	0.45%
Lemna minor	common duckweed	L5	6	1.17%	8.79%
Rhamnus cathartica	common buckthorn	L+	6	0.04%	0.11%
Solanum dulcamara	climbing nightshade	L+	6	3.08%	0.49%
Bidens tripartitus	three-parted beggar's-ticks	L4	5	3.52%	1.29%
Cornus stolonifera	red osier dogwood	L5	5	*	0.04%
Sium suave	water parsnip	L4	5	1.32%	1.10%
Alisma plantago-aquatica	water-plantain	L5	4	0.04%	0.23%
Carex pseudo-cyperus	pseudocyperus sedge	L4	4		0.30%
Lemna trisulca	star duckweed	L3	4	1.17%	6.10%
Lycopus uniflorus	northern water-horehound	L4	4	2.31%	0.83%
Scutellaria lateriflora	mad-dog skullcap	L5	4	0.55%	*
Taraxacum officinale	dandelion	L+	4	0.07%	*
Acer x freemanii	hybrid swamp maple	L3	3	*	*
Carex gracillima	graceful sedge	L4	3	0.29%	0.34%
Ceratophyllum demersum	coontail	L3	3	0.70%	1.55%
Cicuta bulbifera	bulblet-bearing water-hemlock	L3	3	*	*
Circaea lutetiana ssp. canadensis	enchanter's nightshade	L5	3	0.18%	*
Dryopteris carthusiana	spinulose wood fern	L5	3	0.55%	0.42%
Galium palustre	marsh bedstraw	L5	3	0.11%	
Galium trifidum var. *trifidum*	small bedstraw	L3	3	*	*
Geum urbanum	urban avens	L+	3	1.43%	1.59%
Ilex verticillata	winterberry	L3	3	*	
Lysimachia thyrsiflora	tufted loosestrife	L3	3	0.40%	0.23%
Onoclea sensibilis	sensitive fern	L5	3	8.54%	11.22%
Phalaris arundinacea	reed canary grass	L+?	3	1.69%	0.45%
Poa pratensis ssp. *pratensis*	Kentucky blue grass	L+	3	0.04%	1.18%
Prunus virginiana ssp. *virginiana*	choke cherry	L5	3	*	*
Sagittaria cuneata	arum-leaved arrow-head	L3	3	0.22%	0.83%
Scutellaria galericulata	common skullcap	L5	3	0.18%	0.19%
Spirodela polyrhiza	greater duckweed	L3	3	1.03%	4.40%

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover

Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	Species Common Name	L-rank	Frequency (# plots) 2008-2009	Relative Cover (%) NOTE: * = trace 2008	2009
Thelypteris palustris var. *pubescens*	marsh fern	L4	3	1.87%	0.72%
Typha latifolia	broad-leaved cattail	L4	3	0.77%	0.76%
Acer saccharinum	silver maple	L4	2	*	*
Acer saccharum ssp. *saccharum*	sugar maple	L5	2	*	*
Alliaria petiolata	garlic mustard	L+	2	*	0.04%
Arisaema triphyllum	Jack-in-the-pulpit	L5	2	0.15%	0.15%
Betula papyrifera	paper birch	L4	2	0.04%	*
Carex crinita	fringed sedge	L3	2	1.69%	2.05%
Carex lacustris	lake-bank sedge	L4	2	3.26%	4.25%
Cornus alternifolia	alternate-leaved dogwood	L5	2	*	*
Daucus carota	Queen Anne's lace	L+	2	0.11%	*
Echinocystis lobata	wild cucumber	L5	2	0.15%	0.15%
Eleocharis smallii	Small's spike-rush	L3	2	5.72%	0.34%
Epilobium ciliatum ssp. *ciliatum*	sticky willow-herb	L5	2	0.04%	*
Epipactis helleborine	helleborine	L+	2	0.04%	*
Equisetum arvense	common horsetail	L5	2	0.18%	0.04%
Equisetum fluviatile	water horsetail	L3	2	0.04%	*
Fragaria virginiana	wild strawberry	L5	2	0.11%	0.11%
Galium tinctorium	stiff marsh bedstraw	L3	2		*
Glyceria borealis	northern manna grass	L3	2	9.24%	0.23%
Leersia oryzoides	rice cut grass	L5	2	5.32%	2.84%
Maianthemum canadense	Canada May flower	L4	2	0.07%	0.04%
Polygonum amphibium	water smartweed	L4	2	0.29%	0.11%
Potamogeton natans	floating pondweed	L3	2	20.10%	12.85%
Potamogeton zosteriformis	flat-stemmed pondweed	L2	2	9.64%	20.89%
Rubus idaeus ssp. *melanolasius*	wild red raspberry	L5	2	0.07%	0.04%
Rubus pubescens	dwarf raspberry	L4	2	1.83%	2.84%
Sagittaria latifolia	common arrow-head	L4	2	*	0.08%
Solidago altissima	tall goldenrod	L5	2		*
Typha x *glauca*	hybrid cattail	L+	2	0.26%	
unknown sp. (seedling)	unknown seedling	n/a	2		*

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover					
Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	**Species Common Name**	**L-rank**	**Frequency (# plots) 2008-2009**	**Relative Cover (%) NOTE: * = trace**	
				2008	**2009**
Veronica scutellata	marsh speedwell	L3	2	0.26%	
Vitis riparia	riverbank grape	L5	2	*	
Wolffia columbiana	Columbia water-meal	L4	2	0.04%	0.30%
Acer negundo	Manitoba maple	L+?	1		*
Acer rubrum	red maple	L4	1		*
Acer spicatum	mountain maple	L4	1	*	0.04%
Agrimonia gryposepala	agrimony	L5	1		0.11%
Alopecurus aequalis	short-awned foxtail	L3	1	0.07%	
Aronia melanocarpa	black choke-berry	L2	1	*	
Asclepias incarnata ssp. *incarnata*	swamp milkweed	L4	1		0.04%
Asclepias syriaca	common milkweed	L5	1	0.07%	0.11%
Aster puniceus var. *puniceus*	swamp aster	L5	1	*	
Athyrium filix-femina var. *angustum*	lady fern	L5	1	0.18%	0.38%
Betula alleghaniensis	yellow birch	L4	1	0.04%	*
Bidens cernuus	nodding bur-marigold	L5	1		*
Boehmeria cylindrica	false nettle	L4	1	*	
Calamagrostis canadensis	Canada blue joint	L4	1		0.08%
Campanula aparinoides	marsh bellflower	L3	1	*	*
Cardamine pensylvanica	bitter cress	L4	1	0.04%	
Carex atherodes	awned sedge	L3	1	*	
Carex blanda	common wood sedge	L5	1	*	
Carex canescens ssp. *canescens*	silvery sedge	L3	1	*	
Carex comosa	bristly sedge	L3	1	0.11%	
Carex cristatella	crested sedge	L5	1	*	
Carex retrorsa	retrorse sedge	L4	1	0.37%	0.61%
Carex sp.	sedge (species unknown)	n/a	1	*	*
Chamaedaphne calyculata	leatherleaf	L3	1	0.29%	0.04%
Cirsium arvense	creeping thistle	L+	1	0.07%	*
Drosera rotundifolia	round-leaved sundew	L1	1	*	0.04%
Dryopteris clintoniana	Clinton's wood fern	L3	1	0.07%	
Dulichium arundinaceum	three-way sedge	L2	1	*	

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover

Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	Species Common Name	L-rank	Frequency (# plots) 2008-2009	Relative Cover (%) NOTE: * = trace 2008	2009
Elodea canadensis	common water-weed	L4	1	0.04%	0.30%
Epilobium leptophyllum	narrow-leaved willow-herb	L3	1		*
Epilobium strictum	downy willow-herb	L2	1		*
Euthamia graminifolia	grass-leaved goldenrod	L5	1	0.51%	0.08%
Festuca pratensis	meadow fescue	L+	1	0.07%	1.14%
Festuca rubra ssp. *rubra*	red fescue	L+	1	0.11%	
Fraxinus americana	white ash	L5	1	*	
Fraxinus nigra	black ash	L4	1	0.07%	
Galium sp.	bedstraw (species unknown)	n/a	1	*	
Galium triflorum	sweet-scented bedstraw	L5	1	*	
Galium verum	yellow bedstraw	L+	1	0.66%	0.19%
Geum sp.	avens (species unknown)	n/a	1		*
Glyceria grandis	tall manna grass	L4	1		0.11%
grass spp. (not identified)	grasses	n/a	1	*	
Hesperis matronalis	dame's rocket	L+	1	0.07%	0.08%
Hypericum perforatum	common St. Johnswort	L+	1	0.40%	0.15%
Iris versicolor	blue flag	L3	1	0.15%	0.04%
Lactuca serriola	prickly lettuce	L+	1	0.07%	0.04%
Linaria vulgaris	butter-and-eggs	L+	1	0.07%	*
Liparis loeselii	Loesel's twayblade	L3	1	*	
Lotus corniculatus	bird's foot trefoil	L+	1	*	*
Lythrum salicaria	purple loosestrife	L+	1	0.66%	0.49%
Malus pumila	apple	L+	1		*
Matteuccia struthiopteris var. *pensylvanica*	ostrich fern	L5	1	1.06%	0.45%
Melilotus alba	white sweet clover	L+	1	*	0.27%
Mitella nuda	naked mitrewort	L3	1	0.07%	*
Myosotis scorpioides	true forget-me-not	L+	1	0.26%	
Najas flexilis	bushy naiad	L2	1	0.11%	0.04%
Parthenocissus inserta	thicket creeper	L5	1	0.04%	*
Peltandra virginica	tuckahoe	L3	1	0.15%	0.15%
Penthorum sedoides	ditch stonecrop	L4	1	0.15%	0.42%

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover

Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	Species Common Name	L-rank	Frequency (# plots) 2008-2009	Relative Cover (%) NOTE: * = trace 2008	2009
Poa compressa	flat-stemmed blue grass	L+	1	0.04%	
Poa nemoralis	woodland spear grass	L+	1		*
Populus tremuloides	trembling aspen	L5	1	*	*
Potamogeton foliosus	leafy pondweed	L3	1		*
Potamogeton sp.	pondweed (species unknown)	n/a	1		0.45%
Potentilla palustris	marsh cinquefoil	L2	1	0.11%	0.15%
Ranunculus abortivus	kidney-leaved buttercup	L5	1	*	0.04%
Ranunculus sceleratus	cursed crowfoot	L5	1	*	
Rhus typhina	staghorn sumach	L5	1		*
Rorippa palustris ssp. *fernaldiana*	Fernald's marsh cress	L4	1	*	
Rosa multiflora	multiflora rose	L+	1		*
Rumex orbiculatus	great water dock	L3	1	0.04%	0.04%
Salix pedicellaris	bog willow	L2	1		*
Scirpus cyperinus	woolly bulrush	L3	1	0.44%	1.52%
Scirpus sp.	bulrush (species unknown)	n/a	1	0.04%	
Solidago flexicaulis	zig-zag goldenrod	L5	1	0.26%	*
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	L+	1	*	
Sonchus oleraceus	annual sow-thistle	L+	1	*	
Sorbus aucuparia	European mountain-ash	L+	1	*	
Sparganium emersum ssp. *emersum*	green-fruited bur-reed	L3	1	0.99%	1.02%
Spiraea alba	wild spiraea	L4	1	*	
Triadenum fraseri	marsh St. Johnswort	L2	1	0.11%	0.04%
Tussilago farfara	coltsfoot	L+	1	0.73%	0.27%
unknown sp.	unknown species	n/a	1		0.04%
Viburnum opulus	European highbush cranberry	L+	1	0.04%	
Viola affinis	Le Conte's violet	L3	1	*	
Viola blanda	sweet white violet	L3	1	0.07%	*
Viola macloskeyi ssp. *pallens*	northern white violet	L3	1	0.11%	0.08%
Non-vascular plants					

Appendix 3: Wetland Transect Ground Vegetation 2008-2009 Frequency and Cover

Species Scientific Name (ground veg includes all herbaceous plants, and woody seedlings < 16 cm tall)	Species Common Name	L-rank	Frequency (# plots) 2008-2009	Relative Cover (%) NOTE: * = trace 2008	2009
moss spp.	mosses	n/a	6		
Riccia sp.	slender riccia	n/a	3		
Chara sp.	stonewort	n/a	2		
lichen spp.	lichens	n/a	2		
Ricciocarpus sp.	purple-fringed riccia	n/a	2		
algae spp.	algae	n/a	1		
liverwort spp.	liverworts	n/a	1		
Riccia fluitans	slender riccia	n/a	1		
Ricciocarpus natans	purple-fringed riccia	n/a	1		
Sphagnum sp.	sphagnum moss	n/a	1		
Unvegetated					
standing water	standing water	n/a	5		
bare soil	bare soil (recorded 2008)	n/a	4		

Appendix 4: ORMCP wetland transect floristic quality information 2008-2009

Transect	Year	Number of Species	Number of Native Species	Percent Native Species	Number of L1 to L3 Species	Mean Coefficient of Conservatism	Floristic Quality Index
	2008	39	25	64	11	4	19.8
WV7	2009	39	27	69	11	3.7	19.2
	2008	50	39	78	15	4.3	26.6
WV7-A	2009	41	31	76	13	4.2	23.2
	2008	51	46	90	9	4.4	29.8
WV7-B	2009	46	43	93	7	4.1	26.8
	2008	59	47	80	21	4.7	32.5
WV7-C	2009	64	53	83	20	4.6	33.5
	2008	16	12	75	0	4.1	14.1
WV7-D	2009	18	16	89	1	3.8	15.3
	2008	36	32	89	9	4.2	23.7
WV7-E	2009	30	27	90	6	4.1	21.6
	2008	**41.8 (±15.2)**	**33.5 (±13.5)**	**79.3 (±9.6)**	**10.8 (±7.0)**	**4.3 (±0.3)**	**24.4 (±6.7)**
Mean (± SD)	2009	**39.7 (±15.5)**	**32.8 (±13.2)**	**83.3 (±9.3)**	**9.7 (±6.6)**	**4.1 (±0.3)**	**23.3 (±6.3)**

Appendix 5: ORMCP Flora Species 2008-2009

Scientific Name	Common Name	Sensitivity		Plot / Transect Occurrences 2008-2009						
		TRCA	Coeff. of	Forest	Wetland					
		L-rank	Conserv.	FV26-A	WV7	WV7-A	WV7-B	WV7-C	WV7-D	WV7-E
Acer negundo	Manitoba maple	L+?	-			x				
Acer rubrum	red maple	L4	4					x		
Acer saccharinum	silver maple	L4	5				x	x	x	
Acer saccharum ssp. *saccharum*	sugar maple	L5	4	x			x	x	x	
Acer spicatum	mountain maple	L4	6				x			
Acer x *freemanii*	hybrid swamp maple	L3	5			x	x	x		x
Agrimonia gryposepala	agrimony	L5	2						x	
Alisma plantago-aquatica	water-plantain	L5	3		x	x			x	x
Alliaria petiolata	garlic mustard	L+	-			x	x	x		
Alopecurus aequalis	short-awned foxtail	L3	7							x
Arisaema triphyllum	Jack-in-the-pulpit	L5	5	x			x		x	
Aronia melanocarpa	black choke-berry	L2	7					x		x
Asclepias incarnata ssp. *incarnata*	swamp milkweed	L4	6					x		
Asclepias syriaca	common milkweed	L5	0		x					
Aster puniceus var. *puniceus*	swamp aster	L5	6				x			
Athyrium filix-femina var. *angustum*	northeastern lady fern	L5	4				x			
Betula alleghaniensis	yellow birch	L4	6				x			
Betula papyrifera	paper birch	L4	2				x	x		
Bidens cernuus	nodding bur-marigold	L5	2		x					
Bidens tripartitus	three-parted beggar's-ticks	L4	4		x	x	x	x		x
Boehmeria cylindrica	false nettle	L4	4						x	
Calamagrostis canadensis	Canada blue joint	L4	4		x					
Campanula aparinoides	marsh bellflower	L3	7					x		
Cardamine pensylvanica	bitter cress	L4	6				x			
Carex atherodes	awned sedge	L3	6		x					
Carex blanda	common wood sedge	L5	3					x		
Carex canescens ssp. *canescens*	silvery sedge	L3	7					x		
Carex comosa	bristly sedge	L3	5					x		
Carex crinita	fringed sedge	L3	6				x			x
Carex cristatella	crested sedge	L5	3				x			
Carex gracillima	graceful sedge	L4	4			x	x	x		
Carex lacustris	lake-bank sedge	L4	5				x	x		
Carex pseudo-cyperus	pseudocyperus sedge	L4	6		x		x	x		x
Carex retrorsa	retrorse sedge	L4	5			x				
Carya cordiformis	bitternut hickory	L4	6	x						
Caulophyllum giganteum	long-styled blue cohosh	L4	6	x						
Ceratophyllum demersum	coontail	L3	4		x	x		x		
Chamaedaphne calyculata	leatherleaf	L3	9					x		
Cicuta bulbifera	bulblet-bearing water-hemlock	L3	5		x	x		x		
Circaea lutetiana ssp. *canadensis*	enchanter's nightshade	L5	3	x		x		x	x	
Cirsium arvense	creeping thistle	L+	-		x					

Appendix 5: ORMCP Flora Species 2008-2009

Scientific Name	Common Name	Sensitivity: TRCA L-rank	Sensitivity: Coeff. of Conserv.	Plot / Transect Occurrences 2008-2009: Forest FV26-A	Wetland WV7	WV7-A	WV7-B	WV7-C	WV7-D	WV7-E
Cornus alternifolia	alternate-leaved dogwood	L5	6				x		x	
Cornus stolonifera	red osier dogwood	L5	2			x	x	x	x	x
Crataegus sp.	hawthorn (native unidentified)	L4	4					x		
Daucus carota	Queen Anne's lace	L+	-		x	x				
Drosera rotundifolia	round-leaved sundew	L1	7					x		
Dryopteris carthusiana	spinulose wood fern	L5	5	x			x	x	x	
Dryopteris clintoniana	Clinton's wood fern	L3	7				x			
Dulichium arundinaceum	three-way sedge	L2	7					x		
Echinocystis lobata	wild cucumber	L5	3					x		x
Eleocharis smallii	Small's spike-rush	L3	6		x	x				
Elodea canadensis	common water-weed	L4	4					x		
Epilobium ciliatum ssp. *ciliatum*	sticky willow-herb	L5	3				x			x
Epilobium leptophyllum	narrow-leaved willow-herb	L3	7					x		
Epilobium strictum	downy willow-herb	L2	9					x		
Epipactis helleborine	helleborine	L+	-				x			x
Equisetum arvense	field horsetail	L5	0		x		x			
Equisetum fluviatile	water horsetail	L3	7			x		x		
Erythronium americanum ssp. *americanum*	yellow trout-lily	L5	5	x						
Euthamia graminifolia	grass-leaved goldenrod	L5	2		x					
Festuca pratensis	meadow fescue	L+	-					x		
Festuca rubra ssp. *rubra*	red fescue	L+	-					x		
Fragaria virginiana	wild strawberry	L5	2			x	x			
Fraxinus americana	white ash	L5	4	x		x	x		x	
Fraxinus nigra	black ash	L4	7				x			
Fraxinus pennsylvanica	green/red ash	L5	3			x				
Galium palustre	marsh bedstraw	L5	5			x	x	x		
Galium tinctorium	stiff marsh bedstraw	L3	5				x	x		
Galium trifidum var. *trifidum*	small bedstraw	L3	5				x	x		x
Galium triflorum	sweet-scented bedstraw	L5	4				x			
Galium verum	yellow bedstraw	L+	-					x		
Geranium robertianum	herb Robert	L+?	-	x						
Geum urbanum	urban avens	L+	-			x		x	x	
Glyceria borealis	northern manna grass	L3	8		x	x				
Glyceria grandis	tall manna grass	L4	5							x
Hesperis matronalis	dame's rocket	L+	-					x		
Hypericum perforatum	common St. Johnswort	L+	-					x		
Ilex verticillata	winterberry	L3	5			x	x	x		x
Impatiens capensis	orange touch-me-not	L5	4		x	x	x	x	x	x
Iris versicolor	blue flag	L3	5			x				
Lactuca serriola	prickly lettuce	L+	-		x					
Leersia oryzoides	rice cut grass	L5	3			x				x

Appendix 5: ORMCP Flora Species 2008-2009

Scientific Name	Common Name	Sensitivity: TRCA L-rank	Sensitivity: Coeff. of Conserv.	Plot / Transect Occurrences 2008-2009: Forest: FV26-A	Wetland: WV7	Wetland: WV7-A	Wetland: WV7-B	Wetland: WV7-C	Wetland: WV7-D	Wetland: WV7-E
Lemna minor	common duckweed	L5	2		x	x	x	x	x	x
Lemna trisulca	star duckweed	L3	4		x	x	x		x	
Linaria vulgaris	butter-and-eggs	L+	-		x					
Liparis loeselii	Loesel's twayblade	L3	5				x			
Lotus corniculatus	bird's foot trefoil	L+	-		x					
Lycopus uniflorus	northern water-horehound	L4	5			x	x	x		x
Lysimachia thyrsiflora	tufted loosestrife	L3	7			x		x		x
Lythrum salicaria	purple loosestrife	L+	-			x		x		
Maianthemum canadense	Canada mayflower	L4	5				x			x
Malus pumila	apple	L+	-			x				
Matteuccia struthiopteris var. *pensylvanica*	ostrich fern	L5	5							x
Melilotus alba	white sweet clover	L+	-		x					
Mitella nuda	naked mitrewort	L3	6				x			
Myosotis scorpioides	true forget-me-not	L+	-			x				
Najas flexilis	bushy naiad	L2	5		x					
Onoclea sensibilis	sensitive fern	L5	4				x	x	x	
Ostrya virginiana	ironwood	L5	4	x						
Oxalis stricta	common yellow wood-sorrel	L5	0	x						
Parthenocissus inserta	thicket creeper	L5	3					x		
Peltandra virginica	tuckahoe	L3	9					x		
Penthorum sedoides	ditch stonecrop	L4	4							x
Phalaris arundinacea	reed canary grass	L+?	-		x	x				x
Poa compressa	flat-stemmed blue grass	L+	-		x					
Poa nemoralis	woodland spear grass	L+	-			x				
Poa pratensis ssp. *pratensis*	Kentucky blue grass	L+	-		x	x		x		
Polygonum amphibium	water smartweed	L4	5		x				x	
Populus tremuloides	trembling aspen	L5	2				x			x
Potamogeton foliosus	leafy pondweed	L3	4			x				
Potamogeton natans	floating pondweed	L3	5		x	x				
Potamogeton zosteriformis	flat-stemmed pondweed	L2	5		x	x				
Potentilla palustris	marsh cinquefoil	L2	7					x		
Prunus pensylvanica	pin cherry	L4	3	x						
Prunus serotina	black cherry	L5	3	x			x			
Prunus virginiana ssp. *virginiana*	choke cherry	L5	2	x		x	x	x	x	x
Quercus rubra	red oak	L4	6	x						
Ranunculus abortivus	kidney-leaved buttercup	L5	2			x				
Ranunculus sceleratus	cursed crowfoot	L5	2			x				
Rhamnus cathartica	common buckthorn	L+	-	x	x	x	x	x	x	x
Rhus typhina	staghorn sumach	L5	1					x		
Ribes americanum	wild black currant	L5	4							x
Ribes cynosbati	prickly gooseberry	L5	4	x		x				x

Appendix 5: ORMCP Flora Species 2008-2009

Scientific Name	Common Name	Sensitivity: TRCA L-rank	Sensitivity: Coeff. of Conserv.	Plot / Transect Occurrences 2008-2009: Forest FV26-A	Wetland WV7	WV7-A	WV7-B	WV7-C	WV7-D	WV7-E
Ribes rubrum	garden red currant	L+	-							x
Rorippa palustris ssp. *fernaldiana*	Fernald's marsh cress	L4	3		x					
Rosa multiflora	multiflora rose	L+	-		x					
Rubus idaeus ssp. *melanolasius*	wild red raspberry	L5	0		x			x		
Rubus pubescens	dwarf raspberry	L4	4				x			x
Rumex orbiculatus	great water dock	L3	6					x		
Sagittaria cuneata	arum-leaved arrowhead	L3	7		x	x		x		
Sagittaria latifolia	common arrowhead	L4	4		x			x		
Salix amygdaloides	peach-leaved willow	L4	6			x				
Salix bebbiana	Bebb's willow	L4	4					x		
Salix discolor	pussy willow	L4	3					x		
Salix eriocephala	narrow heart-leaved willow	L5	4							x
Salix lucida	shining willow	L3	5			x				x
Salix pedicellaris	bog willow	L2	9					x		
Salix petiolaris	slender willow	L4	3		x	x		x		x
Sambucus canadensis	common elderberry	L5	5			x	x		x	
Sambucus racemosa ssp. *pubens*	red-berried elder	L5	5	x						
Scirpus cyperinus	woolly bulrush	L3	4							x
Scirpus sp.		L5	3		x					
Scutellaria galericulata	common skullcap	L5	6			x	x			x
Scutellaria lateriflora	mad-dog skullcap	L5	5			x	x	x		x
Sium suave	water-parsnip	L4	4		x	x	x		x	x
Solanum dulcamara	bittersweet nightshade	L+	-		x	x	x	x	x	x
Solidago altissima	tall goldenrod	L5	1				x	x		
Solidago flexicaulis	zig-zag goldenrod	L5	6						x	
Sonchus arvensis ssp. *arvensis*	glandular perennial sow-thistle	L+	-			x				
Sonchus oleraceus	annual sow-thistle	L+	-					x		
Sorbus aucuparia	European mountain-ash	L+	-			x				
Sparganium emersum ssp. *emersum*	green-fruited bur-reed	L3	5		x					
Spiraea alba	wild spiraea	L4	3				x	x		
Spirodela polyrhiza	greater duckweed	L3	4		x	x		x		
Taraxacum officinale	dandelion	L+	-	x	x	x	x	x		
Thelypteris palustris var. *pubescens*	marsh fern	L4	5				x	x		x
Thuja occidentalis	white cedar	L4	4				x			
Triadenum fraseri	marsh St.Johnswort	L2	7					x		
Trillium erectum	red trillium	L4	6	x						
Trillium grandiflorum	white trillium	L4	5	x						
Tussilago farfara	coltsfoot	L+	-		x					
Typha latifolia	broad-leaved cattail	L4	3		x			x		x
Typha x *glauca*	hybrid cattail	L+	-		x	x				
Ulmus americana	white elm	L5	3				x	x		

Appendix 5: ORMCP Flora Species 2008-2009

Scientific Name	Common Name	Sensitivity: TRCA L-rank	Sensitivity: Coeff. of Conserv.	Plot / Transect Occurrences 2008-2009: Forest FV26-A	Wetland WV7	Wetland WV7-A	Wetland WV7-B	Wetland WV7-C	Wetland WV7-D	Wetland WV7-E
Veronica scutellata	marsh speedwell	L3	7			x				x
Viburnum opulus	European highbush cranberry	L+	-	x		x	x			
Viola affinis	Le Conte's violet	L3	6				x			
Viola blanda	sweet white violet	L3	6				x			
Viola macloskeyi ssp. *pallens*	northern white violet	L3	6					x		
Viola pubescens	stemmed yellow violet	L5	5	x						
Vitis riparia	riverbank grape	L5	0	x	x	x	x	x		x
Wolffia columbiana	columbia water-meal	L4	4		x	x				

Natives	20	**32**	43	**54**	60	20	37
Exotics	4	15	17	6	**14**	3	5
Total	24	**47**	60	**60**	**74**	23	42

All Wetland Total	**160**
Natives	**127**
Exotics	**33**
All ORMCP Total	**172**
Natives	**138**
Exotics	**34**

Appendix 6: Bird list for the LTMP conducted at ORMCP, showing local ranks (L-ranks) and assigned nest-habitat guilds.

Common Name	L-rank	forest	forest-edge	wetland	meadow	general	cavity	low	mid	upper	aerial	text summary
Cooper's hawk	L4											C) forest upper-level nester
eastern wood-pewee	L4											C) forest upper-level nester
great-crested flycatcher	L4											C) forest upper-level nester
hairy woodpecker	L4											C) forest upper-level nester
olive-sided flycatcher	L2											C) forest upper-level nester
ovenbird	L3											A) forest low-level nester
pine warbler	L3											C) forest upper-level nester
red-eyed vireo	L4											B) forest mid-level nester
scarlet tanager	L3											C) forest upper-level nester
white-breasted nuthatch	L4											C) forest upper-level nester
wood duck	L3											C) forest upper-level nester
wood thrush	L3											B) forest mid-level nester
American redstart	L3											E) forest-edge mid-level nester
black-billed cuckoo	L3											E) forest-edge mid-level nester
brown thrasher	L3											E) forest-edge mid-level nester
chestnut-sided warbler	L3											E) forest-edge mid-level nester
downy woodpecker	L5											E) forest-edge mid-level nester
indigo bunting	L4											E) forest-edge mid-level nester
least flycatcher	L4											F) forest-edge upper-level nester
rose-breasted grosbeak	L4											E) forest-edge mid-level nester
ruby-throated hummingbird	L4											E) forest-edge mid-level nester
yellow-billed cuckoo	L3											N) generalist mid-level nester
alder flycatcher	L4											K) wetland mid-level nester
Canada goose	L5											J) wetland low-level nester
common yellowthroat	L4											J) wetland low-level nester
great blue heron	L3											L) wetland upper-level nester
mallard	L5											J) wetland low-level nester
osprey	L3											L) wetland upper-level nester
pied-billed grebe	L3											J) wetland low-level nester
ring-billed gull	L4											J) wetland low-level nester
swamp sparrow	L4											J) wetland low-level nester
Virginia Rail	L3											J) wetland low-level nester
bobolink	L3											G) meadow low-level nester
eastern kingbird	L4											I) meadow upper-level nester
eastern meadowlark	L4											G) meadow low-level nester

Appendix 6: Bird list for the LTMP conducted at ORMCP, showing local ranks (L-ranks) and assigned nest-habitat guilds.

Common Name	L-rank	forest	forest-edge	wetland	meadow	general	cavity	low	mid	upper	aerial	text summary
field sparrow	L4											G) meadow low-level nester
grasshopper sparrow	L2											G) meadow low-level nester
horned lark	L4											G) meadow low-level nester
savannah sparrow	L4											G) meadow low-level nester
spotted sandpiper	L4											G) meadow low-level nester
willow flycatcher	L4											H) meadow mid-level nester
American Crow	L5											O) generalist upper-level nester
American goldfinch	L5											N) generalist mid-level nester
American kestrel	L4											O) generalist upper-level nester
American robin	L5											N) generalist mid-level nester
Baltimore oriole	L5											O) generalist upper-level nester
barn swallow	L4											N) generalist mid-level nester
black-capped chickadee	L5											N) generalist mid-level nester
blue jay	L5											O) generalist upper-level nester
cedar waxwing	L5											N) generalist mid-level nester
chipping sparrow	L5											N) generalist mid-level nester
cliff swallow	L4											O) generalist upper-level nester
common grackle	L5											N) generalist mid-level nester
European starling	L+											N) generalist mid-level nester
grey catbird	L4											N) generalist mid-level nester
house finch	L+											N) generalist mid-level nester
house wren	L5											N) generalist mid-level nester
killdeer	L5											M) generalist low-level nester
mourning dove	L5											N) generalist mid-level nester
northern cardinal	L5											N) generalist mid-level nester
northern flicker	L4											O) generalist upper-level nester
red-tailed hawk	L5											O) generalist upper-level nester
red-winged blackbird	L5											N) generalist mid-level nester
song sparrow	L5											M) generalist low-level nester
tree swallow	L4											N) generalist mid-level nester
warbling vireo	L5											O) generalist upper-level nester
yellow warbler	L5											N) generalist mid-level nester
bank swallow	L4											special case
brown-headed cowbird	L5											special case
northern rough-winged swallow	L4											special case

Appendix 6: Bird list for the LTMP conducted at ORMCP, showing local ranks (L-ranks) and assigned nest-habitat guilds.

Common Name	L-rank	forest	forest-edge	wetland	meadow	general	cavity	low	mid	upper	aerial	text summary
note that the given habitat is that in which the species places the nest.												
forest-edge can also be used to indicate thicket habitat												
ground = on or very near to ground-level. <0.5m = low level												
undrstry = lower shrub layer (in forest), or generally in shrubs (open country). 0.5 to 3m = mid level												
canopy = middle or upper canopy in forest habitat - small to large trees. > 3m = upper level												