Osgoode Woodlot Management Plan

Photo Credit: D. Barcza, LGL Limited

Prepared for:

YORK UNIVERSITY
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NORTH YORK, ONTARIO
M3J1P3

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Osgoode Woodlot Management Plan

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

A Management Plan has been prepared for the Osgoode Woodlot in support of the York University Master Plan Update. Three season field investigations for vegetation and wildlife were conducted in the Osgoode Woodlot. Data gathered was used to update the existing conditions information in the York University Secondary Plan Update Natural Heritage Report and Addendum (LGL 2008).

An ecological assessment was undertaken during 2012 to identify potential habitat restoration, enhancement and creation opportunities in the Osgoode Woodlot as is documented in **Section 4.0**. A number of reports have been reviewed in order to create the Osgoode Woodlot Management Plan. The following reports provide documentation from 2001 through 2011:

- Dougan & Associates. 2001. *York University South Keele Woodlot Sustainability Study.* Prepared for York University;
- LGL. 2008. *York University Secondary Plan Update: Natural Heritage Report*. Prepared for York University Development Corporation;
- LGL. 2008. *York University Secondary Plan Update Natural Heritage Report – Addendum.* Prepared for York University Development Corporation; and,
- LGL. 2011. *Natural Heritage Impact Study: Pan American Games 2015 Athletics Stadium Track and Field Facility York University.* Prepared for York University.

1.1 Study Site Location

York University is located within the City of Toronto and is bounded by Steeles Avenue West to the north, Keele Street to the east, the Finch Hydro Corridor to the south and the Black Creek Valley to the west. The Osgoode Woodlot and adjacent lands, lie within the south-western portion of the York University campus. **Figure 1** presents the location of the study area in a regional context.

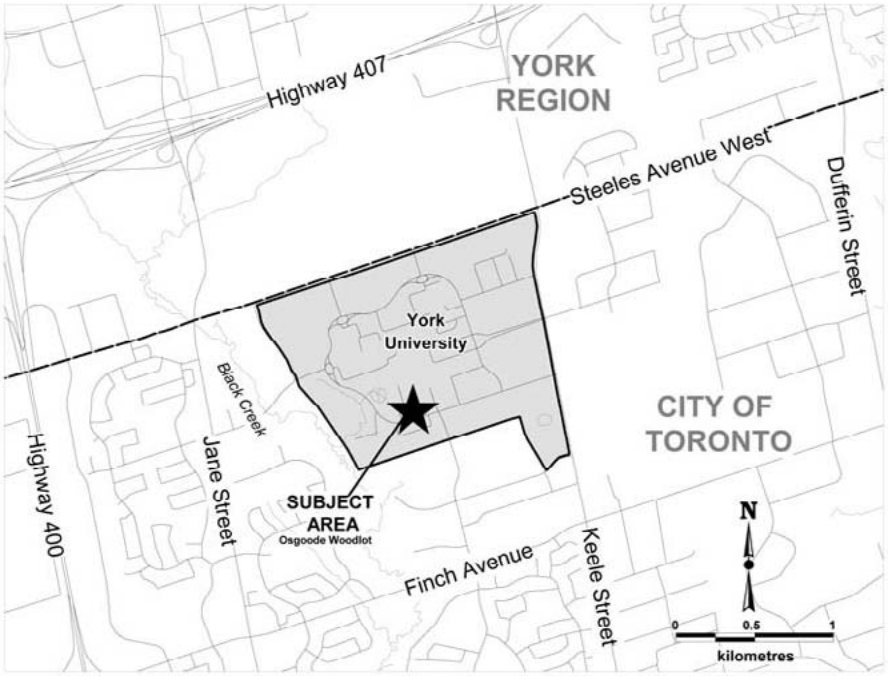


Figure 1. Key Plan of the Osgoode Woodlot.

1.2 Core Woodlots

The Osgoode Woodlot is one of four core woodlots on the York University campus (**Figure 2**). The Osgoode Woodlot covers an area of approximately of 0.84 ha. It is bounded by the Pond Road to the south; a pathway called Scholar's Walk and construction area to the east; Nelson Road to the west, Osgoode Hall to the north; an old residence called Hart House and hedgerows to the northwest; the Stong Pond, Arboretum and manicured grass further to the northwest. There are three other woodlots on the York University campus, including Boynton, Boyer, and Danby woodlots. Separate management plans have been prepared for each of these woodlots.

1.3 Osgoode Woodlot Study Area

The Osgoode Woodlot study area is composed of the Osgoode Woodlot and the hedgerows to the northwest (**Figure 2**). The hedgerows were only examined from the outside because they appear to be a part of the residence and field staff did not want to disturb the privacy of the residents. The Osgoode Woodlot Study Area is described and delineated in greater detail within **Section 3.0**.

1.4 Planning and Legislative Context

The Woodlot Management Plans have been prepared to fulfill York University's obligations related to the York University Secondary Plan, the York University Master Plan and the City of Toronto Ravine and Natural Feature Protection By-law.

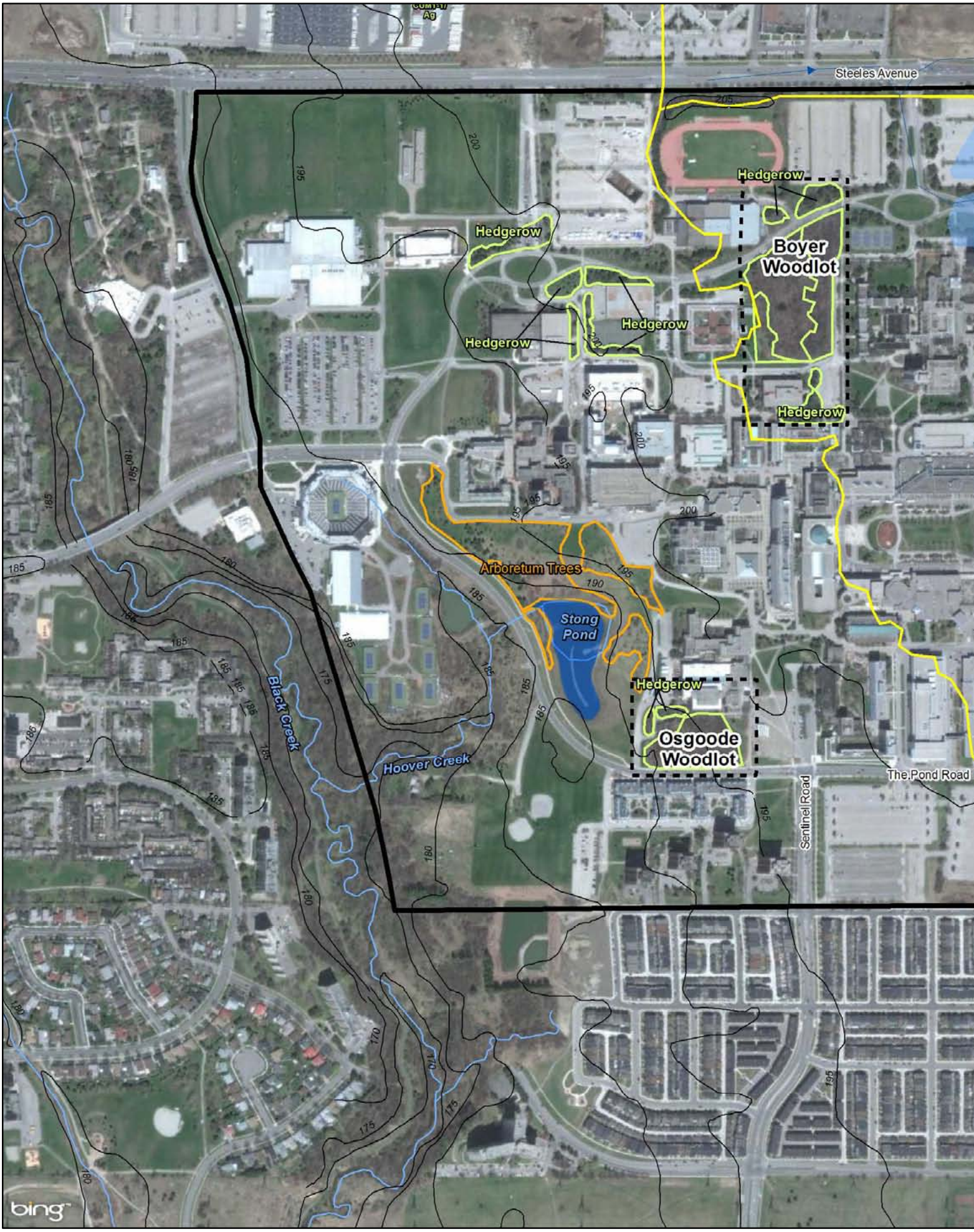
The York University Secondary Plan, Amendment No. 104 to the Official Plan of the City of Toronto, was adopted by Council on December 4, 2009. The Secondary Plan includes policies related to the Natural Heritage System found on campus, including the Boyer, Boynton Danby and Osgoode Woodlots. Specifically, Policy 3.7.1.8 requires the preparation of management/stewardship plans for the woodlots at the precinct planning stage or when the University updates its 1988 Master Plan and the implementation of the plans will be a condition of development approvals. The management/stewardship plans are to include adaptive management monitoring programs to:

(a) determine and measure the ongoing health of the woodlots;
(b) determine whether the management practices implemented are effective; and,
(c) determine if modifications are required due to unacceptable impacts from adjacent development.

The York University Master Plan is being updated to inform decision-making as the University continues to grow and to guide the physical qualities of the campus by becoming a working tool used by all stakeholders, including staff, students, faculty and partners. Updates to the Master Plan were initiated in 2009 and a draft Master Plan was released for review in November 2012. The Woodlot Management Plans constitute a major component of the new Master Plan.

The City of Toronto Ravine and Natural Feature Protection By-law, Municipal Code Chapter 658, was amended by the City in May 2008 to include woodlands in addition to ravines. The purpose of the By-law is to promote the management, protection and conservation of ravines and associated natural and woodland areas and to prohibit and regulate the injury and destruction of trees, filling, grading and dumping in defined areas. The four woodlots, as well as the Hoover Creek/Black Creek Valleylands, are located within the ravine and natural heritage protection area and are thus subject to the requirements of The By-law.

The Woodlot Management Plans have been prepared in sufficient detail to describe the site characteristics, stressors/impacts and the actions recommended for maintaining and restoring the woodlots as viable ecosystems. However, additional information may be required to facilitate implementation of the Woodlot Management Plans, in particular, detailed restoration plans, monitoring plans, timing and



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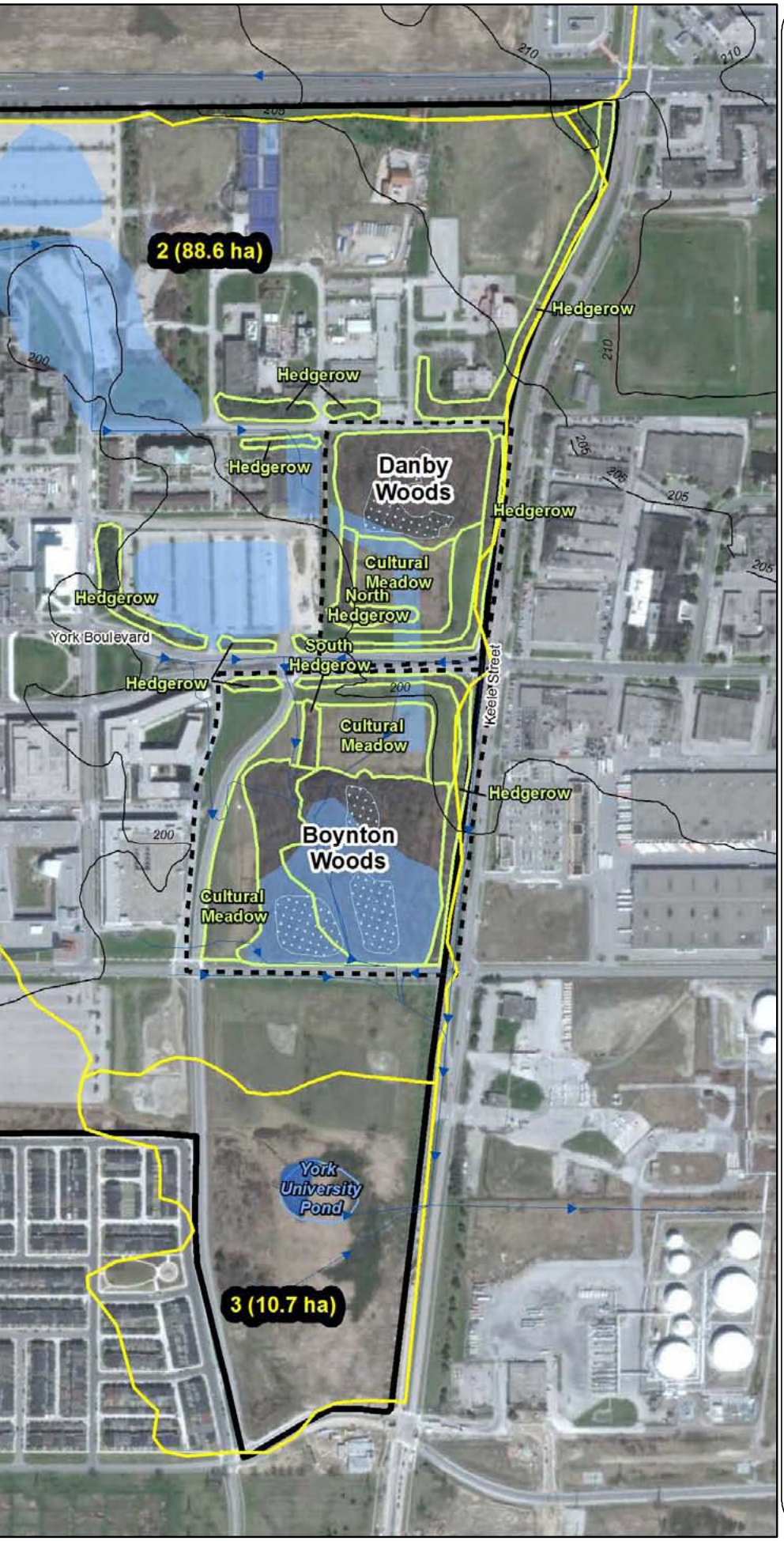

LEGEND

- York University Property Line
- Study Area
- Watercourse
- Sources of Water
- Pond
- Seasonally Wet Area
- Existing Overland Drainage Routes
- Vegetation Community Boundary
- Arboretum
- Topographic Lines
- Catchment Area
- # (## ha) Catchment Area ID (Area)

Data Source: LGL Limited Field Surveys, Dougan & Associates 2001: "York University South Keele Woodlot Sustainability Study", Conestoga-Rovers & Associates 2011: "Hydrogeological Assessment Boyer Woodlot Ponds York University Campus" and Ministry of Natural Resources.

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Woodlots on the York University Campus

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Project: TA8152	**Figure:** 2
Date: March 2013	**Prepared By:** KDR
Scale: 1 : 7000	**Checked By:** DEB

responsibilities for activities. The preparations of detailed Implementation Plans are considered beyond the scope of these Woodlot Management Plans and remain under consideration as future work by York University.

2.0 ASSESSMENT OF POTENTIAL HABITAT RESTORATION, ENHANCEMENT AND CREATION OPPORTUNITIES IN THE OSGOODE WOODLOT

As a part of efforts to identify areas suitable for restoration and enhancement, an assessment of the Osgoode Woodlot was undertaken in 2012. Existing vegetation communities within and immediately adjacent to the Osgoode Woodlot were examined to determine how the land could be restored and managed to improve the habitat. The intent of the Osgoode Woodlot assessment was to identify opportunities for future strategic improvements.

2.1 Process for Osgoode Woodlot Ecological Assessment

Each vegetation community within and immediately adjacent to the Osgoode Woodlot was assessed to determine how it could be restored or enhanced. The vegetation communities were also reviewed to determine whether they are currently mammal and/or bird corridors or if through enhancement they could become corridors. Each site was also assessed to determine what management practices should be used to improve the vegetation communities.

The following steps have been/will be taken with respect to management of the Osgoode Woodlot:

1. Current land use site assessment;
2. Examination of past disturbance regimes and current ecological stressors;
3. An Osgoode Woodlot Restoration Site Plan;
4. Formation of restoration goals and objectives;
5. Creation of a management plan to improve the habitat;
6. Initiation of a monitoring program;
7. Implementation; and,
8. Adaptive management based upon monitoring.

It is the intent of the University to implement the Osgoode Woodlot Management Plan once it is approved, subject to funding, staffing and University priorities.

2.2 Current Land Use Site Assessment Protocols

A reconnaissance level field investigation of natural/semi-natural vegetation communities within and immediately adjacent to the Osgoode Woodlot were conducted within the study area by LGL on May 7, August 9, and September 25, 2012. Semi-natural vegetation communities are those communities that occur without regular management, maintenance or species introduction, but have been sufficiently altered in terms of species composition or vegetation structure by anthropogenic activity (Canadian National Vegetation Classification 2012). The Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998) field sampling methods and data cards were used as a template to create more extensive restoration field sheets. Necessary data was collected to describe and classify the vegetation community type, assess the soils, the plant composition, linkages and disturbance regimes according to the ELC. Detailed field sampling techniques, analysis and mapping are described in Lee et al. (1998) and Apfelbaum et al. (2010).

Detailed site assessments included the following activities:

1) Conducting detailed analysis of the plant composition, structure and function in each vegetation community present at the site;

2) Taking soil cores for analysis of soil composition and soil moisture;
3) Identifying existing linkages;
4) Assessment of vegetation community habitat quality and corridor quality; and,
5) Identifying and analyzing past disturbance regimes for the purpose of assessing management requirements to address the ecological stressors.

2.2.1 Protocol for Vegetation Community, Structure and Function Analysis

The geographical extent, composition, structure and function of vegetation communities within the study area were first identified through aerial photo interpretation and then confirmed through field investigations. Aerial photos were interpreted to determine the limits and characteristics of vegetation communities.

Vegetation communities were classified according to the *Ecological Land Classification for Southern Ontario: First Approximation and Its Application* (Lee *et al*. 1998). The communities were sampled using a plotless method for the purpose of determining general composition and structure of the vegetation and the vegetation communities within the study area. An extensive vascular plant list was compiled, as well as the height and cover of each layer and the dominant species in each layer. Dominant flora was used to classify vegetation community types and ecosites. Plant species status was reviewed for Ontario (Oldham 1999), Toronto (Varga *et al. 2000*) and for the Toronto Region Conservation Authority (TRCA 2009a). Vascular plant nomenclature follows Newmaster *et al.* (1998), with a few exceptions that have been updated to Newmaster *et al.* (2005).

Size Class Analysis was carried out for all living woody plants, standing snags and deadfall/logs. Dichotomous keys presented in Lee *et al*. (1998) were used to determine the community age, system, site, history, substrate, cover, plant form and topographic feature. Special emphasis was placed upon surveying and recording watershed rare species and invasive species when observed in the field.

2.2.1.1 FLORISTIC QUALITY ASSESSMENT

Floristic quality assessment was used to determine the significance and amount of restoration required for each vegetation community. This assessment gives a dependable, repeatable and convenient method for evaluating the relative significance of vegetation communities in terms of their native floristic composition. It is not intended for use as a stand-alone method, but it can be applied to complement and support other methods of evaluating the natural quality of a site.

Floristic Quality Index

Floristic Quality Assessment is applied by calculating a **mean coefficient of conservatism C** (MC*C*) and a **floristic quality index** (*FQI*) from a comprehensive list of plant species obtained from a particular site. Each plant species present on the site has been assigned a Coefficient of Conservatism (C) value which ranged from 0 to 10 (Oldham et al., 1995). Species that have little or no fidelity to natural ecosystems and occur widely in a variety of altered and unaltered landscapes have a lower C value (e.g., 0-1), while species that show a very high association with unaltered natural ecosystems and do not occur in altered landscapes have a high C value (e.g., 9-10). The MCC is calculated by summing the coefficients of conservatism (C) of an inventory of plants and dividing by the total number of plant taxa (n), yielding an average or the mean coefficient of conservatism ($C = \square C / n$). The C is then multiplied by the square root of the total number of plants (n) to yield the floristic quality index ($FQI = C\ n$). The square root of n is used as a multiplier to transform the mean coefficient of conservatism and allow for better comparison of the *FQI* between large sites with a high number of species and small sites with fewer species. Other methods used to determine the significance of each vegetation community, include number of native plants, number of exotic plants, species richness, percent exotic, sum of weediness, average coefficient of conservatism, average coefficient of wetness, number of regionally rare or uncommon species, size, soils and level of anthropogenic disturbance.

Based upon the above criteria, vegetation communities were classified as high significance areas if their floristic quality index value was (FQI > 35), moderate significance areas if (20 < FQI < 35) and low significance areas if (FQI < 20).

Coefficient of Wetness

A numerical value from -5 to +5 has been assigned to plant species based upon the tendency of that species to occur in wetland habitats (Oldham *et. Al.* 1995). The index is based upon the wetland categories, their definitions and the Wetness Index, based on Oldham *et. al.* (1995) (taken from Ecological Land Classification for Southern Ontario, First Approximation and its Application, 1998).

Wetland Category		Definition	Wetness Index	
OBL	Obligate Wetland	Occurs almost always in wetlands under natural conditions(estimated >99% probability)	OBL	-5
FACW	Facultative Wetland	Usually occurs in wetlands, but occasionally found in non-wetlands(estimated 67 -99% probability)	FACW+	-4
			FACW	-3
			FACW-	-2
FAC	Facultative	Equally likely to occur in wetlands or non-wetlands (estimated 34-66% probability)	FAC+	-1
			FAC	0
			FAC-	1
FACU	Facultative Upland	Occasionally occurs in wetlands, but usually occurs in non-wetlands(estimated 1-33% probability)	FACU+	2
			FACU	3
			FACU-	4
UPL	Upland	Occurs almost never in wetlands under natural conditions(estimated <1% probability)	UPL	5

The mean coefficient of wetness is calculated to estimate the probability that a vegetation community is a wetland or an upland area. Species assigned negative numbers are likely found in wet areas, while species assigned positive number are most often found in drier sites. The Mean Coefficient of Wetness (MCW) is calculated by summing the coefficients of wetness (*CW*) of an inventory of plants and dividing it by the total number of plant taxa (*n*), yielding an average or the mean coefficient of wetness (M*CW* = □CW /*n*).

Sum of Weediness

A numerical value from -1 to -3 has been assigned to plant species based upon how invasive the alien species are (Oldham *et. Al.* 1995). An alien species with a -3 value is a high priority invasive for removal and control, an alien species with a -2 value is a moderate priority invasive and an alien species with a -1 value is a low priority invasive plant. Sum of weediness (Weed) was calculated from pre-assigned scores

of weediness for alien species to determine the proportion of high priority invasives to low priority invasives present in each vegetation community. The sum of weediness is calculated by summing the coefficient of weediness (Weed) of an inventory of plants.

2.2.2 Protocol for Soil Sampling

One auger sample was taken per vegetation community within the Osgoode Woodlot and the adjacent vegetation communities to determine the soil composition and to establish if the soil profile was natural or anthropogenic. The soil texture, soil moisture, soil homogeneity or variability, depth to mottles/gleys, depth to thatch, organics and bedrock were investigated to determine the soil quality.

To determine soil texture, the following tests were carried out: feel, ribbon, taste, cast and shine test. Effective texture was used to determine the soil moisture. A metre stick and an additional 30 cm ruler were used to determine the depth to mottles, gleys, organics and bedrock. These results were analyzed to determine if any soil amendments would be required in order to restore the site. The protocol for soil sampling was the protocol used in Ecological Land Classification for Southern Ontario: First Approximation and Its Application (Lee et al. 1998) and Field Manual for Describing Soils in Ontario (Irvine et al. 2003).

2.2.3 Habitat Quality

Habitat quality was determined by looking for human disturbances (i.e. mowing, dumping, construction, logging, tracks and trails, noise, etc.), health of native vegetation (i.e. signs of Emerald Ash Borer, Dutch Elm Disease, Asian Long-horned Beetle or Gypsy Moth etc.), later successional community age, high floristic quality index, high flora and fauna diversity, connectivity, historical hydrological conditions and high native/invasive plant ratio to come up with the habitat quality.

2.2.4 Past Disturbance Regimes and Current Ecological Stressors

2.2.4.1 Past Disturbance Regimes

Methodologies outlined in the ELC manual (Lee *et al*. 1998) were used to assess the past disturbance regimes within the Osgoode Woodlot. A Management/Disturbance field sheet was filled out for each vegetation community within the Osgoode Woodlot study area (**Figure 2**).

2.2.4.2 Ecological Stressors

Past disturbance regimes were analyzed to identify current ecological stressors for the purpose of assessing current management requirements. The current ecological stressors that are affecting each vegetation community or the ecosystem as a whole were examined to determine what is required to improve the area. Stressors to the area, including development, agricultural impacts (compaction, haying, erosion and sedimentation), mowing, trails, invasive plant abundance and distribution, altered hydrology, damage from hiking were described and mapped to help recognize what, how and why the landscape has changed. This was done to determine the woodlot health.

2.2.5 Mapping

Mapping requirements consisted of mapping the study area location (Osgoode Woodlot), woodlots on the York University campus, vegetation communities in Osgoode Woodlot, wildlife migration routes and lastly an Osgoode Woodlot Restoration Site Plan. Current vegetation communities and wildlife usage was compared against the ecological stressors in order to create the Restoration Site Plan.

3.0 FINDINGS

3.1 Physical Setting

3.1.1 Physiography

The Osgoode Woodlot is located within the Peel Plain Physiographic Region (Chapman and Putnam 1984), which is characterized as imperfectly drained Chingacousy clay loam, with alluvial "Bottomland" soils associated with stream courses (Hoffman and Richards, 1955). There are no significant landform features located within the study area.

3.1.2 Topography

The York University campus is primarily a terrestrial site that is not associated with the waters of a lake or river or with an active shoreline or river valley, with the exception of the west side of the campus where Black Creek has formed a considerable valley slope. The site is located on unconsolidated mineral substrates. The campus is considered a Rolling Upland topographic feature, which is a site on a rolling topography with a complex pattern of ridges, slopes and hollows.

The area where the Osgoode woodlot is located; is on a Rolling Upland feature or a site with an undulating topography by way of a complex or repeated pattern of ridges, slopes and hollows. The elevation decreases from approximately 200 m above sea level in the northeast to 185 m above sea level in the southwest. The slope within the woodlot is a 10 percent slope to the southwest. The decrease in slope goes towards the Stong Pond, Hoover Creek and Black Creek (**Figure 2**).

3.1.3 Hydrology

Based on changes in elevation; surface water flows from the northeast to the southwest towards the Stong Pond, Hoover Creek and Black Creek in the Osgoode Woodlot (**Figure 2**). North and Northeast of the Osgoode Woodlot, the land is made up of buildings, paved pathways, parking lots and some grass. Most of these landscape features are impervious to water drainage, except for the manicured lawn. The surface water from snowmelt and precipitation flows off of these anthropogenic features into the Osgoode Woodlot. There are no visible watercourses or vernal pools within the Osgoode Woodlot. Surface water appears to flow down the ridges into the hollows towards The Pond Road. Water loss is likely due to evaporation which is slowed by the dense canopy cover and surface water runoff.

3.1.4 Soil Characteristics

Osgoode Woodlot and adjacent habitat is located on tableland topography with mineral soils. One soil core was taken within the woodlot. The location of the soil core is delineated in **Figure 3.**

Soil Core 1 (FOD4)
The A horizon silt loam goes down to a depth of 35 cm followed by a clay loam layer to a depth of 120 cm. Mottles were identified at 65 cm. The soil moisture regime was identified as very fresh (3).

3.2 Vegetation and Vegetation Communities

3.2.1 Vegetation Communities

A total of one ELC vegetation community Ecosite was identified by LGL within the study limits (**Figure 3**); a Dry-Fresh Deciduous Forest (FOD4). This vegetation community is considered L4 or widespread and common in the TRCA watershed and in Ontario (NHIC 1997). There are two hedgerows situated northwest of the FOD4 vegetation community. The FOD4 vegetation community is described in **Table 1** and delineated in **Figure 3**.

TABLE 1.
SUMMARY OF ECOLOGICAL LAND CLASSIFICATION VEGETATION COMMUNITIES AND ASSOCIATED HEDGEROWS

ELC Code	Vegetation Type	Species Association	Comments
Terrestrial-Natural/Semi-Natural			
FOD	DECIDUOUS FOREST		
FOD4	Dry-Fresh Deciduous Forest	**Canopy:** Black cherry (*Prunus serotina*) and white ash (*Fraxinus americana*) are abundant with occasional bitternut hickory (*Carya cordiformis*), red oak (*Quercus rubra*) and white elm (*Ulmus americana*). **Subcanopy:** Bitternut hickory is abundant with occasional Manitoba maple (*Acer negundo*), black cherry, and white elm. **Understorey:** Choke cherry (*Prunus virginiana* var. *virginiana*) is dominant with abundant common buckthorn (*Rhamnus cathartica*). **Ground Cover:** Garlic mustard (*Alliaria petiolata*) is dominant with abundant yellow enchanter's (*Circaea lutetiana* ssp. *canadensis*), periwinkle (*Vinca minor*), choke cherry and common buckthorn seedlings.	• Tree cover > 60% (FO). • Deciduous trees > 75% of canopy cover (D). • Tree species associations that are relatively uncommon or a result of disturbance or management (4). • Moderately dry (0) to fresh (1, 2 & 3) moisture regimes (Dry-Fresh).

Osgoode Woodlot – Dry- Fresh Deciduous Forest (FOD4)

Osgoode Woodlot is located on the west side of York University campus north of The Pond Road and is approximately 0.84 ha in size. The Osgoode Woodlot is comprised primarily of a Dry- Fresh Deciduous Forest. Some sections of the woodlot are dominated by large, calliper sized, latter successional and shade tolerant tree species, while other sections are dominated by smaller calliper sized and earlier successional tree species. Plant diversity within the canopy and subcanopy layers is moderate while plant diversity in the understorey and ground layers is low because common buckthorn and garlic mustard are out-competing the native vegetation.

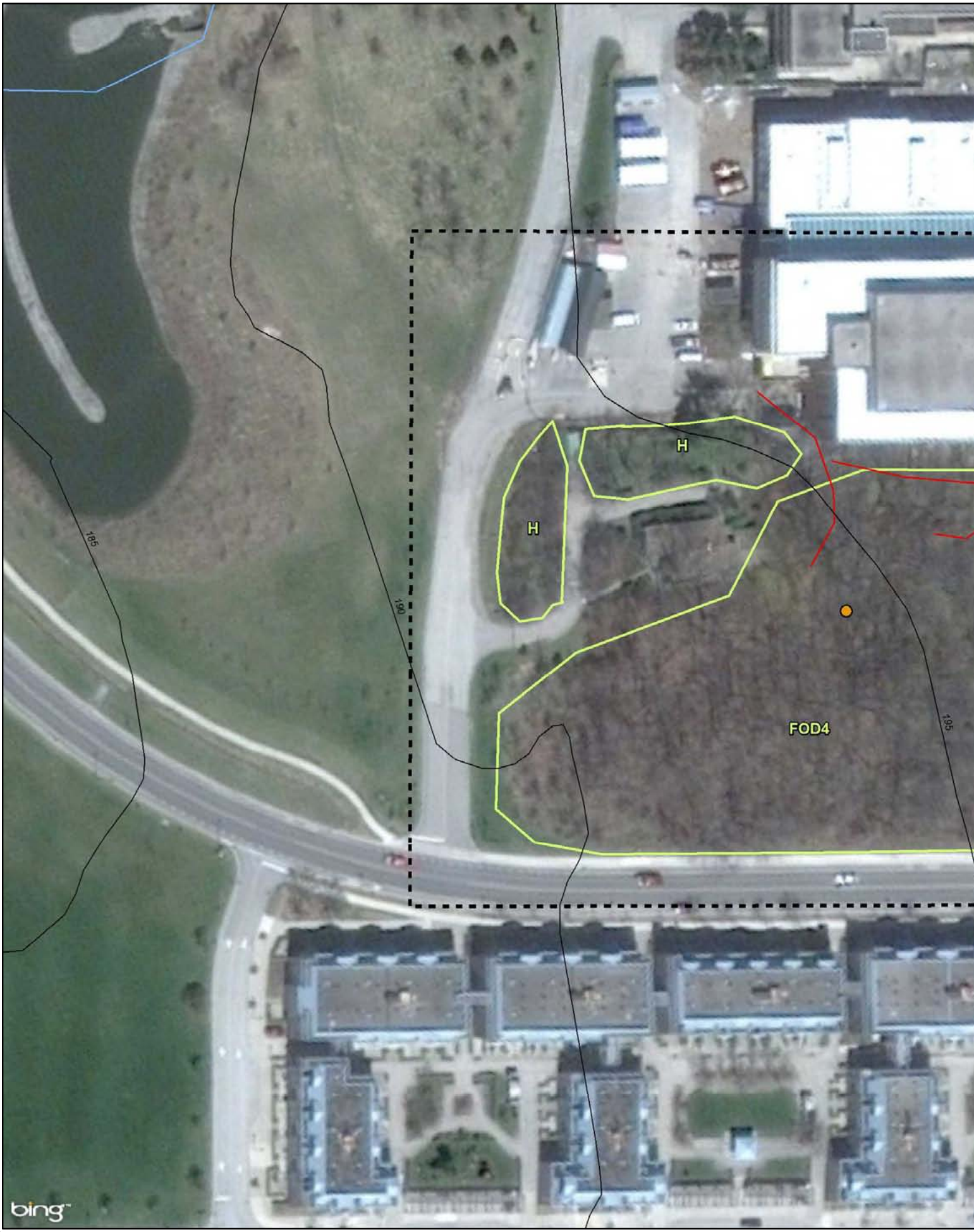
This woodlot pre-dates the development of the York University campus in the early 1960s as evidenced by historical air photos and the age of some of the trees present. Maintenance of this woodlot is low to none, with minor interventions to maintain or enhance ecological function.

Hedgerows

The hedgerows situated northwest of the Osgoode Woodlot were a mixture of black cherry (*Prunus serotina*), white ash (*Fraxinus americana*), red oak (*Quercus rubra*) and white elm (*Ulmus americana*). There were a number of cultivated trees, shrubs and flowering plants present within the hedgerows, including white spruce (*Picea glauca*), common buckthorn (*Rhamnus cathartica*), garlic mustard (*Alliaria petiolata*), golden bells (*Forsythia viridissima*), common lilac (*Syringa vulgaris*), bending wayfaring-tree (*Viburnum lantana*), orange day-lily (*Hemerocallis fulva*) and daffodil (*Narcissus pseudonarcissus*).

3.2.2 Flora

To date, a total of 51 vascular plant taxa have been recorded within the study area (**Figure 3**). Twenty one taxa, or 41 percent of the recorded flora, are considered introduced and non-native to Ontario. A working vascular plant list is presented in **Appendix A**



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LEGEND

- York University Property Line
- Study Area
- Soil Core Location
- Topographic Lines
- Trail
- Vegetation Community Boundary

Vegetation Community Boundary

- FOD4 Dry-Fresh Deciduous Forest Ecosite
- H Hedgerow

Data Source: LGL Limited Field Surveys, Dougan & Associates 2001: "York University South Keele Woodlot Sustainability Study", Conestoga-Rovers & Associates 2011: "Hydrogeological Assessment Boyer Woodlot Ponds York University Campus", and Ministry of Natural Resources.

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VEGETATION COMMUNITIES IN OSGOODE WOODLOT

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Project:	TA8152	**Figure:**	3
Date:	March 2013	**Prepared By:**	KDR
Scale:	1 : 1000	**Checked By:**	DEB

Significant Plant Species

No plant species that are regulated under the Ontario *Endangered Species Act* or the Canada *Species at Risk Act* were encountered during LGL's botanical investigation on the subject property (those plant species regulated as Special Concern, Endangered, Rare or Threatened).

In addition, the study area contains four plant species that are considered rare to uncommon in Toronto and three of these species are designated L1 to L3 in the TRCA watershed. **Table 2** provides a summary of regionally rare and species of concern that were identified within the Osgoode Woodlot. The white spruce (*Picea glauca*) trees are planted and their significance is diminished. There is one mature slippery elm (*Ulmus rubra*) tree located immediately adjacent to Osgoode Hall.

TABLE 2.
SUMMARY OF REGIONALLY RARE PLANT SPECIES

Scientific Name	Common Name	TRCA	Toronto	FOD4
Picea glauca	white spruce	L3		X
Ulmus rubra	slippery elm	L2	R4	X
Carex rosea	stellate sedge		U	
Allium tricoccum	wild leek	L3		

3.2.2.1 Floristic Quality Assessment

The FOD4 vegetation community has a moderate floristic quality index value at 20.99, indicating that this vegetation community has moderate significance and some specialized forest plants (**Table 3**). The sum of weediness value is -34, which is moderately high and indicative of the invasive plant abundance and past residential and current institutional land use adjacent to the woodlot. The mean coefficient of wetness indicates that the majority of the plants within the Osgoode Woodlot are Facultative Upland species or plants that occasionally occur in wetlands, but usually occur in non-wetlands.

TABLE 3.
FLORISTIC QUALITY ASSESSMENT

Vegetation Communities	FOD4
Number of Native Plants	30
Number of Exotic Plants	21
Species Richness	51
Percent Exotic	41.18%
Sum of Weediness	-34
Mean Coefficient of Conservatism	3.83
Floristic Quality Index (FQI)	20.99
Mean Coefficient of Wetness	2.17
# of Regionally Rare or Uncommon Species	4

3.2.2.2 Past Disturbance Regimes

The following past disturbance regimes were observed:

- Abundant alien species with broad distributions are affecting the native plant composition, structure and function of the woodlot;
- There is one well-marked pedestrian trail running east to west along the northern boundary of the Osgoode Woodlot with two faint pedestrian trails running southwards off of this main trail into the woodlot (**Figure 3**). The trails are used for recreation and as a travel route by pedestrians. Pedestrians that use the Osgoode Woodlot, periodically dump rubbish, and introduce invasive plant species. Pedestrian paths and roads surround the Osgoode Woodlot on the western, southern and eastern edges. These paved and concrete surfaces reduce the pedestrian use of the trails within the woodlot;
- Noise is widespread from the adjacent roadways; and
- Disease and death of trees has opened up the canopy cover and in this case the predominant infestation was Emerald Ash Borer with minimal signs of Dutch elm disease. Emerald Ash Borer is prevalent throughout the edges of the woodlot with the decline of the white ash trees. The rare elm trees throughout the woodlot demonstrate signs of poor health from Dutch Elm Disease; and,
- There were no signs of Asian Long-horned Beetle and Gypsy Moth observed, but their presence is known to occur within the York University Keele Campus (Royle *et. al.* 2009).

3.3 Wildlife and Wildlife Habitat

The Osgoode Woodlot is fragmented and isolated from other natural heritage features found within the York University Keele Campus. A semi-natural corridor exists to the northwest towards the Stong Pond, hedgerows and Arboretum Trees. The Osgoode Woodlot is highly disturbed due to the proximity of roads on two sides of the woodlot, as well as buildings and pedestrian pathways on the other sides. In urban settings, such as the Osgoode Woodlot, wildlife have become acclimatized to urban conditions and only those fauna that are tolerant of human activities tend to persist. However, noise, roadways, artificial light, visual intrusion and pedestrian use within and adjacent to the study area may alter wildlife activities and patterns. Wildlife that elect to leave the Osgoode Woodlot risk being struck by vehicles and have an increased chance of being predated (**Figure 4**).

3.3.1 Fauna in the Osgoode Woodlot

Fourteen species of wildlife (9 birds and 5 mammals) were recorded within Osgoode Woodlot (**Table 4**) while conducting surveys on May 1, June 14 and August 28, 2012. The woodlot is a mid-aged to mature forest and had limited habitat diversity. It did not have a water source capable of harboring amphibians and thorough searching (flipping logs and rocks, listening for calls) throughout the woodlot on two occasions (May 1 and June 14, 2012) did not reveal any amphibians or reptiles within the woodlot. Habitat was suitable for American Toad (*Anaxyris americanus*) and Eastern Gartersnake (*Thamnophis sirtalis*), within the manicured lawn surrounding the Stong Pond. Neither of these two species were observed during the 2012 field visit. Past field surveys have observed Garter Snakes within the manicured lawn.

Birds, primarily migratory birds, made up the majority of the wildlife observed in the woodlot in both spring and late summer/fall seasons. Surveys were conducted as early as possible in the mornings when bird activity is the most prevalent and widespread. Direct observations and bird song were the primary methods used to determine which species used the woodlot. Bird Studies Canada (BSC) Breeding Bird Atlas (BBA) criteria were officially used to determine whether bird species recorded in the woodlot were local nesters or seasonal migrants. Flocks of migrant birds, such as Hermit Thrush (*Catharus guttatus*)


Arboretum Trees
Stong Pond
Hedgerow
Osgoode Woodlot
Hoover Creek

LEGEND

- York University Property Line
- Vegetation Community Boundary
- Arboretum
- Watercourse
- Mammal Migration Route
- Bird Migration Route
- Proposed Wildlife Corridor

Data Source: LGL Limited Field Surveys.

50 25 0 50 Metres

N

OSGOODE WOODLOT WILDLIFE MIGRATION ROUTES

LGL LIMITED
environmental research associates

Project: TA8152	**Figure:** 4
Date: November 2012	**Prepared By:** KDR
Scale: 1 : 3000	**Checked By:** DEB

TABLE 4.
WILDLIFE LIST

Scientific Name	Common Name	COSEWIC	(COSSARO) MNR	LOCAL (BSC/TRCA)	LEGAL STATUS (SARA (Sched.1-3); ESA, FWCA (F),(G),(P); MBCA)	BREEDING STATUS
Birds						
Colaptes auratus	Northern Flicker			(- /L4)	MBCA	?
Vireo olivaceus	Red-eyed Vireo			(- / L4)	MBCA	?
Corvus brachyrhynchos	American Crow					N
Catharus guttatus	Hermit Thrush			(L4 / L3)	MBCA	N
Turdus migratorius	American Robin			(- / L5)	MBCA	Y
Spizella passerina	Chipping Sparrow			(- / L5)	MBCA	?
Zonotrichia albicollis	White-throated Sparrow			(L2 / L3)	MBCA	N
Cardinalis cardinalis	Northern Cardinal			(- / L5)	MBCA	?
Carduelis tristis	American Goldfinch			(L3 / L5)	MBCA	N
Mammals						
Didelphis virginiana	Virginia Opossum				FWCA(F)	
Sciurus carolinensis	Gray Squirrel			(- / L5)	FWCA(G)	
Marmota monax	Woodchuck			(- / L4)		
Procyon lotor	Raccoon			(- / L5)	FWCA(F)	
Odocoileus virginianus	White-tailed Deer			(- / L4)	FWCA(G)	

Breeding Bird Status: Y: Yes based on criteria used by BSC for Breeding Bird Atlas.
N: No based on criteria used by BSC for Breeding Bird Atlas.
? : Unknown - bird in area however did not observe BSC criteria for breeding.

and White-throated Sparrow (*Zonotrichia albicollis*), were observed feeding at ground level while moving east and west through the woodlot. Species such as Northern Flicker (*Colaptes auratus*), Red-eyed Vireo (*Vireo olivaceus*) and Northern Cardinal (*Cardinalis cardinalis*) were in full song on territory during the June 14 visit but were not seen in this woodlot on any other date. These species may have been breeding in this woodlot but the BSC BBA criteria for breeding birds were not met. American Robin (*Turdus migratorius*) fledgling birds were observed on the June 14 visit and therefore recorded as a local breeding bird species for the woodlot. Currently birds appear to use the woodlot primarily for seasonal migration and as a food source. Birds were observed flying east to west; to and from the Stong Pond, the Arboretum Trees and the Black Creek/Hoover Creek valleylands (**Figure 4**). Little nesting activity was observed.

Five species of mammals were recorded using the Osgoode Woodlot (**Table 4**). Based on direct observations and sign evidence (tracks, digs, dens and trails), the woodlot appeared to be a feeding and denning area for Gray Squirrel (*Sciurus carolinensis*), Woodchuck (*Marmota monax*) and Raccoon (*Procyon lotor*). A temporary trail and bedding site of White-tailed Deer (*Odocoileus virginianus)* was located in the southeast end of the woodlot on the June 14 visit.

Bird visual sightings as well as mammal tracks and scat were observed along a corridor running southeast to northwest from the Black Creek/Hoover Creek Valleylands to the Stong Pond across Nelson Road to the Osgoode Woodlot. Birds were also observed migrating along the southern edge of the woodlot. Woodchuck individuals were observed migrating from the eastern edge of the woodlot towards an area of construction further to the east (**Figure 4**).

Species at Risk

A background review using the Natural Heritage Information Centre (NHIC) database indicated several historic element occurrence records for the following species.

- Blanding's Turtle (*Emdoidea blandingii*) is listed as Threatened and is regulated as such under the *Ontario Endangered Species Act* and the *Canada Species at Risk Act*. The NHIC database lists the last known occurrence record as 1986.
- The Eastern Ribbonsnake (*Thamnophis sauritus*) is listed as Special Concern and is regulated as such under the *Ontario Endangered Species Act* and the *Canada Species at Risk Act*. The NHIC database lists the last known occurrence record as 1913.
- The Jefferson X Blue-spotted Salamander (*Ambystoma* hybrid pop. 1) is provincially ranked as S2 (population is Imperiled in Ontario because of rarity due to very restricted range). The NHIC database lists the last known occurrence record as 1978.

Blanding's Turtle and Eastern Ribbonsnake occurrence records are dated and likely originate from the Black Creek Valleylands (located within 1 km of the study area), because suitable habitat for these species were not found within the study area or the Osgoode Woodlot. The Jefferson X Blue-spotted Salamander occurrence record is dated but suitable habitat for this species are present within the Boyer Woodlot vernal pools, but not within the Osgoode Woodlot.

None of the wildlife species recorded by LGL within the Osgoode Woodlot are considered of any federal, provincial or regional significance according to the NHIC. However, 8 of the 9 species of birds recorded are protected under the *Migratory Birds Convention Act* (MBCA) and four mammal species are protected under the *Fish and Wildlife Conservation Act* (FWCA). Three of the bird species are also designated as a priority species of conservation concern by BSC for the Metro Toronto Region (**Table 4**).

3.4 Constraints and Impact Analysis

Efforts should be taken to minimize impacts to the Osgoode Woodlot mid-aged to mature forest; and associated habitat that provide corridors for mammal movement through the remaining natural heritage system on the York University campus. Regionally rare species and their habitat should be avoided when planning future development proposals. If avoidance is not possible, regionally rare plant species should be transplanted to suitable habitat. Displaced habitat for regionally rare wildlife species should be created or restored in other natural areas on the York University property.

3.5 Ecosystem Services

Conservation, restoration and management of the Osgoode Woodlot will have positive ecosystem services for the students, faculty and workers that utilize the York University campus. For example, conserving urban forests regulates the microclimate (evapotranspiration-cooling effects, carbon dioxide sequestration, oxygen generation, removal of gaseous and particulate pollutants), prevents erosion, filters water and, the natural area is used for recreation and aesthetics. These ecosystem services play a role in enhancing environmental quality, quality of life, and, sustainable urban development. Conservation of the Osgoode Woodlot will also conserve forest-dependent species (Reyers *et. al.* 2012 and Jim *et. al.* 2009).

4.0 MANAGEMENT AND RESTORATION

4.1 Goals and Guiding Principles for the Osgoode Woodlot Restoration

Some guiding principles have been followed to improve the Osgoode Woodlot and have been adapted from Apefelbaum *et al. (2010)*:

1. Work with, not against nature and mimic what historically occurred in the area, but be flexible and adaptable to natural succession. Restore vegetation communities based upon current site conditions and past anthropogenic disturbances rather than trying to manage the land in a way that would create habitat that is not suited to the area in the long term. The objective is to restore vegetation communities that are self-sustaining and usually what naturally occurred prior to human disturbance in that location.
2. Start restoration and management work in the most pristine ecosystems because healthier areas are refugia for species that can be reintroduced or disperse into more disturbed areas. After management has been started in the higher quality areas then the more disturbed areas should be tackled.
3. Improve the floral composition, structure and function, leading to increased faunal diversity.

4.2 Management of Ecological Stressors

The following is a list of the key ecological stressors that should be addressed in order to restore the habitat in the Osgoode Woodlot:

1. **Invasive species** - have spread as a result of anthropogenic influences, exotic plant and animal introductions;
2. **Fragmentation** - from surrounding natural areas; and,
3. **Anthropogenic influences** – Current land use practices within and adjacent to the Osgoode Woodlot have led to dumping, adverse trail systems and inappropriate landscaping immediately adjacent to natural features.

In order to address the current ecological stressors facing the Osgoode Woodlot, the following management techniques are recommended to improve the habitat:

1. **Woody Plant Control** – To remove unwanted invasive woody vegetation, focusing on common buckthorn (*Rhamnus cathartica*) as well as control of common pear (*Pyrus communis*), red currant (*Ribes rubrum*), bending wayfaring-tree (*Viburnum lantana*), white mulberry (*Morus alba*), sour cherry (*Prunus cerasus*), and Tartarian honeysuckle (*Lonicera tatarica*) if their abundance becomes greater;
2. **Herbaceous Invasive Species Control** - Herbicide application to remove invasive plant species that outcompete native plants, focusing on garlic mustard (*Alliaria petiolata*) and periwinkle

(*Vinca minor*) as well as control of lily-of-the-valley (*Convallaria majalis*) and orange day-lily (*Hemerocallis fulva*) if their abundance becomes more pronounced; and,

3. **Fragmentation** – planting a tree and shrub wildlife corridor along the bird and mammal migration routes west of the Osgoode Woodlot to the Stong Pond and to the Black Creek natural area will provide a connection to other natural areas (**Figures 4** and **5**).

4.2.1 Woody Plant Control

Removing common buckthorn cover is recommended to open the understorey and ground cover for native plants in the Osgoode Woodlot. **Figure 5** delineates where common buckthorn should be removed from within the Osgoode Woodlot and adjacent hedgerows and **Appendix C** describes the required equipment to carry out the task. Once the common buckthorn has been reduced through a combination of brush cutting, hand pulling and chainsaw use, Garlon needs to be applied to the cut stumps, basal bark or into a cut in the trunk. In order to allow the native seedbank to re-establish common buckthorn removal should occur for three to five years to kill the abundant common buckthorn root systems and deplete the common buckthorn seedbank present from previous years fruiting.

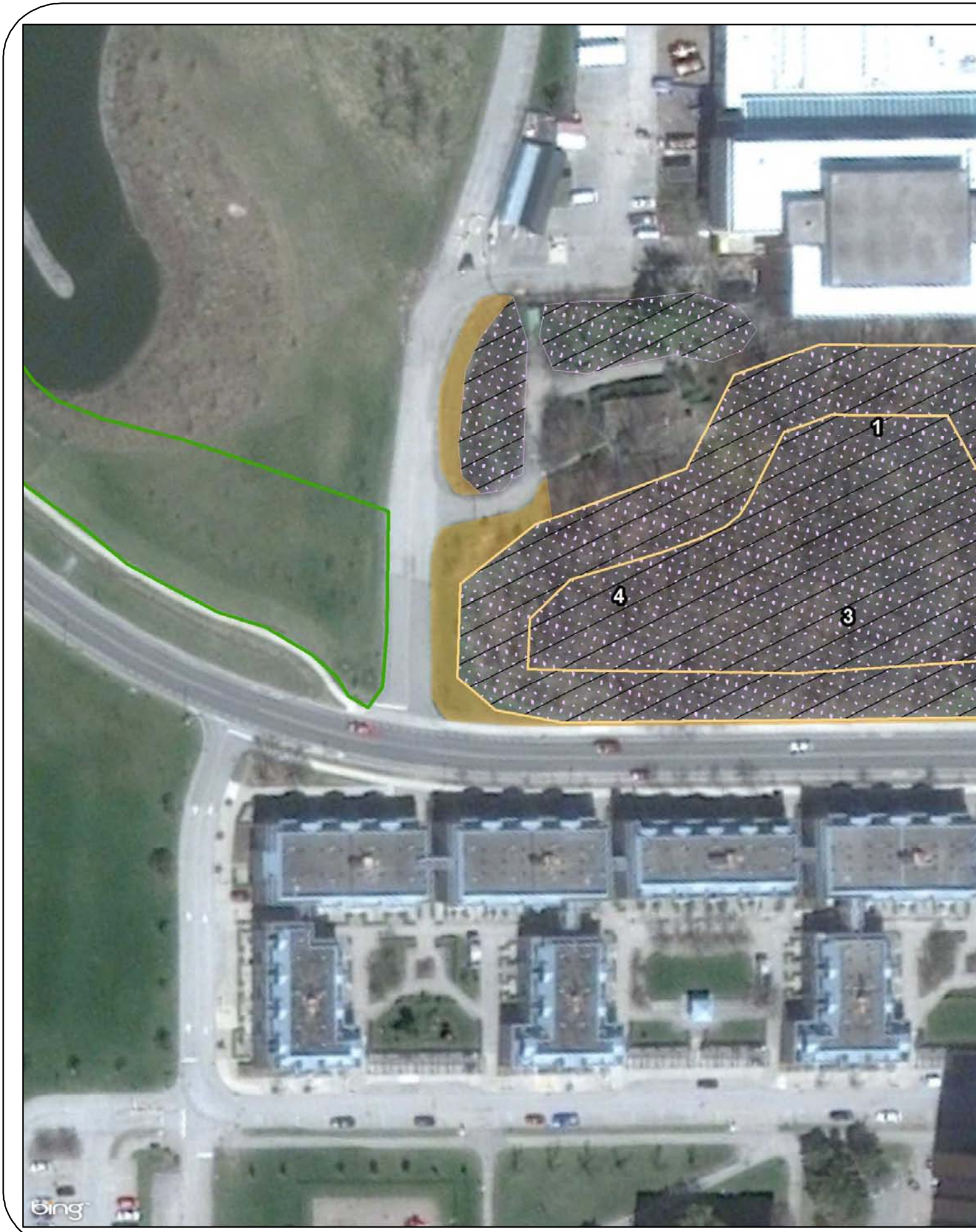
Thinning of the common buckthorn cover in the understorey and ground cover should allow native shade-tolerant species to re-establish in all of the seral levels. Removing the common buckthorn increases the light availability to the ground, reduces the competition and encourages the growth of native understorey and ground layer plants. There are other woody invasives that are not quite as abundant or problematic as common buckthorn, but they should still be controlled, including common pear (*Pyrus communis*), red currant (*Ribes rubrum*), bending wayfaring-tree (*Viburnum lantana*), white mulberry (*Morus alba*), sour cherry (*Prunus cerasus*), and Tartarian honeysuckle (*Lonicera tatarica*). Fruit from all cut woody invasives should be collected and disposed of off-site. Cut woody invasives should be cut and brush piles should be created from their remains to improve the wildlife habitat. Brush piles should be placed in openings where large quantities of common buckthorn have been removed. Further details on techniques for the removal of woody invasive species are provided in **Appendix D**.

4.2.2 Hazard Tree Management

Hazard tree management should focus on the dead standing trees located within the edges of the woodlot. All dead standing trees or hazard trees should be examined to determine if they can be retained. If portions of the trees are classified as hazardous to pedestrians; than they should be removed. The objective should be to retain as many dead standing trunks as possible.

In addition, the health of ash trees should be monitored and any ash trees that die as a result of Emerald Ash Borer that are within 15 metres of the woodlot edge should be examined. Branches and leaning trunks that pose a hazard should be cut down. Where possible, dead standing ash trunks should be retained for wildlife habitat. If Ash tree removal is required they should be cut down and left to decompose where they fall. The health of the elm trees should also be monitored and any elm trees that die of Dutch Elm Disease within 15 metres of the woodlot edge should be cut down, removed, buried or burned to reduce the spread of Dutch Elm Disease (**Figure 5**).

No signs of either Asian Long-horned Beetle or Gypsy Moth were observed during 2012 field surveys. Both species are known to occur within the area and susceptible trees should be monitored to look for signs of infestations. York University's Keele Campus lies within the Asian long-horned beetle, Emerald Ash Borer and Gypsy Moth Regulated Area. Until the pests have been eradicated, the Canadian Food Inspection Agency recommends that known host species should not be planted (Canadian Food Inspection Agency, 2006b, 2012a and 2012b). The problem with this stipulation is that it eliminates almost all of the dominant deciduous tree species in the Toronto area for restoration purposes.



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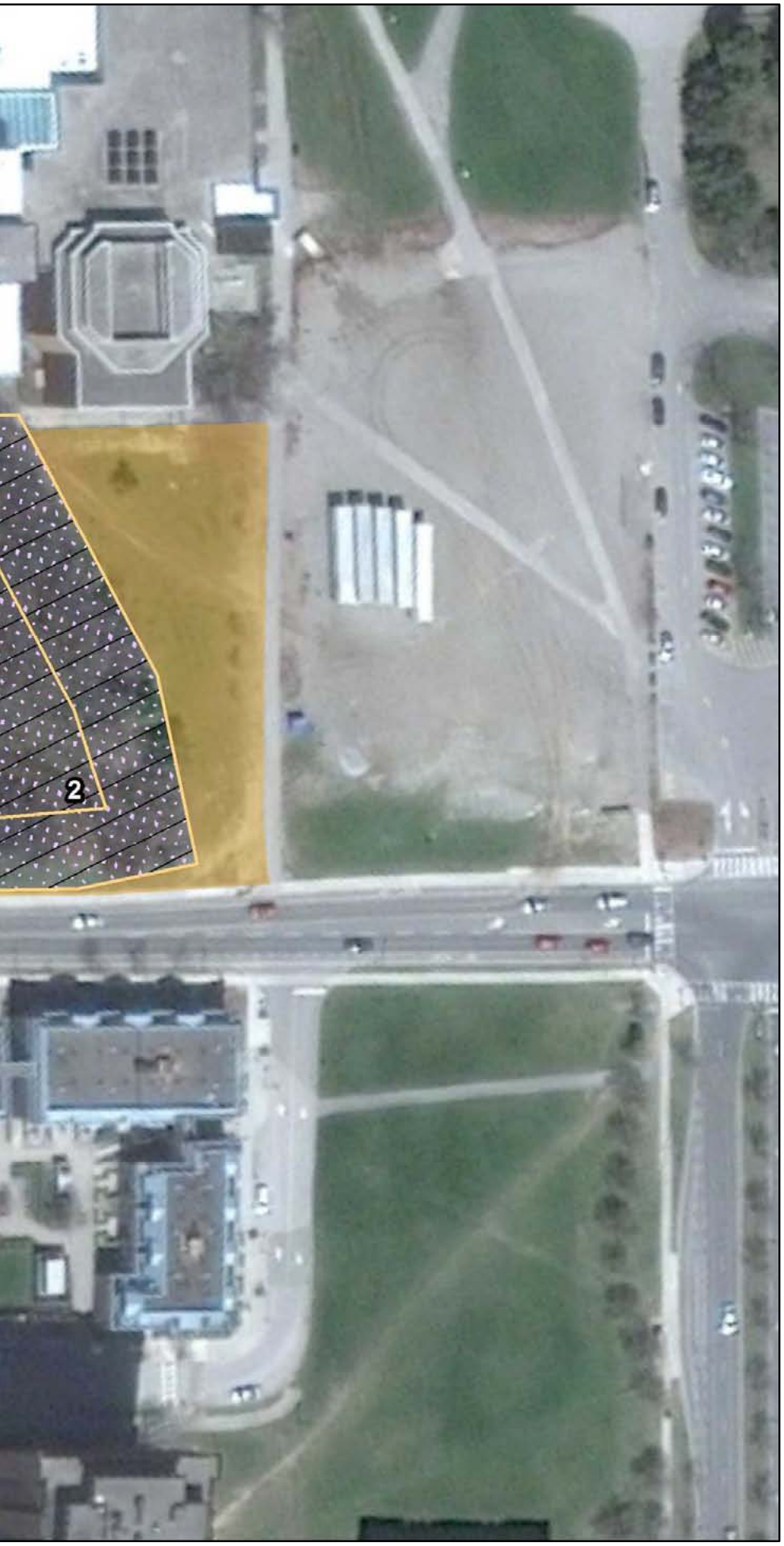

LEGEND

- Common Buckthorn (Chainsaw, Brush-cutting and Garlon herbicide application) Removal
- Garlic Mustard (Hand Removal & Roundup herbicide application
- Ash and Elm Hazard Tree Removal (15m) Zone
- Proposed Monitoring Location
- Proposed Wildlife Corridor
- No Mow Zone or Limited Mow Zone

Data Source: LGL Limited Field Surveys.

20 10 0 20 Metres

N

OSGOODE WOODLOT RESTORATION SITE PLAN

LGL LIMITED
environmental research associates

Project:	TA8152	**Figure:**	5
Date:	March 2013	**Prepared By:**	KDR
Scale:	1 : 1000	**Checked By:**	DEB

4.2.2.1 Emerald Ash Borer (Agrilus planipennis) Control

Emerald Ash Borer is an introduced insect from Asia that attacks and kills all ash (*Fraxinus*) trees. There is one species of ash present within the Osgoode Woodlot, specifically abundant white ash (*F. americana*) in the FOD4 vegetation community.

According to the City of Toronto Urban Forestry Branch (2012):

"The Canadian Food Inspection Agency (CFIA) confirmed the presence of Emerald Ash Borer in 2007 within Toronto. All ash trees in Toronto are at risk of dying from this infestation. Mortality takes between 1 to 3 years once infestation has started" (City of Toronto 2012).

New pesticide application techniques and products have provided a potential new solution to Emerald Ash Borer as is described by the City of Toronto (2012):

"Pesticide injection can be used to protect trees for a certain period of time, in order to provide an extended control the injection needs to be repeated every two years. Repeated injections may affect the long term health of the tree given the impact of drilling holes into the main stem. However, a study of wound response conducted on City-owned trees, showed that over 90% of injection site wounds were completely healed after 2 growing seasons."

The insecticide that the City of Toronto used was created by BioForest Technologies Inc (2012):

"A pesticide called TreeAzin is the only registered product for use in Canada against Emerald Ash Borer. TreeAzin has been shown to be effective in the control of Emerald Ash Borer in keeping ash trees alive. TreeAzin is a systemic bioinsecticide containing Azadirachtin. A liquid formulation has been developed for stem injection by the Canadian Forest Service in collaboration with BioForest Technologies Inc. The pesticide has an Emergency Registration by the Pest Management Regulatory Agency (PMRA) of Health Canada for Emerald Ash Borer control in ash trees. *TreeAzin* inhibits Emerald Ash Borer larval development, prevents adult emergence, and provides preventative and remedial treatments."

4.2.2.2 Dutch Elm Disease Control

Dutch Elm Disease is the primary cause of mortality of all of the elm (*Ulmus*) trees. There are two species of elm present within the Osgoode Woodlot: white elm (*Ulmus americana*) and slippery elm (*U. rubra*). White elm trees are found occasionally while slippery elm trees are found rarely within the FOD4 vegetation community.

According to the City of Toronto Forest Health Care brochure (2010) and Myers and Bazely (2003):

Dutch elm disease is a wilt disease caused by ascomycete fungi: *Ophiostoma ulmi* and *O. novo-ulmi*. The fungus is spread by elm bark beetles in the genus *Scolytus.* The potential for spread is determined by the movement of infected wood and the by the flight of contaminated beetles. It attacks and blocks the water-conducting system of certain elm trees. Infection usually results in the death of the tree. The fungus spreads from infected to healthy trees. Dead elm trees, elm logs and firewood serve as breeding sites for the elm bark beetles. Connecting roots between infected and healthy trees (root grafts) may also serve as conduits for transfer of the fungus."

The following management practices to control Dutch Elm Disease are described by the City of Toronto (2010):

"Control of Dutch Elm Disease depends mainly on denying elm bark beetles places to breed. Quick removal and disposal of seriously infected and dead trees reduces the spread of the disease to other healthy trees. The recommended method of disposal is burial or burning. Tree care specialists should debark, bury or burn all affected stems greater than 1cm in diameter, and the stump should be cut flush to the ground. Where elms grow close to each other and root grafting is suspected, a trench approx. 60 cm deep should be dug around infected trees to cut potential root grafts."

4.2.2.3 Asian Long-horned Beetle (Anoplophora glabripennis) Monitoring

According to the UFORE report completed for the York University Keele Campus by Royle *et. al.* (2009):

"Asian long-horned beetle bores into trees and kills a wide variety of hardwood species. The Asian long-horned beetle affects both healthy and weak trees. Young shoots wither and die as a result of feeding damage (Canadian Food Inspection Agency. 2006a)."

A number of host tree species are present within the Osgoode Woodlot study area, including **maple (*Acer*):** rare Manitoba maple (*Acer negundo*); **ash (Fraxinus):** abundant white ash (*F. americana*); **poplar (*Populus*):** rare trembling aspen (*P. tremuloides*); and, **elm (*Ulmus*):** occasional white elm (*Ulmus americana*) and rare slippery elm (*Ulmus rubra*) (Canadian Food Inspection Agency, 2006B). If any trees with signs of Asian Long-horned Beetle are encountered during monitoring; York University faculty and the Canadian Food Inspection Agency will be notified immediately.

4.2.2.4 Gypsy Moth (Lymantria dispar) Monitoring

According to the UFORE report completed for the York University Keele Campus by Royle *et. al.* (2009):

"Gypsy Moth is a forest pest that defoliates healthy trees and can cause death in combination with other detrimental factors (Canadian Food Inspection Agency, 2006c). --- Females lay egg masses which can be found on tree bark, branches and near other protected areas (e.g. fallen logs, lawn furniture/equipment). As larvae grow they feed on foliage – making large holes in leaves and consuming the leaf margin. Large infestations can completely defoliate a tree – whereas feeding is often barely noticeable at low populations. Tree mortality typically occurs after at least four subsequent years of infection or in combination with other insects or diseases."

A number of host tree species are present within the Osgoode Woodlot study area, including **oak (*Quercus*):** abundant red oak (*Q. rubra*), which is the Gypsy Moth's main host genus. Other host species in the Osgoode Woodlot study area include: **maple (*Acer*):** rare Manitoba maple (*Acer negundo*); **hawthorn (*Crataegus*):** rare scarlet hawthorn (*Crataegus pedicellata*); **apple (*Malus*):** rare common apple (*Malus pumila*); **poplar (*Populus*):** rare trembling aspen (*P. tremuloides*); **cherry (*Prunus*):** rare sour cherry (*Prunus cerasus*), dominant black cherry (*P. serotina*), and dominant choke cherry (*P. virginiana*); and many other tree and shrub species (Canadian Food Inspection Agency, 2006c). If any trees or shrubs with signs of Gypsy Moth are encountered during monitoring; York University faculty and the Canadian Food Inspection Agency will be notified immediately.

4.2.3 Invasive Plant Control

The following herbaceous invasive plant species should be removed: garlic mustard (*Alliaria petiolata*), periwinkle (*Vinca minor*), lily-of-the-valley (*Convallaria majalis*) and orange day-lily (*Hemerocallis fulva*). **Figure 5** delineates where garlic mustard should be removed either through hand pulling and/or RoundUp herbicide application within the Osgoode Woodlot and adjacent hedgerows.

Native and non-native invasives should be removed when they are out-competing the native vegetation and closing the canopy cover of a vegetation community. Invasive plants should be sprayed or hand wicked with RoundUp Ultra containing Glyphosate if they are herbaceous or Garlon if it is a woody plant. Invasive woody vegetation is further described in **Section 4.2.1**. Three plants should be focused upon during invasive plant control, common buckthorn, garlic mustard and periwinkle. Other invasive plant species that require management should also be controlled where they are becoming a problem.

Many non-native and native invasive plant species have spread into the Osgoode Woodlot as a result of roads and trails, cultivated plant dispersal, exotic plant and animal introduction. The dominance of aggressive non-native plants needs to be controlled and reduced. **Table 5** describes the abundance and distribution of the priority invasive plant species within and immediately adjacent to the Osgoode Woodlot. Further details on techniques for the removal of invasive species are provided in **Appendix D**.

TABLE 5.
PRIORITY INVASIVE PLANT SPECIES

Invasive Herbaceous or Woody Plants that Threaten Habitat Structure and/or Species Composition of the Osgoode Woodlot		
Common Name	**Scientific Name**	**Abundance and Distribution**
Common buckthorn	*Rhamnus cathartica*	Occasional in the subcanopy and abundant in both the understory and ground layer.
Periwinkle	*Vinca minor*	Dominant in patches in the ground layer.
garlic mustard	*Alliaria petiolata*	Dominant in the ground layer.

4.2.4 Tree and Shrub Planting Plan within Openings in the Canopy Cover

In order to enhance the structural and species diversity of the woodlot, trees and shrubs should be planted within openings in the canopy cover. As ash and elm trees fall; they will open up the canopy cover. Additionally as invasive plants are removed; this will reduce competition for light, water, nutrients, space and remove some of the negative allelochemicals within the soil produced by the invasive plant species. Negative allelopathy is when plants produce chemicals that have a detrimental effect on the growth, survival and reproduction of surrounding plant species. For example garlic mustard (*Alliaria petiolata*) produces allelochemicals that suppress the growth of native mycorrhizal fungi that native forest trees require for optimum growth and establishment.

It is anticipated that the native plant seedbank should respond favourably to less competition for light, space, nutrients and water. If the native seedbank is so depleted and all that remains is an exotic seedbank, then native trees and shrubs should be planted in the new openings within the canopy cover. Trees should be planted on 6 m centres while shrubs should be planted on 3 m centres. If the native herbaceous seedbank is completely depleted, plugs and/or woodland seed mixes and plugs should also be used.

Tree and shrub species should consist of a mixture of plants that are found within the FOD4 vegetation community as well as other tree and shrub species that are common within the other forest vegetation communities on the York University campus. Additional trees and shrubs would help the Osgoode Woodlot because of the low native tree and shrub diversity, the isolation of the woodlot, the small size and the Emerald Ash Borer die off that is currently occurring. Shade tolerant and latter successional tree species are needed to replace the dyeing ash trees.

Special attention should be paid to planting shade tolerant woody species in smaller gaps created by fallen trees or felled trees. The following trees should be planted in small gaps:

1. Sugar Maple;

2. American Beech;
3. Ironwood;
4. Basswood; and,
5. Black Maple.

The following shrubs should be planted in small gaps:
1. Alternate-leaved Dogwood;
2. Chokecherry;
3. Nannyberry; and,
4. Red-berried Elderberry.

Semi shade-tolerant and shade intolerant woody species should be planted along the edge or in larger openings within the canopy cover; primarily where buckthorn has been removed.

The following trees should be planted in large gaps and along the edges:
1. Trembling Aspen;
2. Eastern White Pine;
3. Bitternut Hickory;
4. Black Cherry; and,
5. Red Oak.

The following shrubs should be planted in large gaps and along the edges:
1. Staghorn Sumac;
2. Wild Red Raspberry; and,
3. Native Hawthorn species.

Tree and shrub protection barriers should be installed at the base of the trees and shrubs after planting. Trees and shrubs should be watered as required.

4.2.5 Fragmentation

Osgoode Woodlot is fragmented from the other Natural Heritage features on the York University campus. The closest semi-natural area is the Stong Pond Arboretum to the northwest and the Black Creek natural area further to the northwest. Osgoode Woodlot and Stong Pond Arboretum are currently connected by manicured grass and separated by Nelson Road. Manicured grass is too open to encourage wildlife movement towards the Osgoode Woodlot from the Black Creek/Hoover Creek valleylands. A solution to encourage the faunal use of the Osgoode Woodlot would be to plant a tree and shrub corridor along the bird and mammal migration routes west of the Osgoode Woodlot (**Figures 4** and **5**). Refer to **Section 4.2.5.1** for further details on the proposed woody corridor.

4.2.5.1 Proposed Stong Pond Corridor

In order to encourage greater wildlife usage of the Osgoode Woodlot, a connection to the larger natural area within the Black Creek/Hoover Creek valleylands is suggested. A tree and shrub corridor should be planted along the bird and mammal migration routes west of the Osgoode Woodlot (**Figures 4** and **5**). Trees should be planted on 12 m centres and shrubs should be planted on 6 m centres. Trees and shrubs should be planted far apart because dense woody cover is a safety concern because of the lack of visibility that they produce. Mowing regimes can be maintained within the proposed corridor. The woody corridor should be a minimum of 21 m wide and run from the Osgoode Woodlot all the way to the larger trees on the western edge of the Stong Pond. The route of the proposed corridor should be just east of Pond Road and follow its alignment. This corridor would provide a connection for fauna to migrate between the Black Creek/Hoover Creek valleylands to the Osgoode Woodlot. The proposed corridor would enable mammals and birds to move between the woodlots in a safer fashion. Additional tree and shrub cover

surrounding the open corridor should reduce predation risks and reduce genetic isolation. **Figure 4** delineates the current faunal migration routes.

4.2.6 Garbage Removal

Dumping is widespread and evident throughout the Osgoode Woodlot. Along Pond Road there are copious amounts of garbage that has been dumped within the woodlot. Signs should be erected to discourage dumping and efforts should be made to remove the current garbage throughout the Osgoode Woodlot. Periodic monitoring and removal of trash from the woodlot should occur.

4.2.7 Trail Access

Current trail access to Osgoode Woodlot is limited. The University should discourage the use of the woodlot for recreational use. Only University sanctioned study of the woodlot should be allowed to discourage further anthropogenic impacts to the woodlot. Woodlots should be monitored to determine if trail use is causing any erosion, introducing further invasive plant species, furthering the negative impacts of light dumping or damaging the remaining native plant composition that is becoming scarce.

If monitoring reveals that trail use is leading to negative impacts to the woodlot then the trails should be closed for pedestrian use. Large berms composed of clean soil, root systems and/or building debris should be placed at the entrance to each trail system, provided that these berms will not affect drainage. Woody invasive plant species brush piles should be placed behind the berms to make them less appealing for pedestrian use. Any fruit from the invasive woody plants should be disposed of outside of the woodlot. If these measures are not sufficient to discourage trail use, then native hawthorns (*Crataegus*) should be planted at 3 m on centre with Alleghany blackberry (*Rubus allegheniensis*) and thimbleberry (*Rubus occidentalis*) planted at 1 m on centre at the entrance to each trail. All three species have thorns that should discourage pedestrian use of the trails.

4.2.8 No Mow Zone

No mowing should occur within the manicured lawn surrounding the Osgoode Woodlot and hedgerows. Cessation of mowing will allow naturalization to occur, provide a buffer around the Osgoode Woodlot, reduce noise and light within the woodlot and create more cover for wildlife

If this no mow zone is considered to be unsafe for pedestrians then the edges near the natural features should be only mown once in the late fall when all of the plants are dormant. This will keep the height of the vegetation down for visibility, while retaining a natural edge. Yearly mowing will remove any woody establishment from the edges. Dense shrubs and trees near the edges are a safety concern because of the cover and lack of visibility that they produce.

4.2.9 Stewardship

4.2.9.1 Labs

Annual labs should be set up in the biology department to monitor the health and level of disturbance within the Osgoode Woodlot. Flora and fauna surveys should be included to monitor how the management practices have changed the species diversity. As part of the labs, students should help to pick up garbage, pull invasive plant seedlings, install tree and shrub protection barriers as well as record other forms of disturbance. Each class should adopt a section of the Osgoode Woodlot for yearly maintenance. Annual labs within the Earth and Atmospheric Science and Physical Geography departments should also be set up to monitor changes in the soils, hydrology and geomorphology.

4.2.9.2 Future Stewardship

Future stewardship activities should include:

1. litter clean-ups;
2. wildlife habitat construction (brush piles, rock piles, organic matter debris piles, snake hibernacula, bird boxes, etc…);
3. environmental monitoring;
4. tree and shrub planting;
5. native forb and graminoid planting; and,
6. watering.

4.3 Measures to Improve Wildlife Habitat

There is low faunal species diversity within the Osgoode Woodlot because of the maturity of the canopy, the small size of the woodlot, fragmentation, low plant diversity and the lack of connection to other natural areas. To increase the structural and species diversity within the woodlot; common buckthorn, garlic mustard and periwinkle removal should be carried out. Another way to increase the faunal diversity is allow Emerald Ash Borer and Dutch elm disease to kill many of the white ash and American elm trees. Their mortality will open up the canopy allowing new plant growth in the ground layer and understorey layers. This should encourage foraging of bird and mammal species that feed on ground vegetation and require more structural diversity. Open areas should be planted with native shade intolerant and semi-shade tolerant berry bushes favorable to certain species of wildlife. Refer to **Section 4.2.4** for further details on planting within openings in Osgoode Woodlot canopy cover.

Bird next boxes should be staked into the ground to encourage further nesting within the woodlot. The posts should be pound into the ground at least 2 feet deep leaving 5 feet of the post exposed. A three foot long plastic tube should be installed just below the bird box to reduce nest predation. The bird next box should be installed at the top of the post with the plastic tube just below it. Four bird nest boxes should be installed; one at each edge of the woodland/at each cardinal direction.

Four rock piles and four organic matter debris piles should be placed at the edge of each side of the woodland. This should improve the habitat for any potential brownsnake (*Storeria dekayi*), common gartersnake (*Thamnophis sirtalis*) and red-bellied snake (*Storeria occipitomaculata*) that may potentially inhabit the area. The likelihood that there is an abundant snake population within and immediately adjacent to the Boyer Woodlot is low, but there is a small potential because of their cryptic nature. The rock piles and organic matter debris piles should be placed in openings near the edge of the woodland where large amounts of common buckthorn are removed.

Osgoode Woodlot has little function as a wildlife corridor because of the lack of natural areas surrounding it (**Figure 4**). Only the northwest side of the woodlot has any semi-natural features; consisting of a manicured lawn leading to the Stong Pond and eventually to the Black Creek/Hoover Creek valleylands. Connectivity could be improved by creating a 21 m wide wildlife travel safety zone by planting naturally occurring tree and shrub species. The new corridor would provide bird nesting habitat and a protection zone for mammals. The increased cover could encourage further wildlife usage of the Osgoode Woodlot by fauna that inhabit the Black Creek/Hoover Creek valleylands.

5.0 MONITORING OF OSGOODE WOODLOT RESTORATION

The intent of the monitoring program is to determine the effectiveness of management endeavours and techniques, as well as to document the changes to vegetation structure and composition within the Osgoode Woodlot and adjacent natural areas as a result of management activities, natural succession through time and further anthropogenic impacts. The amount of native seedbank that is still present should be monitored to determine if potted stock, plugs or seed mixes are required to augment the restoration efforts. In addition, monitoring should be completed on the growing progress of all planted

trees and shrubs. If at any time during the monitoring program the planted trees and shrubs are found to be declining or in poor health, additional management strategies should be brought forward as part of the adaptive management strategy.

5.1 Long-term Monitoring

Annual monitoring reports should be provided for a five year monitoring time period once the Osgoode Woodlot Management Plan has been approved. It is suggested that Monitoring should occur every three years after the five year monitoring time period has ended to ensure a successful long-term response to restoration initiatives. The Osgoode Woodlot will never be completely restored to a point where it functions without maintenance. Stewardship activities should occur in perpetuity. Only in the most remote locations, where the land is still connected to the larger ecosystem processes are self-sustaining ecosystems even possible (Apfelbaum *et. al.* 2010). There are too many anthropogenic stressors, including development pressures, fragmentation, invasive species, mowing, trash and other anthropogenic impacts within the Osgoode Woodlot for it to become self-sustaining. Ecosystem restoration in an urban environment is a commitment forever. As the York University campus grows in size the impacts will become greater unless they are managed in the future.

According to Section 3.7.1.8 of the York University Secondary Plan (2009):

"Management/stewardship plans will include adaptive management monitoring programs to:

a) determine and measure the ongoing health of the woodlots;
b) determine whether the management practices implemented are effective; and
c) determine if modifications are required due to unacceptable impacts from adjacent development."

In order to ensure Section 3.7.1.8 (a) is successful, long-term monitoring and adaptive management in perpetuity are required.

5.2 Monitoring Station Site Selection

Permanent photo monitoring stations should be established at four random points in the Osgoode Woodlot (**Figure 5**). Permanent monitoring stations should consist of 10.0 meter (m) by 10.0 m plots (100 m^2 plots), where qualitative and quantitative measurements of plant community structure and composition may be carried out for the five year monitoring time period. Plots should be established in areas that when monitored, shall provide the necessary information required to assess the status of habitat restoration efforts, species diversity and invasive plant abundance on a micro scale.

5.3 Photo Monitoring Methods

Photo monitoring should be conducted three times (mid-May, mid-July and mid-September) at each permanent photo monitoring station location for a five year monitoring time period once the Osgoode Woodlot Management Plan has been approved. Two T-bars should be placed into the ground at each permanent monitoring station. The GPS co-ordinates should be recorded to ensure that the same spot is being photographed every year. A Photo Monitoring board should be placed on a piece of rebar that shall be inserted immediately adjacent to one of the T-bars, to determine plant structure and dominance.

A total of five photographic positions should be taken at each photo monitoring station, one in each cardinal direction (north, south, east and west) from the centre of the quadrat and an additional north-facing photograph from the southern end that includes the photo monitoring board. The annual photographic comparison should be complemented with quantitative measurements of vegetation height and density using the photo monitoring board. The photo monitoring board is 30 cm wide by 200 cm high and is painted with alternating, equal length bands of black and white paint. Vegetation density

should be estimated by the percentage of each coloured band that is covered by vegetation. The cover values relative to vegetation density shall be described as follows: sparse (0 to 30 percent (%) cover); moderate (31 to 60% cover); dense (61 to 90% cover); and very dense (>90% cover).

5.4 Vegetation Community Surveys

All plant species within the 100 m^2 plots and their abundance within each community level (canopy, sub-canopy, understory and groundcover) should be recorded at each monitoring station. Abundance shall be estimated as a percent cover: dominant (>50% cover), abundant (35-50% cover), occasional (1-35% cover) or rare (<1% cover). All significant flora species, invasive species, wildlife use and level of disturbance (caused by humans, wildlife and/or weather) should be recorded. An annual photographic record should provide a mechanism to analyze the health status of the restored and enhanced Osgoode Woodlot and adjacent natural lands. It shall provide the opportunity to eliminate invasive species from the area should they establish or require control.

5.4.1 Vegetation Community Analysis

A Floristic Quality Assessment (FQA) should be completed using the vegetation data collected from each monitoring station plot. Each native and exotic plant species present on the sites has an assigned Coefficient of Conservatism (CC) value which ranges from 0 to 10. Species that have little or no fidelity to natural ecosystems and occur widely in a variety of altered and unaltered landscapes have lower CC values (e.g., 0-1); while species that show a very high association with unaltered natural ecosystems and do not occur in altered landscapes receive a high CC value (e.g., 9-10). The CC values for each species shall be used to calculate an overall Floristic Quality Index (FQI), which represents the relative proportions of exotic/generalist species and specialist native species. Based on this criteria, the sites shall be classified as high significance sites if the floristic quality index values is (FQI > 35), moderate significance sites if (20 < FQI < 35), and low significance sites if (FQI < 20). This method should be used as one measure of restoration success (i.e. actively restored sites have higher floristic quality values, lower sum of weediness values, and greater forest species diversity than originally assessed).

5.4.2 Invasive Species Control

The distribution and abundance of invasive species within the Osgoode Woodlot and adjacent natural lands should be described and delineated annually. Invasive plant species monitoring and management will be necessary for a minimum of five years to help exhaust the growth of any invasive plant species present.

5.5 Faunal Monitoring

Spring surveys for wildlife in the Osgoode Woodlot should be carried out every second year to determine how the restoration initiatives have enhanced the woodlot. Breeding bird surveys should be conducted every second year in early summer to determine which species have adapted to the woodlot restorations and become permanent residents. Surveys should be conducted in the early mornings when the birds are most active. Breeding bird surveys involve conducting point counts in areas that represent specific habitat types to maximize the number of species that would be recorded as breeding in the study area. The point count methodology involves standing quietly for five to ten minutes in a particular location and recording any bird species seen or heard within 100 meters. This methodology should be repeated a second time, at least one week later at the same locations to determine which species are recorded again. Species recorded two weeks in a row in the same areas are considered local breeding birds according to BSC BBA criteria.

Mammals can be surveyed almost any time of the year. Reading signs, like tracks, feces, hair samples, food caches, nests and tree holes, can be used for species identification. Since most mammal species are

nocturnal, visits to the woodlot, preferably at dusk, could reveal mammal species that become active at this time.

5.6 Stong Pond Corridor

Monitoring of the Stong Pond Corridor should be conducted three times (mid-May, mid-July and mid-September) for a five year period. Visual health surveys of all planted trees and shrubs should occur during each field survey. All planted trees and shrubs should be watered during all hot and dry periods.

6.0 FUTURE STEPS FOR THE OSGOODE WOODLOT

6.1 Goals and Guiding Principles for Osgoode Woodlot Restoration

Currently, the goals and guiding principles outlined in **Sections 4.1** and **4.2** should be considered as a first step. Yearly management and restoration activities should be re-assessed on an on-going basis to determine how successful the goals and guiding principles are for the restoration of the Osgoode Woodlot.

6.2 Monitoring Program

The Monitoring Program should be used to evaluate the progress towards the goals and objectives. Monitoring should be started prior to restoration in order to come up with a starting point prior to implementation. The Restoration and Monitoring Programs should be re-evaluated yearly allowing for implementation of adaptive management techniques in order to ensure a positive restoration outcome.

6.3 Implementation

Implementation of the restoration goals should be started to help improve the Osgoode Woodlot. Extensive invasive plant removal programs are suggested to ensure future native plants compositions plus higher fauna and flora diversity within the woodlots. Dead Ash and Elm trees should be felled and/or left to decompose, burned or buried to reduce the risk of them falling on any individual(s) and remove further infestations of Dutch Elm Disease. Further monitoring should be carried out to determine if Gypsy Moth and Asian Long-horned Beetle are present and what level of impact they have caused. A woody tree and shrub planting program should be started in the gaps and the new proposed wildlife corridor should be implemented. Garbage should be removed and access should be limited to reduce further anthropogenic impacts. Landscaping close to the Osgoode Woodlot edges, associated hedgerows and the Arboretum Trees should be reduced to provide better wildlife corridors through the York University campus. **Table 6** describes the implementation schedule.

6.4 Adaptive Management

Documenting how, when and where habitat creation, restoration or enhancement efforts are implemented and how the vegetation community or Management Unit responded is essential. A comparison of baseline and annual monitoring data provides details on the changes that occurred. This analysis allows the restoration practitioner to view the rate of change of the vegetation communities, what plant or animal species appeared or disappeared because of a certain restoration action, what prescriptions worked best and under what weather conditions. This provides a basis for making accurate, ongoing and future restoration decisions based upon the progress of the past actions. It also allows the practitioner to adjust their methodology to reflect past monitoring results.

TABLE 6.
IMPLEMENTATION SCHEDULE

Activity	Season	Timeline (Years)				
		1	2	3	4	5
Baseline Monitoring	May, July and September	X				
Follow-up Monitoring	May, July and September		X	X	X	X
Garbage Removal	Spring, Summer and Fall	X	X	X	X	X
Adjusting the Mow Zone	Spring, Summer and Fall	X	X	X	X	X
Common Buckthorn Control	Fall	X	X	X	X	X
Garlic Mustard Control	Mid-spring or Early Fall	X	X	X	X	X
Periwinkle Control	Spring preferably, but fall once the forest canopy is bare.	X	X	X	X	X
Tree and Shrub Plantings in gaps	Fall	X	X	X	X	X
Proposed Wildlife Corridor (Tree and Shrub Plantings)	Fall	X				
Tree and Shrub Maintenance (watering)	Spring, summer and fall	X	X	X	X	X
Additional Tree and Shrub Plantings	Fall		X	X	X	X
Faunal Monitoring	Spring		X		X	
Hazard Tree Monitoring and Removal	Yearly	X	X	X	X	X
Stewardship	Yearly	X	X	X	X	X

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APPENDICES

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

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Scientific Name	Common Name	Status						FQI		FOD4
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	
PINACEAE	**PINE FAMILY**									
Picea glauca	white spruce	G5	S5			X+	L3	6	3	X
Pinus strobus	eastern white pine	G5	S5			X	L4	4	3	X
CUPRESSACEAE	**CEDAR FAMILY**									
Thuja occidentalis	eastern white cedar	G5	S5			X	L4	4	-3	X
BERBERIDACEAE	**BARBERRY FAMILY**									
Podophyllum peltatum	may-apple	G5	S5			X	L4	5	3	X
ULMACEAE	**ELM FAMILY**									
Ulmus americana	white elm	G5?	S5			X	L5	3	-2	X
Ulmus rubra	slippery elm	G5	S5			R4	L2	6	0	X
MORACEAE	**MULBERRY FAMILY**									
* *Morus alba*	white mulberry	G?	SE5			X	L+		0	X
JUGLANDACEAE	**WALNUT FAMILY**									
Carya cordiformis	bitternut hickory	G5	S5			X	L4	6	0	X
Juglans nigra	black walnut	G5	S4			X	L5	5	3	X
FAGACEAE	**BEECH FAMILY**									
Quercus rubra	red oak	G5	S5			X	L4	6	3	X
VIOLACEAE	**VIOLET FAMILY**									
Viola sororia	woolly blue violet	G5	S5			X	L5	4	1	X
SALICACEAE	**WILLOW FAMILY**									
Populus tremuloides	trembling aspen	G5	S5			X	L5	2	0	X
BRASSICACEAE	**MUSTARD FAMILY**									
* *Alliaria petiolata*	garlic mustard	G5	SE5			X	L+		0	X
GROSSULARIACEAE	**GOOSEBERRY FAMILY**									
* *Ribes rubrum*	red currant	G4G5	SE5			X	L+		5	X
CRASSULACEAE	**STONECROP FAMILY**									
* *Hylotelephium telephium* ssp. *fabaria*	sedum purpureum	G?T?	SE2							X
ROSACEAE	**ROSE FAMILY**									
Crataegus pedicellata	scarlet hawthorn	G5	S4			X	L5	4	5	X
Fragaria virginiana ssp. *virginiana*	scarlet strawberry	G5T?	SU			X	L5	2	1	X
Geum aleppicum	yellow avens	G5	S5			X	L5	2	-1	X

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WORKING VASCULAR PLANT CHECKLIST

Scientific Name	Common Name	Status						FQI		FOD4
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	
* *Malus pumila*	common apple	G5	SE5			X	L+		5	X
* *Prunus cerasus*	sour cherry	G?	SE1						5	X
Prunus serotina	black cherry	G5	S5			X	L5	3	3	X
Prunus virginiana var. *virginiana*	choke cherry	G5T?	S5			X	L5	2	1	X
* *Pyrus communis*	common pear	G5	SE4			X	L+		5	X
Rubus idaeus ssp. *strigosus*	red raspberry	G5T5	S5							X
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**									
Circaea lutetiana ssp. *canadensis*	yellowish enchanter's nightshade	G5T5	S5			X	L5	3	3	X
CORNACEAE	**DOGWOOD FAMILY**									
Cornus alternifolia	alternate-leaved dogwood	G5	S5			X	L5	6	5	X
RHAMNACEAE	**BUCKTHORN FAMILY**									
* *Rhamnus cathartica*	common buckthorn	G?	SE5			X	L+		3	X
VITACEAE	**GRAPE FAMILY**									
Parthenocissus vitacea	inserted Virginia-creeper	G5	S5			X	L5	3	3	X
Vitis riparia	riverbank grape	G5	S5			X	L5	0	-2	X
ACERACEAE	**MAPLE FAMILY**									
Acer negundo	Manitoba maple	G5	S5			X	L+?	0	-2	X
ANACARDIACEAE	**SUMAC FAMILY**									
Rhus hirta	staghorn sumac	G5	S5			X	L5	1	5	X
APOCYNACEAE	**DOGBANE FAMILY**									
* *Vinca minor*	periwinkle	G?	SE5			X	L+		5	X
BORAGINACEAE	**BORAGE FAMILY**									
* *Myosotis scorpioides*	mouse-ear scorpion-grass	G5	SE5			X	L+		-5	X
LAMIACEAE	**MINT FAMILY**									
* *Glechoma hederacea*	creeping Charlie	G?	SE5			X	L+		3	X
* *Leonurus cardiaca* ssp. *cardiaca*	common motherwort	G?T?	SE5			X	L+		5	X
OLEACEAE	**OLIVE FAMILY**									
* *Forsythia viridissima*	golden-bells	G?	SE2			X	L+			X
Fraxinus americana	white ash	G5	S5			X	L5	4	3	X
* *Syringa vulgaris*	common lilac	G?	SE5			X	L+		5	X
CAPRIFOLIACEAE	**HONEYSUCKLE**									

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

Scientific Name	Common Name	Status						FQI		FOD4
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	
	FAMILY									
* *Lonicera tatarica*	Tartarian honeysuckle	G?	SE5			X	L+		3	X
Sambucus racemosa var. *racemosa*	red-berried elderberry	G5T4 T5	S5			X	L5	5	2	X
* *Viburnum lantana*	bending wayfaring-tree	G?	SE2			X	L+		5	X
Viburnum lentago	nannyberry	G5	S5			X	L5	4	-1	X
ASTERACEAE	**ASTER FAMILY**									
* *Arctium minus*	common burdock	G?T?	SE5			X	L+		5	X
Aster lanceolatus ssp. *lanceolatus*	tall white aster	G5T?	S5			X	L5	3	-3	X
Arisaema triphyllum ssp. *triphyllum*	small jack-in-the-pulpit	G5T5	S5			X	L4	5	-2	X
CYPERACEAE	**SEDGE FAMILY**									
Carex rosea	stellate sedge	G5	S5			U	L5	5	5	X
LILIACEAE	**LILY FAMILY**									
Allium tricoccum	wild leek	G5	S5			X	L3	7	2	X
* *Convallaria majalis*	lily-of-the-valley	G5	SE5			X	L+		5	X
Erythronium americanum ssp. *americanum*	yellow dog's-tooth violet	G5T5	S5			X	L5	5	5	X
* *Hemerocallis fulva*	orange day-lily	G?	SE5			X	L+		5	X
* *Narcissus pseudonarcissus*	daffodil	G?	SE2				L+			X

APPENDIX B
ACRONYMS AND DEFINITIONS USED IN SPECIES LISTS

Species Status

COSEWIC **Committee On The Status Of Endangered Wildlife In Canada**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species that are considered to be at risk in Canada.

Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.

COSSARO/MNR **Committee On The Status Of Species At Risk In Ontario/Ontario Ministry Of Natural Resources**

The Committee on the Status of Species at Risk in Ontario (COSSARO)/Ontario Ministry of Natural Resources (MNR) assesses the provincial status of wild species that are considered to be at risk in Ontario.

Extinct (EXT)	A species that no longer exists anywhere.
Extirpated (EXP)	A species that no longer exists in the wild in Ontario but still occurs elsewhere.
Endangered (Regulated) (END–R)	A species facing imminent extinction or extirpation in Ontario which has be regulated under Ontario's *Endangered Species Act*.
Endangered (END)	A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's *Endangered Species Act*.
Threatened (THR)	A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
Special Concern (SC)	A species with characteristics that make it sensitive to human activities or natural events.
Not at Risk (NAR)	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)	A species for which there is insufficient information for a provincial status recommendation.

Species Rank

GRANK **Global Rank**

Global ranks are assigned by a consensus of the network of Conservation Data Centres, scientific experts, and The Nature Conservatory to designate a rarity rank based on the range-wide status of a species, subspecies or variety. The most important factors considered in assigning global ranks are the total number of known, extant sites world-wide, and the degree to which they are potentially or actively threatened with destruction. Other criteria include the number of known populations considered to be securely protected, the size of the various populations, and the ability of the taxon to persist at its known sites. The taxonomic distinctness of each taxon has also been considered. Hybrids, introduced species, and taxonomically dubious species, subspecies and varieties have not been included.

G1	**Extremely rare;** usually 5 or fewer occurrences in the overall range or very few remaining individuals; or because of some factor(s) making it especially vulnerable to extinction.
G2	**Very rare;** usually between 5 and 20 occurrences in the overall range or with many individuals in fewer occurrences; or because of some factor(s) making it vulnerable to extinction.
G3	**Rare to uncommon**; usually between 20 and 100 occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
G4	**Common**; usually more than 100 occurrences; usually not susceptible to immediate threats.
G5	**Very common**; demonstrably secure under present conditions.
GH	Historic, no records in the past 20 years.
GU	Status **uncertain**, often because of low search effort or cryptic nature of the species; more data needed.
GX	Globally extinct. No recent records despite specific searches.
?	Denotes inexact numeric rank (i.e. G4?).
G	A "G" (or "T") followed by a blank space means that the NHIC has not yet obtained the Global Rank from The Nature Conservancy.
G?	**Unranked,** or, if following a ranking, rank tentatively assigned (e.g. G3?).
Q	Denotes that the taxonomic status of the species, subspecies, or variety is **questionable**.
T	Denotes that the rank applies to a subspecies or variety.

SRANK **Provincial Rank**

Provincial (or Sub-national) ranks are used by the Ontario Ministry of Natural Resources Natural Heritage Information Centre (NHIC) to set protection priorities for rare species and natural communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of Ontario. By comparing the global and provincial ranks, the status, rarity, and the urgency of conservation needs can be ascertained. The NHIC evaluates provincial ranks on a continual basis and produces updated lists at least annually.

S1	**Critically Imperiled** in Ontario because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation.
S2	**Imperiled** in Ontario because of rarity due to very restricted range, very few populations (often 20 or fewer occurrences) steep declines or other factors making it very vulnerable to extirpation.
S3	**Vulnerable** in Ontario due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	**Apparently Secure**—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	**Secure**—Common, widespread, and abundant in Ontario.
SX	**Presumed Extirpated** – Species or community is believed to be extirpated from Ontario.
SH	**Possibly Extirpated** – Species or community occurred historically in Ontario and there is some possibility that it may be rediscovered.
SE	**Exotic – Species introduced to Ontario.**
SNR	**Unranked**—Conservation status in Ontario not yet assessed
SU	**Unrankable**—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	**Not Applicable** —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	**Range Rank** —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Regulated Species at Risk

SARA **Species at Risk Act**

The Canada *Species at Risk Act* provides a framework for actions across Canada to ensure the survival of wildlife species and the protection of our natural heritage. It sets out how to decide which species are a priority for action and what to do to protect a species. It identifies ways governments, organizations and individuals can work together, and it establishes penalties for a failure to obey the law. Regulated species are listed in Schedules 1, 2 and 3 of the Act.

Schedule 1 SARA (1)	Species that are currently covered under the Act.
Schedule 2 SARA (2)	Species that are endangered or threatened that have not been re-assessed by COSEWIC for inclusion on Schedule 1.
Schedule 3 SARA (3)	Species that are of special concern that have not yet been re-assessed by COSEWIC for inclusion on Schedule 1.

ESA **Endangered Species Act**

The Ontario *Endangered Species Act* provides for the conservation, protection, restoration and propagation of species of fauna and flora of the Province of Ontario that are threatened with extinction. Regulated species are listed in Ontario Regulation 338.

Schedule 1 ESA (1)	The species of fauna listed in Schedule 1 are declared to be threatened with extinction.
Schedule 2 ESA (2)	The species of flora listed in Schedule 2 are declared to be threatened with extinction.

FWCA **Fish and Wildlife Conservation Act**

The Ontario *Fish and Wildlife Conservation Act* enables to Ministry of Natural Resources to protect and manage a broad range of fish and wildlife species. Regulated fish and wildlife are listed as furbearing (F), game (G) or protected (P) in schedules to the Act.

FWCA (F)	Furbearing mammals (Schedule 1).
FWCA (G)	Game mammals (Schedule 2), birds (Schedule 3), reptiles (Schedule 4), and amphibians (Schedule 5)
FWCA (SP)	Specially protected mammals (Schedule 6), birds (raptors) (Schedule 7), birds (other than raptors) (Schedule 8), reptiles (Schedule 9), amphibians (Schedule 10) and invertebrates (Schedule 11).

MBCA **Migratory Birds Conservation Act**

The Canada *Migratory Birds Conservation Act* implements the Convention by protecting and conserving migratory birds – as populations and individual birds – and their nests. Article 1 identifies the migratory game birds, migratory insectivorous birds and other migratory non-game birds regulated by the Act.

FA **Fisheries Act**

The Canada *Fisheries Act* enables the Department of Fisheries and Oceans to protect and manage fish and fish habitat. Fish includes; parts of fish, shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals; and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals.

PPS **Provincial Policy Statement**

The Ontario *Provincial Policy Statement* is issued under the authority of Section 3 of the Planning Act. It provides direction on matters of provincial interest related to land use planning and development, and promotes the provincial "policy-led" planning system. The PPS enables the Province to protect significant natural heritage features and areas including the significant habitat of endangered and threatened species.

APPENDIX C
RECOMMENDED EQUIPMENT

APPENDIX C.
REQUIRED EQUIPMENT

Planting	Habitat Creation, Enhancement and Restoration	Transportation	Herbicide Application
1. Garden Hose 2. Sharp Knives 3. Transplant Spade 4. Standard Spade 5. Hand Shovel 6. Wheel Barrow 7. Garbage Bags 8. Weed Free Mulch 9. Black gardening cloth or plastic sheets 10. Mini-sledge 11. Small wood stakes 12. Camera 13. Flagging Tape 14. Ruler 15. Metre Stick 16. Hand Saw 17. Brush-cutter 18. Heavy-duty scissors or pruners 19. Watering Can 20. Chainsaw	1. Brush-cutter 2. Chainsaw	1. Pick-up Trucks	1. Back-pack Sprayer 2. Herbicide Resistant Gloves 3. Herbicide Resistant Suits 4. Herbicide Resistant Gloves for Wicking 5. 2-Stroke Oil 6. Gasoline 7. Diesel or Vegetable Oil 8. Tranxit 9. Garlon Ultra 10. RoundUp Ultra II 11. Glyfos 12. WeatherMAX 13. 2,4-D 14. Triclopyr 15. Clopyralid 16. Diacamba

APPENDIX D
INVASIVE SPECIES CONTROL STRATEGIES

APPENDIX D

Removal of Invasive Woody Species

Along with the removal of non-native plant species, additional native woody vegetation (i.e. trees and shrubs) will need to be removed and managed in the long-term. Some woody species may have to be removed through cutting and possible herbicide application.

Cutting

Trees will be cut at ground level with power or manual saws. Cutting is most effective when trees have begun to flower to prevent seed production. Because many invasive trees and shrubs spread by suckering, re-sprouts are common after treatment. Cutting is an initial control measure, and success will require either an additional herbicidal control or repeated cutting to control re-sprouts.

Girdling

This method shall be used on large trees where the use of herbicides is not practical. Using a hand axe or saw, a cut shall be made through the bark encircling the base of the tree, approximately 15 cm (6 in) above the ground while the tree is in flower and is most vulnerable. The cut shall penetrate well into the cambium layer. This method will kill the top of the tree; however, re-sprouts are common and may require follow-up treatments for several years until roots are exhausted.

Hand Pulling

Manual removal of young tree and shrub seedlings will control woody species. Plants should be pulled as soon as they are large enough to grasp, but before they produce seeds. Seedlings are best pulled after a rain when the soil is loose. The entire root must be removed since broken fragments may re-sprout. Each stalk should be pulled at ground level.

Foliar Spray Method

This method should be used for large thickets of seedlings where risk to non-target species is minimal. Air temperature should be above 18°C to ensure absorption of herbicides. An herbicide solution shall be applied to thoroughly wet all leaves. Use a low pressure and coarse spray pattern to reduce spray drift damage to non-target species.

Cut Stump Method

This control method should be considered when treating large individual trees or where the presence of desirable species precludes foliar application. Stump treatments can be used as long as the ground is not frozen. Stems shall be horizontally cut at or near ground level and an herbicide solution shall be immediately applied to the cut stump, ensuring that the outer 20 percent of the stump is covered.

Basal Bark Method

This method is effective throughout the year as long as the ground is not frozen. A herbicide solution shall be applied to the basal parts of the tree, from the ground up to a height of 30-38 cm (12-15 in). Thorough wetting is necessary for good control; spray until run-off is noticeable at the ground line.

Hack and Squirt Method

Cuts will be made at 6.5 cm (3 in) intervals around the trunk of the tree between 15 and 45 cm (6-18 in) above the ground, using a hand axe. Each cut shall be placed well into or below the cambium layer of the tree. The cut will be immediately treated with an herbicide solution.

Species Specific Control Strategies

Common Buckthorn (Rhamnus cathartica) Control

Common buckthorn is a deciduous shrub or small tree that readily invades forest edges, woodland, savannah, and prairie habitats. This plant species grows quickly and young shrubs can produce abundant fruit, and establishment often results with high densities of seedlings in very little space. Establishment can also occur through suckering of the root system (shoot which grows from the bud of a plant's roots). As a result of the dense establishment of seedlings, both the recruitment of those tree species in the canopy as well as of native herbaceous species found in the understory, can be altered, ultimately changing the vegetation composition of the forest community in which common buckthorn has invaded. In areas where common buckthorn is removed dense plantings of native shrubs and ground flora would serve to offset the subsequent regeneration of common buckthorn.

The control of buckthorn has been proven successful with the use of an herbicide application of 6% Triclopyr (480g/L) in 94% diesel fuel which is applied to the bark at the base of the stem. This solution will be applied to uncut stems with herbicide applied directly to the bark. Shrubs often show signs of decline within four days. A dye will be added to the mixture so that treated stems can be identified. This method will be applied at any time of the year but is most effective in early to mid-fall when most other species have begun to senesce and buckthorn leaves are still visible on the shrub. Application will be completed prior to leaf fall when buckthorn is moving nutrients from the leaves and twigs down into the roots for winter storage; this will also impact buckthorn's root system, and will minimize stump sprouting.

The application of the herbicide mixture of Triclopyr in diesel fuel is also effective when applied to a fresh gash in a buckthorn stem and the surrounding bark, or on freshly cut stems. Shrubs will be cut using an axe or chain saw and will be cut close to the ground. A second person can walk through the same area once the cutting is completed, to apply the herbicide treatment the gash and bark, or stem, of each targeted, nonnative stem. This method is very effective on larger buckthorn stems as compared to the bark application. The application of herbicide will occur when precipitation is not anticipated within a 2 to 3 day period following application to promote the translocation of the herbicide into the plant. As noted above, the application of an herbicide to reduce buckthorn is more effective when completed in mid to late fall, prior to leaf fall.

It is important to note that seed bearing buckthorn plants will be cut and removed prior to fruit maturation to reduce seed input into the soil, and that follow-up treatment of herbicide applications will be necessary for several years following the initial application due to stump sprouting. Broadcast seeding of native seed or transplanting seedlings in the spring, following the initial herbicide application will help to create competitive conditions that will also help to minimize the subsequent establishment of additional buckthorn stems.

Common Pear (Pyrus communis) Control

Dense and thorny thickets of common pear prevent colonization of native trees and shrubs at woodland edges. Birds and small mammals eat the fruits and disperse the seeds. Tree seedlings should be hand pulled or dug up with a shovel. Larger trees can be girdled if they are in the interior of the woodlot. If the

larger trees are near the woodland edge they should be cut down and painted/sprayed with Garlon (Kaufman, 2007).

Guelder Rose (Viburnum opulus) and Bending Wayfaring-tree (Viburnum lantana)

Exotic Viburnum's grow into thickets, woodlands, forests and swamps excluding many native plants. They are not exceptionally aggressive colonizers. They spread through seed dispersal by birds. Seedlings should be hand pulled or dug up with a shovel. Abundant stands should be cut with a brush-cutter and cut stumps should be sprayed with Garlon (Kauffman, 2007).

Red Currant (Ribes rubrum) Control

Red currant provides an ample food source for local wildlife. When it occurs in dense stands it should be brush cut in the fall to winter and then the stumps should be sprayed with Garlon.

Sweet Cherry (Prunus avium) and Sour Cherry (Prunus cerasus) Control

Both exotic cherry species should only be removed when they form large stands within the forest. Cherry trees provide food for birds and mammal species. Smaller trees should be dug out or hand pulled. Larger trees can be girdled if they are in the interior of the woodlot. When the larger trees are near the edge they should be cut and painted with Glyphosate or Garlon (Kaufman, 2007).

Tartarian Honeysuckle (Lonicera tatarica) Control

Young shrubs can be hand pulled or dug out of the ground. Larger shrubs should be brush cut to a stump in the fall to winter and then painted with Garlon or RoundUp (Kaufman, 2007).

White Mulberry (Morus alba) Control

White mulberry is a threat to red mulberry because it is abundant in Ontario, red mulberry is rare, and it produces a lot more pollen so that it overwhelms the native red mulberry trees and produces hybrids. Seedlings can be hand pulled or dug up. Saplings and older trees produce spreading roots that are difficult to pull up and thus should be cut with a brush cutter or chainsaw and then the stump should be painted with Garlon or RoundUp (Kaufman, 2007).

Removal of Invasive Herbaceous Species

Herbicide Application

Herbicide application techniques will focus on RoundUp Ultra herbicide application. The following general guidelines of herbicide application shall apply:

- All application of RoundUp Ultra herbicide shall take place a minimum of four to six hours prior to any rainfall, to ensure proper absorption of the herbicide by the invasive species and prevent runoff into surface water.
- Mowing and/or cutting of invasive species in an area shall be carried out a minimum of two weeks after the area was sprayed to ensure that the invasive species are deceased and not spread by mowing or cutting.
- All mown or cut organic matter, trimmings, clippings and other debris shall be disposed of in an approved facility.
- All equipment will be cleaned on site prior to the equipment's removal, to reduce transfer of soil or other organic matter that may contain invasive species.

Species Specific Control Strategies

Garlic Mustard (Alliaria petiolata) Control

Garlic mustard dominates and quickly colonizes undisturbed ground cover layers in forests, where it competes for light and space with spring ephemerals and native tree and shrub seedlings. Garlic mustard inhibits the growth of mycorrhizal fungi that give native plants a competitive advantage over exotic plants. Native plants use the mycorrhizal fungi to obtain nutrients from soil (Kaufman, 2007).

In order to control garlic mustard the first thing is to target and prevent seed production. Hand removal should occur when the soil is moist. At least two to five years of seed removal and herbicide application will be necessary to deplete the seed banks. RoundUp herbicide application will be required to control the heavy infestations in the Osgoode Woodlot. The herbicide should be applied in the mid-spring or early fall to the garlic mustard basal rosettes provided the temperatures are above 10° C.

Periwinkle (Vinca minor) Control

Periwinkle spreads primarily from underground rhizomes and from the nodes along the rhizomes. It seldom reproduces from seed. Periwinkle forms dense monoculture stands in shaded and semi-shaded habitats. It completely excludes other ground cover plants, especially herbaceous species. It is an evergreen species that is able to photosynthesize in both the spring and in the fall sunlight when the forest canopy is bare. Leaves are toxic to most birds and mammals. The seeds are too small for birds. Thus, when it displaces native plants it also displaces native food sources for wildlife11111111111. RoundUp foliar herbicide application will be required to control the heavy infestations in the Osgoode Woodlot. The herbicide should be applied in the mid-spring or early fall to the periwinkle stands provided the temperatures are above 10° C (Kaufman, 2007).

Lily-of-the-Valley (Convallaria majalis)

Lily-of-the-valley is primarily found on old house sites. It spreads by rhizomes into dense stands. It shades out any native plants that try to seed into stands of Lily-of-the-Valley. Small populations can be removed by digging up the root systems and disposing of them. Larger populations need to be removed by spraying RoundUp during the spring. Multiple herbicide applications may be required to remove all of the Lily-of-the-Valley plants present.

Orange Day-lily (Hemerocallis fulva)

Orange Day-lily is primarily found on old house sites. Once established, day-lilies form dense clumps that form monocultures that few native plants can penetrate. Day-lilies can contract their roots or elongate their shoots out-competing other plants. The long and dense leaves shade out any native plant seeds that try to germinate under them. The plants spread by rhizomes and occasionally by seed. Day-lilies do not spread rapidly, but native plants cannot compete with established populations. Mammals browse on their root systems and flowers. There are a number of control methodologies, including digging up or tilling the soil where they are established and then removing the roots systems from the loose soil. In larger populations the day-lilies should be cut and sprayed with RoundUp. Another option is to inoculate the soil around the plants with daylily rust that kills the plants (Kaufman, 2007).

APPENDIX E
PHOTO APPENDIX

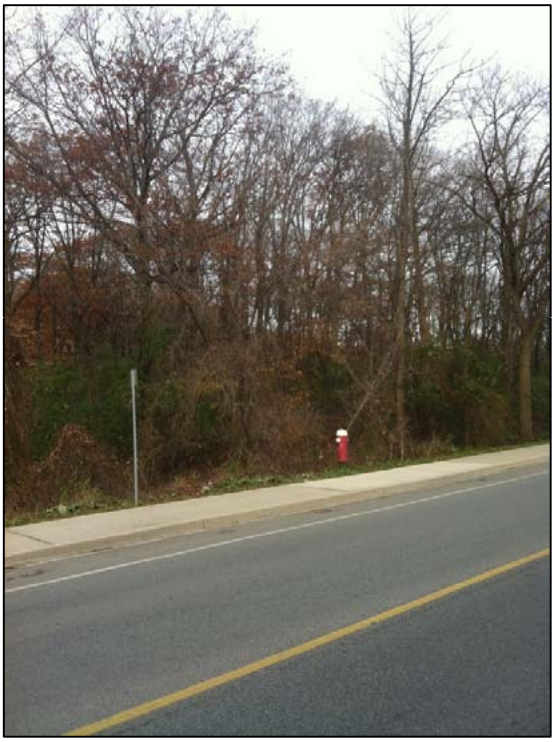
PROJECT #TA8152
November 2012

APPENDIX E
OSGOODE WOODLOT PHOTO APPENDIX

View to the north in Osgoode woolot.

View of the eastern edge of Osgoode woodlot.

View of the northern edge of Osgoode woodlot.



View of the south edge of Osgoode woodlot.

APPENDIX F
ELC DATA CARDS

PLANT SPECIES LIST	
	SITE: OSGOODE, YORK U
	POLYGON: FOOH
	DATE: May 7, August 9, Sept 25, 2002
	SURVEYOR(S): DEB, LMC

LAYERS: 1 = CANOPY TREES > 10m 2 = SUB-CANOPY 3 = SAPLINGS & SHRUBS 4 = GROUND LAYER
BRAUN BLANQUET: + PRESENT 1 = < 1-5% 2 = 5-25% 3 = 25-50% 4 = 50-75% 5 = 75-100%

SPECIES CODE	LAYER 1	2	3	4	COLL.
VINMINO				R	
VIBLENT			R		
VIBLANT			R		
VIOSCRO				R	
VITRIPA			O		
ULMAMER	O	O			
ULMRUBR	R				
SAMRACE			R		
SEDPURP				R	
SYRVULG			R		
SYMLAMX				R	
RHUHIRT			R		
RUBIDAU			R		
RIBRUBR				A	
RHACATH		O	A	A	
QUERUBA	A				
PRUCERA	R				
POPDELT				R	
PINSTRO		R			
POPTREM		R			
PARJUSE				O	
PICGLAU		R			
PYRCOMM		R			
PRUSERO	A	D	O		
PRUVIRG			D	A	
NARPSEU				R	
MALPUMI		R			
MORALA		R			

SPECIES CODE	LAYER 1	2	3	4	COLL.
LONTATA			R		
LECCAPD				R	
JUGNIGR		R	R		
HEMFILV				R	
GLEHEDE				R	
GLYFALF				A	
FRAVIRG				R	
FORVIRD			R		
FRAAMER	A		O	R	
FRYAMER				R	
CRAPEDI		R			
CORALTE			R		
CARCORD		A			
CARROSE				R	
CONMASA				R	
CIRLUTE				A	
ARCMINU				R	
ALLTRIO				R	
ACENEGU		O	O	R	
ARITRIU				R	
ALLPETI				D	
THUOCCI		R	R		
MYOSCOR				R	

STAND CHARACTERISTICS			
	SITE: OSGOODE		POLYGON:
	SURVEYOR(S): DEB, LMC		DATE: Aug 9
	UTMZ:	UTME:	UTMN:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPO. FEATURE	HISTORY	PLANT FORM	COMMUNITY
☒ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☒ MINERAL SOIL ☐ PARENT MATERIAL ☐ ACIDIC BEDROCK ☐ BASIC BEDROCK ☐ CARB. BEDROCK	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☒ TABLELAND ☐ ROLLING UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE/CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH/BAR ☐ SAND DUNE ☐ BLUFF	☒ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☒ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☒ FOREST ☐ PLANTATION
SITE			**COVER**		
☐ OPEN WATER ☐ SHALLOW WAT. ☒ SURFICIAL DEP. ☐ BEDROCK			☐ OPEN ☐ SHRUB ☒ TREED		

STAND DESCRIPTION

LAYER		HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>> MUCH GREATER THAN; > GREATER THAN; = ABOUT EQUAL TO)
1	EMERGENT			
2	CANOPY	1, 2	1, 2	PRUSERO = FRAAMER = CARCORD
3	SUB-CANOPY	3	2, 3	CARCORD = ACENEGU = PRUSERO = ULMAMER
4	UNDERSTORY	4, 5	2, 3	PRUVIRG > RHACATH
5	GROUND LAYER	7	1	ALLPETI > CIRLUTE = PRUVIRG = RHACATH

HT CODES: 1 = > 25m 2 = >10-25m 3 = 2-10m 4 = 1-2m 5 = 0.5-1m 6 = 0.2-0.5m 7 = <0.2m
CVR CODES: 0 = NONE 1 = 1-10% 2 = >10-25% 3 = >25-35% 4 = >35-60% 5 = >60%

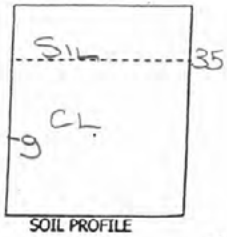
SIZE CLASS ANALYSIS

TREES		A	< 10cm	A	10-24cm	O	25-50cm	O	> 50cm
STANDING SNAGS		R	< 10cm	R	10-24cm	R	25-50cm	R	> 50cm
DEADFALL/LOGS	FIRM	A	< 10cm	O	10-24cm	R	25-50cm	N	> 50cm
	DECAYED	O	< 10cm	R	10-24cm	R	25-50cm		> 50cm

COMMUNITY MATURITY
☐ PIONEER ☐ YOUNG ☒ MID-AGE ☐ MATURE ☐ OLD-GROWTH

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	CL			
DEPTH TO MOTTLES	g = 65	g =	g =	g =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	0			
DEPTH TO BEDROCK	>120			
MOISTURE REGIME	3			



SOIL PROFILE

PLANT SPECIES LIST	
	SITE:
	POLYGON:
	DATE:
	SURVEYOR(S):

LAYERS: 1 = CANOPY TREES > 10m 2 = SUB-CANOPY 3 = SAPLINGS & SHRUBS 4 = GROUND LAYER
VALUE CODES: D = DOMINANT A = ABUNDANT O = OCCASIONAL R = RARE

SPECIES CODE	LAYER 1	2	3	4	COLL.	SPECIES CODE	LAYER 1	2	3	4	COLL.

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: Oscoods
	POLYGON: F014
	DATE: May 4
	SURVEYOR(S): LMC, DSB

MANAGEMENT / DISTURBANCE	LEVEL / EXTENT	MANAGEMENT / DISTURBANCE	LEVEL / EXTENT
SUGAR BUSH OPERATIONS	0 / 0	DUMPING (RUBBISH)	1 / 2
GAPS IN THE CANOPY	1 / 2	EARTH DISPLACEMENT	0 / 0
LIVESTOCK (GRAZING)	0 / 0	RECREATIONAL USE	0 / 0
PLANTING (PLANTATION)	0 / 0	ALIEN SPECIES	0 / 0
TRACKS AND TRAILS	1 / 2	NOISE	1 / 2
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	0 / 2	FLOODING (POOLS & PUDDLING)	0 / 0
WINDTHROW (BLOWDOWN)	0 / 0	FIRE	0 / 0
BROWSE (e.g., DEER)	0 / 0	SOIL EROSION	0 / 0
BEAVER ACTIVITY	0 / 0	OTHER	/

LEVEL: 0 = NONE 1 = LIGHT 2 = MODERATE 3 = HEAVY
EXTENT: 0 = NONE 1 = LOCAL 2 = WIDESPREAD 3 = EXTENSIVE

TREE TALLY BY SPECIES PRISM FACTOR:

SPECIES CODE	TALLY 1	TALLY 2	TALLY 3	TALLY 4	TALLY 5	TOTAL	REL. AV.
TOTAL							
BASAL AREA (BA)							MEAN
DEAD							