Boynton Woodlot Management Plan

Photo Credit: W. King, LGL Limited

Prepared for:

YORK UNIVERSITY
4700 KEELE STREET
NORTH YORK, ONTARIO
M3J1P3

Prepared by:

LGL LIMITED
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Boynton Woodlot Management Plan

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1.0 INTRODUCTION

A Management Plan has been prepared for the Boynton Woodlot in support of the York University Master Plan Update. Three season field investigations for vegetation and wildlife were conducted in the Boynton 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 Boynton Woodlot as is documented in **Section 4.0**. A number of reports have been reviewed in order to create the Boynton 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 Boynton Woodlot and adjacent lands to the south, lie at the eastern limit of the York University campus. **Figure 1** presents the location of the study area in a regional context.

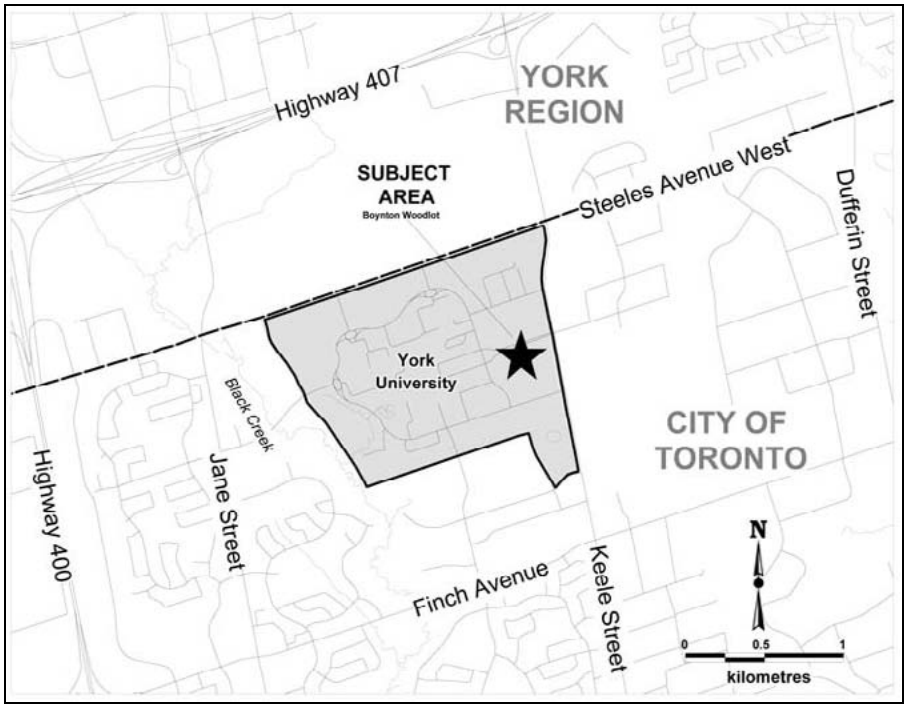


Figure 1. Key Plan of the Boynton Woodlot.

1.2 Core Woodlots

The Boynton Woodlot is one of four core woodlots on the York University campus (**Figure 2**). The Boynton Woodlot covers an area of approximately of 5.13 ha. It is bounded by York Boulevard along the northern edge; York University Busway to the west; The Pond Road along the southern edge and Keele Street along the eastern edge. There are three other woodlots on the York University campus, including Danby, Boyer, and Osgoode woodlots. Separate management plans have been prepared for each of these woodlots.

1.3 Boynton Woodlot Study Area

The Boynton Woodlot study area is composed of the Boynton Woods, meadows along the western and northern edges, hedgerows along the eastern edge running north to south curving westwards along York Boulevard and another hedgerow along the northern edge running northwards. Both hedgerows provide a corridor to the Danby Woodlot (**Figure 2**). The Boynton 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.

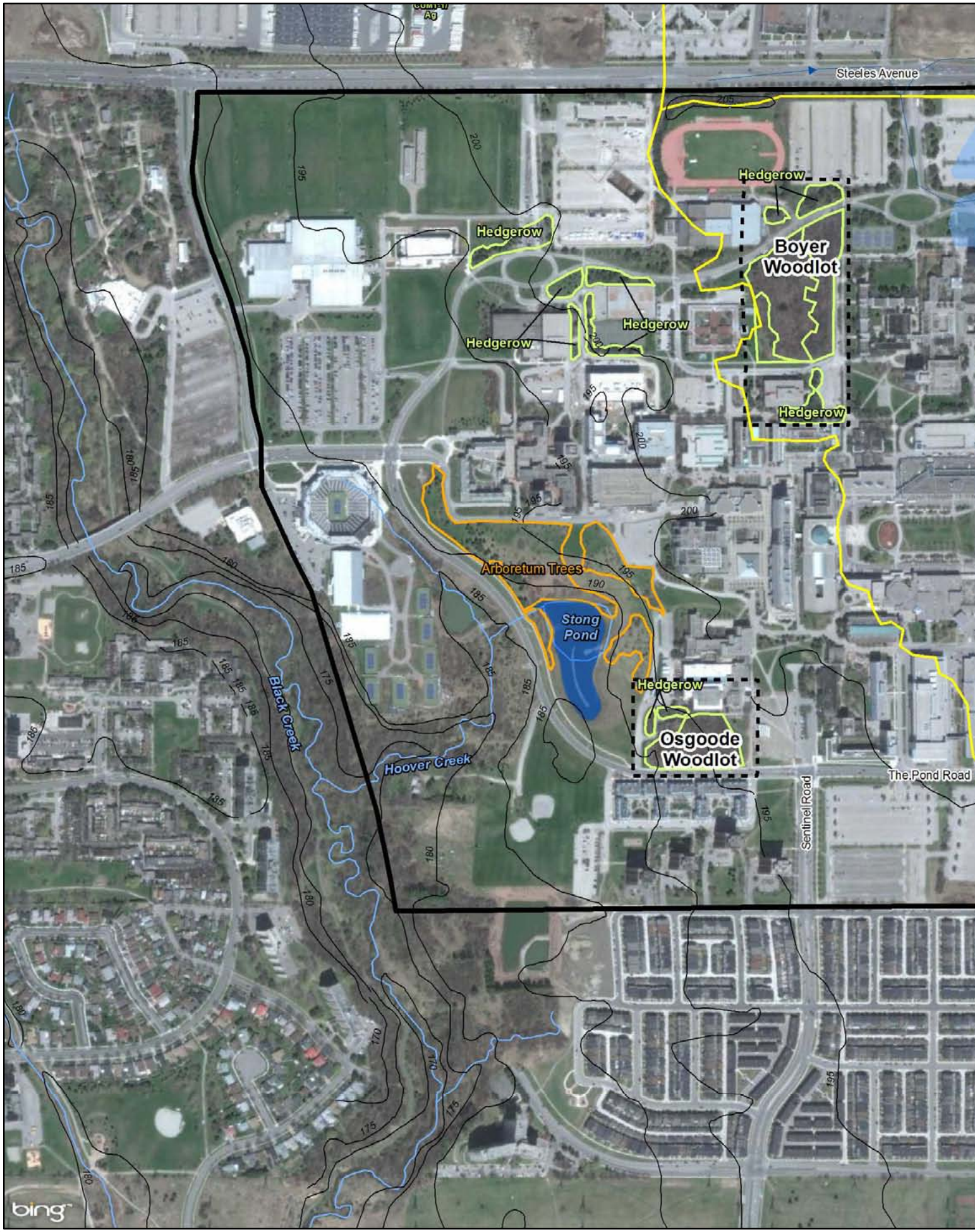
The York University Secondary Plan, Amendment No. 104 to the Official Plan of the City of Toronto, was adopted by Council on December 4, 2009. The Secondary Plan includes policies related to the Natural Heritage System found on campus, including the Boyer, Boynton Danby and Osgoode Woodlots. Specifically, 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:

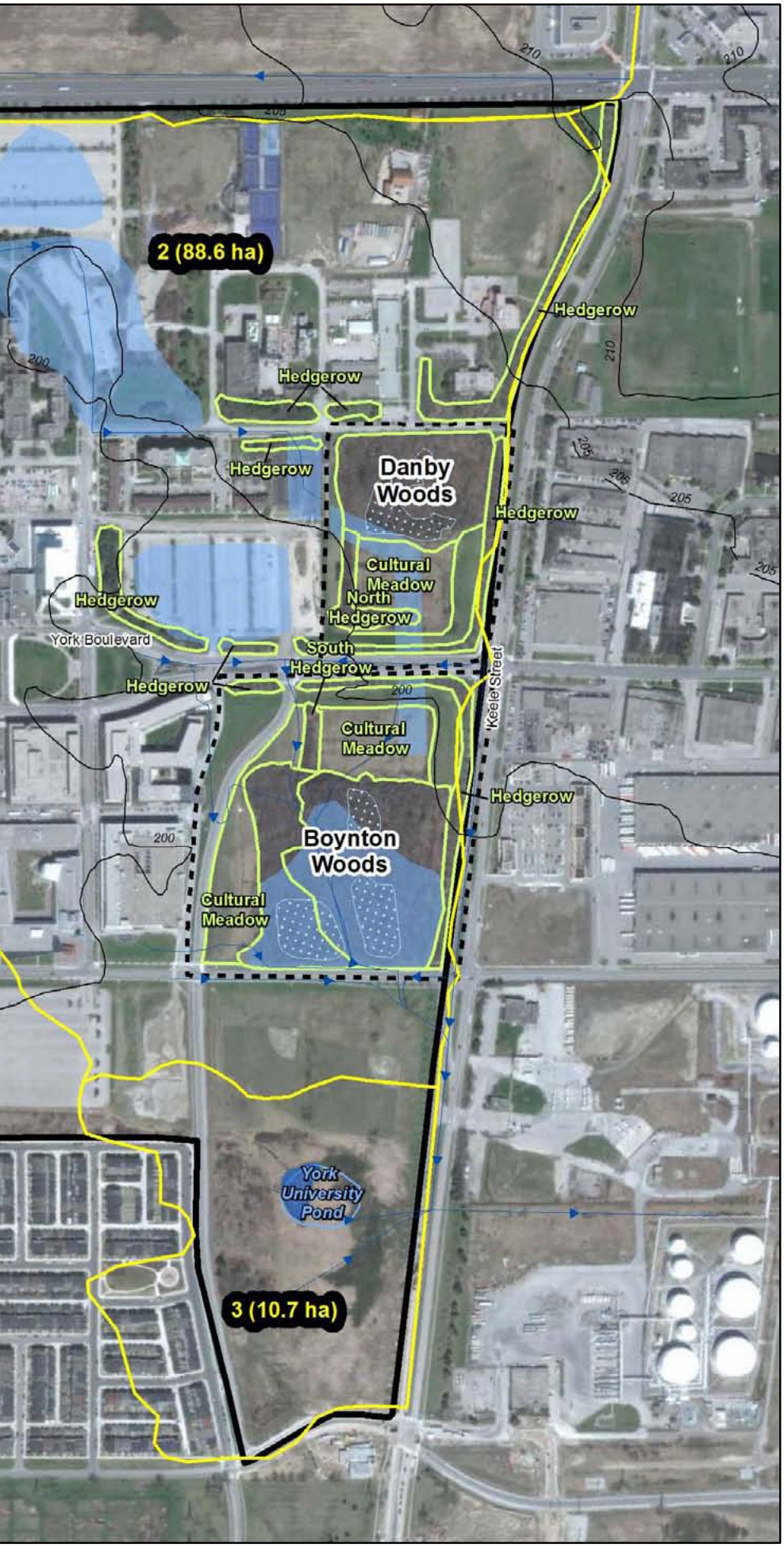
(a) determine and measure the ongoing health of the woodlots;
(b) determine whether the management practices implemented are effective; and,
(c) determine if modifications are required due to unacceptable impacts from adjacent development.

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 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.


Steeles Avenue
Hedgerow
Hedgerow
Boyer Woodlot
Hedgerow
Hedgerow
Hedgerow
Arboretum Trees
Stong Pond
Hedgerow
Osgoode Woodlot
Black Creek
Hoover Creek
The Pond Road
Sentinel Road
bing



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.

100 50 0 100 Metres

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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

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

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

2.1 Process for Boynton Woodlot Ecological Assessment

Each vegetation community within and immediately adjacent to the Boynton 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 Boynton Woodlot:

1. Current land use site assessment;
2. Examination of past disturbance regimes and current ecological stressors;
3. A Boynton 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 Boynton 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 Boynton woodlot was conducted within the study area by LGL on May 31, August 8, and September 26, 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 Boynton 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 Boynton Woodlot. A Management/Disturbance field sheet was filled out for each vegetation community within the Boynton 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 and where a corridor connecting the Boynton Woodlot should be created through old-field meadow and hedgerow vegetation communities.

2.2.5 Mapping

Mapping requirements consisted of mapping the study area location (Boynton Woodlot), woodlots on the York University campus, vegetation communities in Boynton Woodlot, wildlife migration routes and lastly a Boynton 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 Boynton 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 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 and active shoreline or river valley, with the exception of the west side of the campus where Black Creek has formed a considerable valley. 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 Boynton woodlot is located; is on a Tableland feature or a site that is on a more or less level plain that is not associated with any marked topographic feature. The elevation stays constant at approximately 200 m above sea level within and in the surrounding area around the woodlot. There is a slight decrease in elevation towards the southeast that is not apparent in the field, but the watercourse and drainage ditch flow towards the Pond Road (**Figure 2**). There is a berm running east to west on the southern edge of the woodlot along Pond Road. There is an artificial slope running eastwards/downslope from York University Busway towards the woodlot.

3.1.3 Soil Characteristics

Boynton woodlot and adjacent habitat is located on tableland topography with mineral soils. One soil core was taken at each of the ELC vegetation communities. The location of each soil core is delineated in **Figure 3.**

Soil Core 1 (FOD9-1)
The A horizon silt loam goes down to a depth of 25 cm followed by a silty clay loam layer to a depth of 120 cm. Mottles were identified at 75 cm. The soil moisture regime was identified as very fresh (3). The pore pattern of the effective texture (silty clay loam) is retentive (5) with an imperfect (5) soil drainage.

Soil Core 2 (SWD3-3)
The A horizon silt loam goes down to a depth of 35 cm followed by a silty clay loam layer to a depth of 120 cm. Mottles were identified at 45 cm. The soil moisture regime was identified as moderately moist (4). The pore pattern of the effective texture (silty clay loam) is retentive (5) with an imperfect (5) soil drainage.

Soil Core 3 (CUM1-1)
The A horizon loam goes down to a depth of 30 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). The pore pattern of the effective texture (clay loam) is retentive (5) with an imperfect (5) soil drainage.

Soil Core 4 (Hedgerow)
The A horizon loam goes down to a depth of 40 cm followed by a clay loam layer to a depth of 120 cm. Mottles were identified at 70 cm. The soil moisture regime was identified as very fresh (3). The pore pattern of the effective texture (clay loam) is retentive (5) with an imperfect (5) soil drainage.

The depth to mottles confirms the presence of a seasonal water table. Deeper silt A horizons were observed in some locations that are subject to seasonal pooling. The soil texture, pore pattern, drainage class, depth to mottles and soil moisture regime are indicative that tree and shrub species adapted to some seasonal moisture should be planted rather than dry upland species.

The older tree species within the FOD9-1 and SWD3-3 vegetation communities are indicative that the soil moisture used to be moister in the past. Changes in the flow of the watercourse and placing the watercourse underground have changed the ground water depth in the Boynton Woodland and adjacent natural areas.

3.1.4 Hydrology

According to Dougan & Associates (2001), the Boynton Woodlot is located on an intermittent creek channel that historically drained to the West Don River. The downstream channel connection to the West Don was eliminated over the past thirty years as the surrounding area was developed. The westerly tributary was eliminated during the development of the campus. Regular runoff which previously entered this tributary is now intercepted by underground services, which flow into the Black Creek system. Similarly, the easterly tributary was severed by construction of York Boulevard, and regular runoff from the area north of York Blvd. is presently intercepted by storm sewers draining into Black Creek. Local drainage within the woodlot is currently intercepted by three catch basins draining to the Black Creek system via a 250 mm diameter storm sewer (**Figure 3**).

Based on changes in elevation; surface waters flow south from York Boulevard and east from York University Busway towards the Pond Road (**Figure 3**). The landscape to the west is composed of impervious features to water drainage, specifically buildings, parking lots and roads that are located at a higher elevation than the woodlot. There are naturalized features south and north of the woodlot that are composed of pervious soils. The surface water from snowmelt and precipitation flows off of these anthropogenic features into underground services or into the naturalized areas within the Boynton Woodlot, or north and south of the woodlot.

There are three seasonally wet areas. On is located in the north central portion of the woodlot and the other two are located in the southern portion of the woodlot. Water input is likely from snowmelt and precipitation, and water loss is likely due to evaporation which is slowed by the dense canopy cover over the seasonally wet areas. Other conditions that result in ponding include: local groundwater flow and the presence of clay loam soils that impede infiltration.

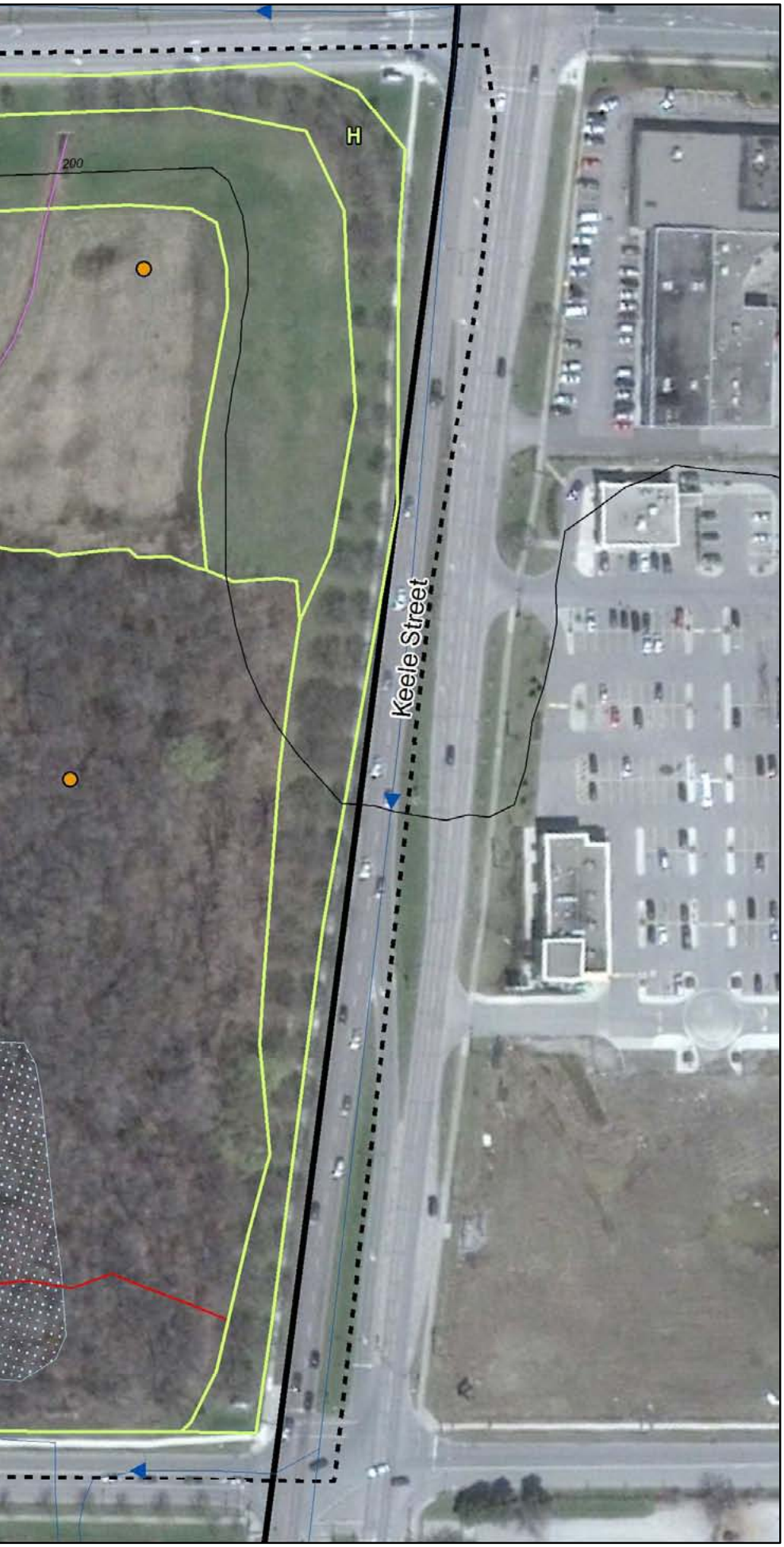
3.2 Vegetation and Vegetation Communities

3.2.1 Vegetation Communities

A total of three ELC vegetation community types were identified by LGL within the study limits (**Figure 3**). These communities include: deciduous forest type (FOD9-1), deciduous swamp type (SWD3-3), and cultural meadow type (CUM1-1). There are a number of hedgerows that connect the Boynton Woodlot to other surrounding natural areas. Human development has resulted in a fragmented natural landscape. The vegetation communities are considered widespread and common in Ontario and secure globally (NHIC 1997).

FOD9-1 is considered L3 or of regional concern in the TRCA watershed. This vegetation community is restricted in occurrence and requires specific site conditions that are rare in the City of Toronto. These communities are described in **Table 1**and delineated in **Figure 3**.


York Boulevard
H
South H
CUM1-1
FOD9-1
SWD3-3
CUM1-1
York University Busway
200
The Pond Road
bing



LEGEND

- York University Property Line
- Study Area
- Watercourse
- Drainage Ditch
- Existing Overland Drainage Routes
- Existing Catch Basin
- Seasonally Wet Area
- Soil Core Location
- Topographic Lines
- Trail
- Vegetation Community Boundary

Vegetation Community Boundary

- CUM1-1 Dry-Moist Old Field Meadow Type
- FOD9-1 Fresh-Moist Oak-Sugar Maple Deciduous Forest Type
- SWD3-3 Swamp Maple Mineral Deciduous Swamp Type
- 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.

25 12.5 0 25 Metres

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VEGETATION COMMUNITIES IN BOYNTON WOODLOT

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Project: TA8152	**Figure:** 3
Date: March 2013	**Prepared By:** KDR
Scale: 1 : 1500	**Checked By:** DEB

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		
FOD9-1	Fresh-Moist Oak-Sugar Maple Deciduous Forest	**Canopy:** Sugar maple (*Acer saccharum* ssp. *saccharum*), bur oak (*Quercus macrocarpa*), and swamp maple (*Acer* X *freemanii*), are abundant with occasional red ash (*Fraxinus pennsylvanica*), and basswood (*Tilia americana*). **Subcanopy:** Common buckthorn (*Rhamnus cathartica*), Manitoba maple (*Acer negundo*), sugar maple, basswood, and red ash are abundant. **Understorey:** Common buckthorn is dominant with abundant red ash, chokecherry (*Prunus virginiana* var. *virginiana*), and riverbank grape (*Vitis riparia*). **Ground Cover:** Yellow enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), yellow avens (*Geum aleppicum*), may-apple (*Podophyllum peltatum*), and western poison-ivy (*Toxicodendron rydbergii*) are abundant.	• Tree cover > 60% (FO). • Deciduous trees > 75% of canopy cover (D). • Sugar Maple, Bur Oak and Swamp Maple are dominant (9-1). • Sand, loam and clay soils that are well to poorly drained, in lower slope and bottomland positions (Fresh-Moist).
Wetland			
SWD	DECIDUOUS SWAMP		
SWD3-3	Swamp Maple Mineral Deciduous Swamp	**Canopy:** Swamp maple is dominant with occasional sugar maple, bur oak, red ash, and bitternut hickory (*Carya cordiformis*). **Subcanopy:** Swamp maple is dominant with abundant common buckthorn, American basswood, and red ash. **Understorey:** Swamp maple is dominant with abundant common buckthorn, red currant (*Ribes rubrum*), red ash, and riverbank grape. **Ground Cover:** Yellow enchanter's nightshade, yellow avens, may-apple, and western poison-ivy are abundant.	• Tree or shrub cover > 25% (SW). • Deciduous trees > 75% of canopy cover (D). • Swamp Maple is dominant (3-3).

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

ELC Code	Vegetation Type	Species Association	Comments
Terrestrial/Cultural			
CUM	CULTURAL MEADOW		
CUM1-1	Dry-Moist Old Field Meadow	**Ground Cover:** Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*) is dominant with abundant tall white aster (*Aster lanceolatus* ssp. *Lanceolatus*), red-top (*Agrostis gigantea*), and Canada thistle (*Cirsium arvense*).	• Cultural communities (CU) • Tree cover and shrub cover < 25% (M) • This community can occur on a wide range of soil moisture regimes (Dry-Moist). • Pioneer community resulting from, or maintained by, anthropogenic-based influences.
H	NORTHERN HEDGEROW		
Hedgerow		**Canopy:** Bur oak is dominant with occasional American elm (*Ulmus americana*) and red ash. **Understorey:** Common buckthorn is dominant with abundant Red-osier dogwood (*Cornus sericea* ssp. *sericea*), American elm, and riverbank grape. **Ground Cover:** Garlic mustard (*Alliaria petiolata*), is dominant with abundant common buckthorn seedlings, yellow avens, and Canada goldenrod (*Solidago canadensis*).	• Cultural community • Tree cover >60%. • Bur Oak is dominant. • Mineral soil.

Boynton Woodlot – Fresh-Moist Oak-Sugar Maple Deciduous Forest and Swamp Maple Mineral Deciduous Swamp

Boynton woodlot is located on the east side of York University campus north of The Pond Road and is approximately 5.13 ha in size. The Boynton Woodlot is comprised primarily of a Silver Maple Deciduous Swamp with a small portion of Oak- Sugar Maple 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 high while plant diversity in the understorey and ground layers is low because common buckthorn is out-competing the native vegetation. In addition, a number of large cavity nesting trees are present throughout the woodlot.

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.

West and North Meadows
The vegetation present with the cultural meadow was primarily grasses and adventive species, such as Canada thistle (*Cirsium arvense*). The western section of the cultural meadow appears to be a little bit more diverse and less disturbed than the northern section. There is a culvert that flows into a ditch within the northern meadow. The vegetation within the ditch is dominated by narrow-leaved cattail (*Typha angustifolia*) and other hydrophytic macrophytes.

North and East Hedgerows
The northern hedgerow is dominated by bur oak and appears to be a continuation of the FOD9-1 vegetation community this is located on the west side of the SWD3-3 vegetation community. The eastern hedgerow is composed of rows of planted trees that are landscaped regularly.

Road and Median
In between the Boynton and Danby woodlot runs York Boulevard, this is a four lane road with a raised centre median. The width of each lane is approximately four metres. The median ranged in size from one to 8 metres. Clumps of switch grass (*Panicum virgatum*) were planted within the median. The centre median provides little cover for mammals attempting to cross York Boulevard during the night time.

3.2.2 Flora

To date, a total of 114 vascular plant taxa have been recorded within the study area (**Figure 3**). Forty seven taxa, or 41 percent of the recorded flora, are considered introduced and non-native to Ontario. Introduced species were almost entirely located within the cultural meadow communities. A working vascular plant checklist is presented in **Appendix A**

Significant Plant Species
One plant species, dense blazing star (*Liatris spicata*), is listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the Committee on the Status of Species at Risk in Ontario (COSSARO)/MNR and it has a provincial rank of S3 (vulnerable). This species, which is believed to have been planted, was recorded within the cultural meadow community.

In addition, the study area contains 13 plant species that are considered rare to uncommon in Toronto and two of these species are designated L1 to L3 in the TRCA watershed. The SWD3-3 contains a relatively high number of regionally significant plant species at 8. The plants are a mixture of upland, facultative, facultative wetland and obligate swamp/forest species. The ninebark and white spruce individuals appear to be planted, diminishing their significance. The FOD9-1 vegetation community contains relatively few regionally significant plant species at four. The plants are a mixture of upland, facultative upland and obligate forest/meadow species. The CUM-1 and the Hedgerow contain few regionally significant plant species at four and three respectively. **Table 2** provides a summary of regionally rare and TRCA species of concern that were identified within the Boynton Woodlot and adjacent habitat.

TABLE 2.
SUMMARY OF REGIONALLY RARE PLANT SPECIES

Scientific Name	Common Name	Status				ELC Vegetation Community			
		MNR	COSEWIC	TRCA	Toronto	SWD3-3	FOD9-1	CUM1-1	Hedgerow
Amelanchier laevis	smooth juneberry	+5			U		X		
Carex bebbii	Bebb's sedge	-5			U	X	X		X
Carex rosea	stellate sedge	+5			U	X			
Carex tenera	straw sedge	-1			R3	X			
Cornus amomum	silky dogwood	-4			R2	X			X
Juncus dudleyi	Dudley's rush	0			U			X	
Liatris spicata	spiked blazing star	0 THR	THR	L1	R1			X	
Oenothera biennis	common evening-primrose	+3			U			X	
Physalis heterophylla	clammy ground-cherry	+5			R6		X	X	
Physocarpus opulifolius	ninebark	-2		L3	R6	X			
Picea glauca	white spruce	+3		L3		X			
Rosa blanda	smooth rose	+3			U		X		
Solidago gigantea	giant goldenrod	-3			U	X			
Toxicodendron radicans ssp. *Negundo*	poison-ivy	0			R5	X			X

3.2.2.1 Floristic Quality Assessment

The SWD3-3 vegetation community has a moderate floristic quality index value at 21.27, indicating that this vegetation community has moderate significance and many specialized forest and wetland plants (**Table 3**). The FOD9-1 vegetation community has a low to moderate floristic quality index value at 18.56. The difference between the two wooded vegetation communities is that the SWD3-3 is older with a more established canopy, subcanopy, understorey and ground cover that have prevented the establishment of many invasive plant species. On the other hand the FOD9-1 is younger and the edges are composed of a greater proportion of earlier successional woodland edge species, including invasives. The hedgerow and meadow have low floristic quality index (FQI) values at 8.55 and 9.99 respectively. This indicates that these vegetation communities have low significance in terms of their native floristic composition.

Species richness in the SWD3-3 vegetation community is 62. Twenty-six percent of the plant species are exotic with a moderate sum of weediness value of -31. Species richness in the FOD9-1 vegetation community is 41. Twenty-four percent of the plant species are exotic with a moderate sum of weediness value at -24. The plant composition in both the SWD3-3 and FOD9-1 vegetation communities need some work to remove and control the abundant invasives in the understorey and ground cover and to restore a more natural plant composition.

Species richness in the CUM1-1 is 60. Fifty-five percent of the plant species are exotic with a high sum of weediness of -52. The invasive plant species within the CUM1-1 are a result of past agricultural practices, such as tilling, seeding cool season hay grasses and the spread of manure. All of these agricultural practices gave the exotic Eurasian plant species a competitive advantage over the native meadow and prairie plant species that were present in the past within the seedbank.

TABLE 3.
FLORISTIC QUALITY ASSESSMENT

Vegetation Communities	Hedgerow	FOD9-1	SWD3-3	CUM1-1
Number of Native Plants	14	31	46	27
Number of Exotic Plants	4	10	16	33
Species Richness	18	41	62	60
Percent Exotic	22.22	24.39	25.81	55.00
Sum of Weediness	-9	-24	-31	-52
Mean Coefficient of Conservatism	2.29	3.33	3.14	1.92
Floristic Quality Index (FQI)	8.55	18.56	21.27	9.99
Mean Coefficient of Wetness	-0.47	1.55	0.95	1.72
# of Provincially Rare Species	0	0	0	1
# of Regionally Rare or Uncommon Species	3	4	8	4

Species richness in the hedgerow is low at 18. Twenty-two percent of the plant species are exotic with a low sum of weediness at -9. The hedgerow is dominated by native trees with an understorey dominated primarily by invasive shrubs and a ground cover composed of a mixture of native and exotic plant species. The high amount of invasive and exotic species within the four vegetation communities are indicative of the surrounding past agricultural land use and the current neighbouring institutional land use of the fragmented woodlot. Findings of the Floristic Quality Assessment are further described in **Table 3**.

3.2.2.2 Past Disturbance Regimes

The following past disturbance regimes were observed:

- Signs of past agricultural use, such as tilling, haying, ridges and furrows, compaction, and mowing in the CUM1-1 and around the western edge of the FOD9-1 vegetation community;
- Abundant alien species with broad distributions are affecting the native plant composition, structure and function of the forest, swamp, meadow and hedgerow;
- There are two faint pedestrian/mammal trails throughout the woodland and one through the hedgerow (**Figure 3**). Recreational users burn deadfall in fire pits, bring picnic tables into the woods, dump rubbish, and introduce invasive plant species.
- Noise is widespread from the adjacent roadways;
- Herbaceous plantings in the cultural meadow community, and woody plantings in the northeast corner of the SWD3-3 vegetation community adjacent to Keele Street;
- Disease and death of trees has opened up the canopy cover and in this case the predominant infestations were Emerald Ash Borer and Dutch elm disease. Emerald Ash Borer is prevalent throughout the edges of the woodlot with the decline of the red and white ash trees. In addition, numerous elm trees throughout the woodlot demonstrate signs of poor health or have deceased from Dutch Elm Disease;

- Disease and death of trees has slightly opened up the canopy cover; 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). Signs of Gypsy Moth were observed by one of the LGL botanists in 2005, while surveying the Boynton Woodlot for the TRCA.

3.3 Wildlife and Wildlife Habitat

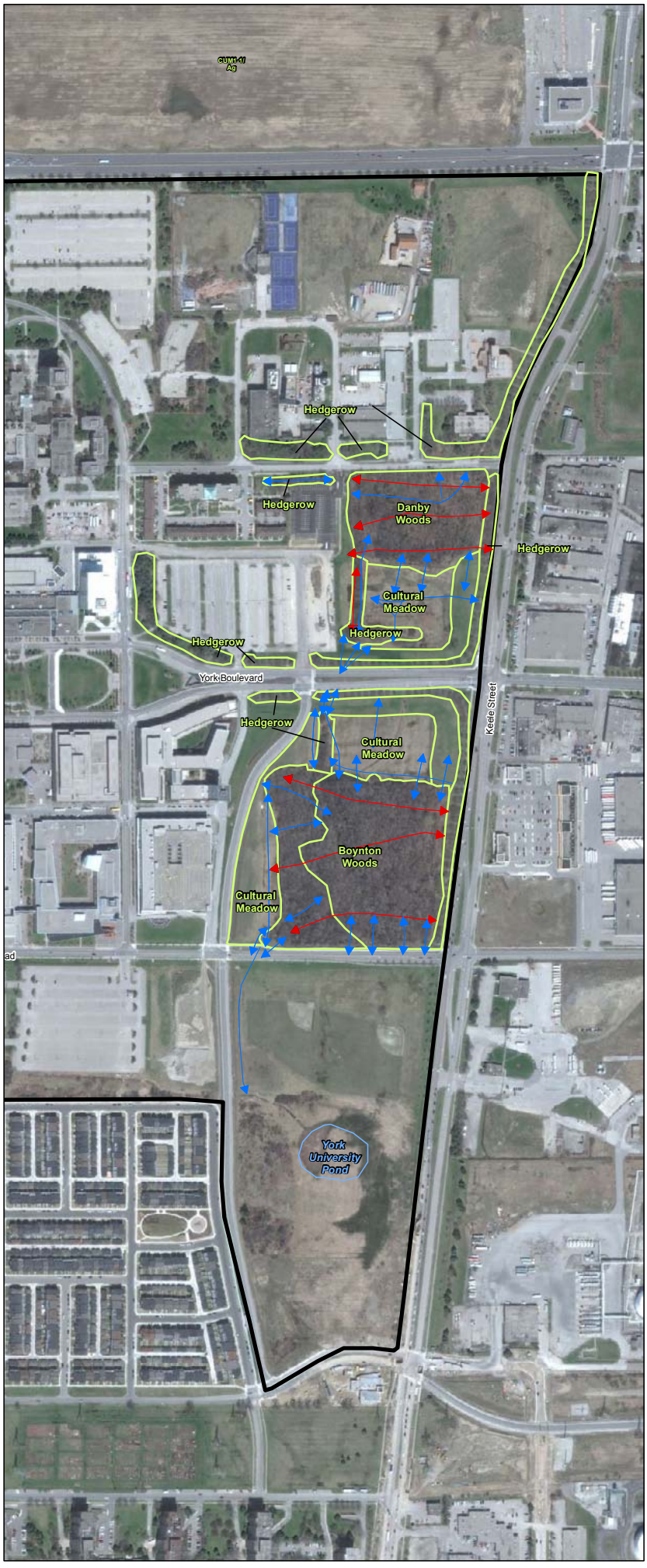
The Boynton Woodlot has connection to other natural heritage features to the north and south within the York University Keele Campus. The Boynton Woodlot is highly disturbed due to the proximity of roads on all four sides of the woodlot, buildings to the west and east, and the frequent pedestrian traffic on lands adjacent to the woodlot. In urban settings, such as the Boynton 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 Boynton Woodlot risk being struck by vehicles and have an increased chance of being predated (**Figure 4**).

3.3.1 Fauna in the Boynton Woods and Adjacent Meadows

Twenty-four species of wildlife (20 birds and 4 mammals) were recorded within the Boynton Woodlot (**Table 4**). No herpetofauna were observed. Although ephemeral pools were observed within the woodlot in the spring season, they were present for only a short period of time and did not provide sustainable habitat for amphibians to use for breeding. Two days of constant searching (checking pools, flipping ground debris, listening for calls) did not reveal any amphibian or reptile species in the woodlot. The meadow habitats on the north and south sides of the woodlot could support snake species; however, none were observed.

The majority of the wildlife observed in the woodlot was birds, primarily migratory birds, observed in both spring and late summer/fall seasons. Birds were surveyed as early as possible in the mornings when activity is the most abundant. 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 was officially used to determine whether the bird species recorded in the woodlot were local nesters or just passing through on migration. Migratory wood warblers, such as the Yellow-rumped Warbler (*Dendroica coronata*), Blackpoll (*Dendroica striata*), Mourning Warbler (*Oporornis philadelphia*) and American Redstart (*Setophaga ruticilla*), moved east and west through the woodlot while feeding and singing. Species such as Northern Flicker (*Colaptes auratus*), American Robin (*Turdus migratorius*) and Northern Cardinal (*Cardinalis cardinalis*) were in full song and recorded as local breeders in this woodlot. Although a pair of Turkey Vultures was observed roosting inside the south edge of this woodlot, no young were found and this species could not be confirmed as breeders based on the BSC BBA criteria. However, confirmation of breeding for this species came from a similar inventory done by LGL in (2008) when two downy young were observed in the center of the woodlot.

The woodlot appears to be an east-west bird migration corridor providing connection between two major north-south migration corridors, Black Creek to the west and a tributary of the Don River to the east. Only four species of mammals were recorded in this woodlot (**Table 4**). Based on direct observations and sign evidence (tracks, digs and trails), the woodlot appeared to be a feeding area as well as a protective migration corridor connecting the large open cultural meadow along its south side (south side of The Pond Road) to the cultural meadow and its western edged hedgerow on the north side (**Figure 4**). Numerous mammal corridors also existed going north-south in the narrow cultural meadow on the west edge of the woodlot and east-west into the west end of the woodlot (**Figure 4**).



LEGEND

- York University Property Line
- Vegetation Community Boundary
- Watercourse
- Mammal Migration Route
- Bird Migration Route

Data Source: LGL Limited Field Surveys.

100 50 0 100 Metres

N

BOYNTON WOODLOT WILDLIFE MIGRATION ROUTES

LGL LIMITED
environmental research associates

Project:	TA8152	**Figure:**	4
Date:	November 2012	**Prepared By:**	KDR
Scale:	1 : 7000	**Checked By:**	DEB

TABLE 4
WILDLIFE LIST

Scientific Name	Common Name	Boynton Woods	CUM1-1 (north of Boynton)	CUM1-1 (south of Boynton)	COSEWIC	(COSSARO) OMNR	LOCAL (BSC/TRCA)	LEGAL STATUS (SARA Sched.1-3); FWCA (F),(G),(P); MBCA)	Breeding Status
Birds									
Branta canadensis	Canada Goose			X			(- / L5)	MBCA	Y
Cathartes aura	Turkey Vulture	X					(- / L4)	FWCA(P)	?
Buteo jamaicensis	Red-tailed Hawk			X			(- / L5)	FWCA(P)	N
Falco sparverius	American Kestrel			X			(L2 / L4)	FWCA(P)	Y
Charadrius vociferus	Killdeer			X			(- / L5)	MBCA	?
Zenaida macroura	Mourning Dove			X			(- / L5)	MBCA	Y
Colaptes auratus	Northern Flicker	X					(- /L4)	MBCA	Y
Contopus virens	Eastern Wood Pewee	X					(- / L4)	MBCA	?
Vireo gilvus	Warbling Vireo			X			(- / L5)	MBCA	?
Vireo olivaceus	Red-eyed Vireo	X					(- / L4)	MBCA	Y
Cyanocitta cristata	Blue Jay	X					(- / L5)	FWCA(P)	?
Poecile atricapillus	Black-capped Chickadee	X					(L4 / L5)	MBCA	Y
Hylocichla mustelina	Wood Thrush	X					(- / L3)	MBCA	N
Turdus migratorius	American Robin	X	X				(- / L5)	MBCA	Y
Dumetella carolinensis	Gray Catbird		X				(- / L4)	MBCA	Y
Toxostoma rufum	Brown Thrasher			X			(L1 / L3)	MBCA	Y
Sturnus vulgaris	European Starling	X	X	X			(- / L+)		Y
Bombycilla cedrorum	Cedar Waxwing	X					(- / L5)	MBCA	?
Dendroica petechia	Yellow Warbler			X			(- / L5)	MBCA	?
Dendroica coronata	Yellow-rumped Warbler	X					(L4 / L3)	MBCA	N
Dendroica striata	Blackpoll Warbler	X					(- / ?)	MBCA	N
Mniotilta varia	Black and White Warbler	X					(L3 / L2)	MBCA	N
Setophaga ruticilla	American Redstart	X					(L2 / L3)	MBCA	N
Oporornis philadelphia	Mourning Warbler	X					(L2 / L3)	MBCA	N
Geothlypis trichas	Common Yellowthroat	X		X			(- / L4)	MBCA	Y
Spizella passerina	Chipping Sparrow			X			(- / L5)	MBCA	Y

TABLE 4
WILDLIFE LIST

Scientific Name	Common Name	Boynton Woods	CUM1-1 (north of Boynton)	CUM1-1 (south of Boynton)	COSEWIC	(COSSARO) OMNR	LOCAL (BSC/TRCA)	LEGAL STATUS (SARA Sched.1-3); FWCA (F),(G),(P); MBCA)	Breeding Status
Melospiza melodia	Song Sparrow		X	X			(- / L5)	MBCA	Y
Passerculus sandwichensis	Savannah Sparrow		X	X			(L1 / L4)	MBCA	Y
Cardinalis cardinalis	Northern Cardinal	X					(- / L5)	MBCA	Y
Agelaius phoeniceus	Red-winged Blackbird			X			(- / L5)		Y
Icterus galbula	Baltimore Oriole	X					(- / L5)	MBCA	Y
Carduelis tristis	American Goldfinch	X	X	X			(L3 / L5)	MBCA	Y
Passer domesticus	House Sparrow	X	X				(- / -)		N
Mammals									
Sylvilagus floridanus	Eastern Cottontail	X	X	X			(- / L4)	FWCA(G)	
Sciurus carolinensis	Gray Squirrel	X		X			(- / L5)	FWCA(G)	
Marmota monax	Woodchuck		X				(- / L4)		
Mephitis mephitis	Striped Skunk	X	X	X			(- / L5)	FWCA(F)	
Procyon lotor	Raccoon	X	X	X			(- / L5)	FWCA(F)	

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.

Species at Risk

None of the wildlife species recorded within the study area are considered of any federal, provincial or regional significance according to the NHIC or the MNR databases of species considered endangered, threatened or of special concern. However, 16 of the 20 species of birds recorded are protected under the *Migratory Birds Convention Act* (MBCA) and two species are protected under the *Fish and Wildlife Conservation Act* (FWCA). Six of the bird species are also designated as a priority species of conservation concern by BSC for the Metro Toronto Region. The FWCA also protects four of the five species of mammals recorded (**Table 4**).

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 Boynton 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 Boynton Woodlot.

3.3.2 Fauna in the Hedgerow

The wildlife recorded using the hedgerows within and adjacent to the northern meadow are a combination of cultural meadow, cultural thicket and periodically forest species. The more common bird thicket species recorded, such as Brown Thrasher (*Toxostoma rufum*), Gray Catbird (*Dumetella carolinensis*) and Yellow Warbler (*Dendroica petechia*); use the bushes as nesting sites and /or foraging areas. This hedgerow links with the hedgerow on the north side of York Boulevard to connect bird movements between the two woodlots, Boynton and Danby.

Mammals, such as the Eastern cottontail (*Sylvilagus floridanus*) and raccoon (*Procyon lotor*), use these hedgerows as travel corridors since they provide protection during their movements from predators, light and sound. The trees found amongst the hedgerow are also daytime denning spots for raccoons and the bushes provide daytime retreats for the Eastern cottontail. The hedgerow along the western edge of the northern meadow is the most heavily used and is a direct link to the hedgerow on the north side of York Boulevard which leads directly to the Danby Woodlot. Three major mammal trails, entering the north corner of the hedgerow just south of York Boulevard and connected to the south corner of the hedgerow on the north side of York Boulevard, form a major mammal corridor (**Figure 4**). This corridor continues southward along the west side of Boynton Woodlot until it crosses The Pond Road at its southwest corner to continue into the west end of the cultural meadow and the ditch where it connects to the cultural thicket further south.

Species at Risk

None of the wildlife species recorded within the area of the hedgerow are considered of any federal, provincial or regional significance according to the NHIC or the MNR databases of species considered endangered, threatened or of special concern.

3.4 East Campus Precinct Proposed Development Plans

According to the York University Secondary Plan (2009) the Boynton Woodlot and the adjacent natural heritage features are part of the East Campus Precinct. York University plans to develop the two Cultural Meadow vegetation communities on either side of York Boulevard just west of Keele Street. These Cultural Meadows are high profile development sites, since York Boulevard is the most important gateway entrance to the campus. At the same time York University recognizes the important natural

heritage features and functions of the Boynton and Danby Woodlots that should be protected, restored and enhanced.

3.5 Constraints and Impact Analysis

Efforts should be taken to minimize impacts to the Boynton Woodlot mid-aged to mature forest and swamp; and associated hedgerows 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.

3.5.1 Meadow Development

Proposed development envelopes, should be placed as far to the east as possible in the northern meadow. A minimum ten metre buffer should be placed around the FOD9-1 and SWD3-3 vegetation community. Hedgerows should be maintained and enhanced where possible. Connectivity between the Boynton and Danby Woodlots must be maintained for development to occur within any of the proposed locations. The hedgerows should be enhanced through the planting of trees and shrubs along the edges to increase the widths of the corridors. Dominant native plant species from the FOD9-1 deciduous forest should be used for the plantings. This should enhance the function for dispersal of wildlife and forest plants. Further native plantings within the road median would also enhance the connectivity.

3.6 Ecosystem Services

Conservation, restoration and management of the Boynton Woodlot should 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 Boynton Woodlot should 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 Boynton Woodlot Restoration

Some guiding principles have been followed to improve the Boynton 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. Restore the historical range of soil moisture regimes and ground water levels where possible. Hydrological restoration should be based upon current anthropogenic disturbances, financial concerns, development pressures, and flood and erosion control contingency planning.
3. 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.

4. 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 Boynton Woodlot:

1. **Invasive species** - have spread as result of anthropogenic influences, haying, exotic plant and animal introductions;
2. **Changes in hydrology –** from watercourse filling, straightening, tilling, culverts and underground piping. Past channel modifications have severed the historical watercourse connection and meander patterns and enclosed the water flow in the urban storm water system below the Boynton Woodlot;
3. **Fragmentation** - from surrounding natural areas; and,
4. **Anthropogenic influences** – Current land use practices within and adjacent to the Boynton 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 Boynton 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, autumn olive, Russian olive, white mulberry, sweet cherry and Tartarian honeysuckle;
2. **Herbaceous Invasive Species Control** - Herbicide application to remove invasive plant species that outcompete native plants, including common buckthorn, garlic mustard, dog strangling vine (*Cynanchum rossicum*), autumn olive and Russian olive;
3. **Hydrologic Restoration** - involves restoring historical watercourse modifications between Boynton and Danby woodlots; and,
4. **Fragmentation** – creating a 50 m wide corridor between Boynton and Danby Woodlots should help reduce the Boynton Woodlot genetic isolation and provide a better connection to other natural areas.

4.2.1 Woody Plant Control

Removing common buckthorn cover is recommended to open the understorey and ground cover for native plants in the Boynton Woodlot. **Figure 5** delineates where common buckthorn should be removed from within the Boynton Woodlot and the northern hedgerow and **Appendix C** describes the recommended 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 should 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 autumn olive (*Elaeagnus umbellata*), Russian olive (*Elaeagnus angustifolia*), sweet cherry (*Prunus avium*), Tartarian honeysuckle (*Lonicera tatarica*) and white mulberry (*Morus alba*). 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 and if required, what portions of the trees should be removed to reduce the hazard. 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 that are within 15 metres of the woodlot edge should be cut down, 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. Signs of Gypsy Moth were observed in the Boynton Woodlot in 2005, while surveying the site for the Toronto Region Conservation Authority. 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.

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 are two species of ash present within the Boynton Woodlot, including red ash (*Fraxinus pennsylvanica*) and white ash (*Fraxinus americana*) present within the FOD9-1, CUM1-1 and SWD3-3 vegetation communities.

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 should 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 is one species of elm present within the Boynton Woodlot: white elm (*Ulmus americana*). White elm is situated within the FOD9-1, SWD3-3 and hedgerow vegetation communities.

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):

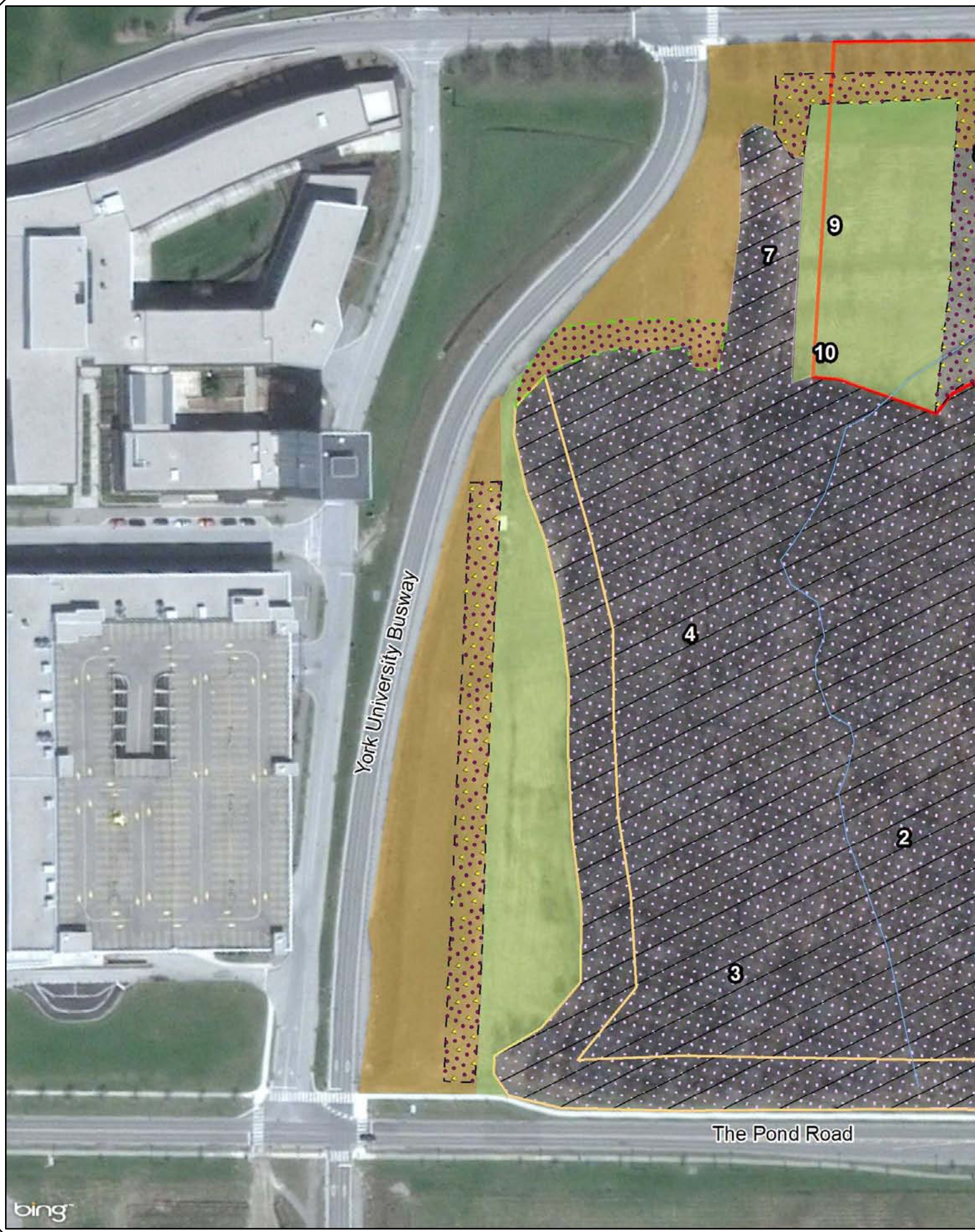
> "Control of Dutch Elm Disease depends mainly on denying elm bark beetles places to breed. Quick removal and disposal of seriously infected and dead trees reduces the spread of the disease to other healthy trees. The recommended method of disposal is burial or burning. Tree care specialists should debark, 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 Boynton Woodlot study area, including **maple (*Acer)*:** Manitoba maple (*Acer negundo*), sugar maple (*A. saccharum*), Norway maple (*Acer platanoides*), and Freeman's maple (*A.X freemanii*); **poplar (*Populus):*** trembling aspen (*P. tremuloides*); **willow (*Salix):*** Missouri willow (*Salix eriocephala*); and, **elm (*Ulmus):*** white elm (*Ulmus americana*) (Canadian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LEGEND

- Drainage Ditch
- Common Buckthorn (Chainsaw, Brush-cutting and Garlon herbicide application) Removal
- Garlic Mustard (Hand Removal & Roundup herbicide application
- Proposed 50m Corridor
- Tree (6m spacing) & Shrub (3m spacing) Planting Area
- Low Shrub (3m spacing) Planting Area
- Tree Planting
- Shrub Planting
- Ash and Elm Hazard Tree Removal (15m) Zone
- Proposed Monitoring Location
- Future Meadow Area
- No Mow Zone or Limited Mow Zone

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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BOYNTON WOODLOT RESTORATION SITE PLAN

LGL LIMITED
environmental research associates

Project:	TA8152	**Figure:**	5
Date:	March 2013	**Prepared By:**	KDR
Scale:	1 : 1500	**Checked By:**	DEB

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 Boynton Woodlot study area, including **oak (*Quercus*):** bur oak (*Quercus macrocarpa*), which is the Gypsy Moth's main host genus. Other host species in the Boynton Woodlot study area include: **maple (*Acer*):** Manitoba maple (*Acer negundo*), sugar maple (*A. saccharum*), Norway maple (*Acer platanoides*), and Freeman's maple (*A.X freemanii*); **hawthorn (*Crataegus*):** large-fruited thorn (*Crataegus punctata*); **beech (*Fagus*):** American beech (*Fagus grandifolia*); **apple (*Malus*):** common apple (*Malus pumila*) and Siberian crabapple (*M. baccata*); **poplar (*Populus*):** trembling aspen (*P. tremuloides*); **willow (*Salix*):** Missouri willow (*Salix eriocephala*) **cherry (*Prunus*):** sweet cherry (*Prunus avium*) and choke cherry (*P. virginiana*); **basswood (*Tilia*):** American basswood (*Tilia americana*) 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: common buckthorn, garlic mustard, dog strangling vine (*Cynanchum rossicum*), red currant, autumn olive, dame's rocket (*Hesperis matronalis*), Tartarian honeysuckle, sweet cherry, Norway maple and white mulberry. **Figure 5** delineates where garlic mustard should be removed either through hand pulling and/or RoundUp herbicide application within the Boynton Woodlot, the Hedgerow and Meadow.

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 dog strangling vine. 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 Boynton Woodlot as a result of agricultural tilling, grazing, roads and trails, cultivated plant dispersal, exotic plant and animal introduction and seeding of hay fields. The dominance of aggressive non-native plants should be controlled and reduced. **Table 5** describes the abundance and distribution of the priority invasive plant species within and immediately adjacent to the Boynton 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 Boynton Woodlot		
Common Name	**Scientific Name**	**Abundance and Distribution**
Common Buckthorn	*Rhamnus cathartica*	Abundant in the understory and dominant in the ground layer of the FOD9-1, SWD3-3, and in the hedgerow.
Dog Strangling Vine	*Cynanchum rossicum*	Rare in the ground layer of the FOD9-1, SWD3-3 and hedgerow. Located within the outer limits of the vegetation communities.
Garlic Mustard	*Alliaria petiolata*	Occasional in the ground layer in the FOD9-1, SWD3-3 and cultural meadow.

4.2.4 Hydrologic Restoration

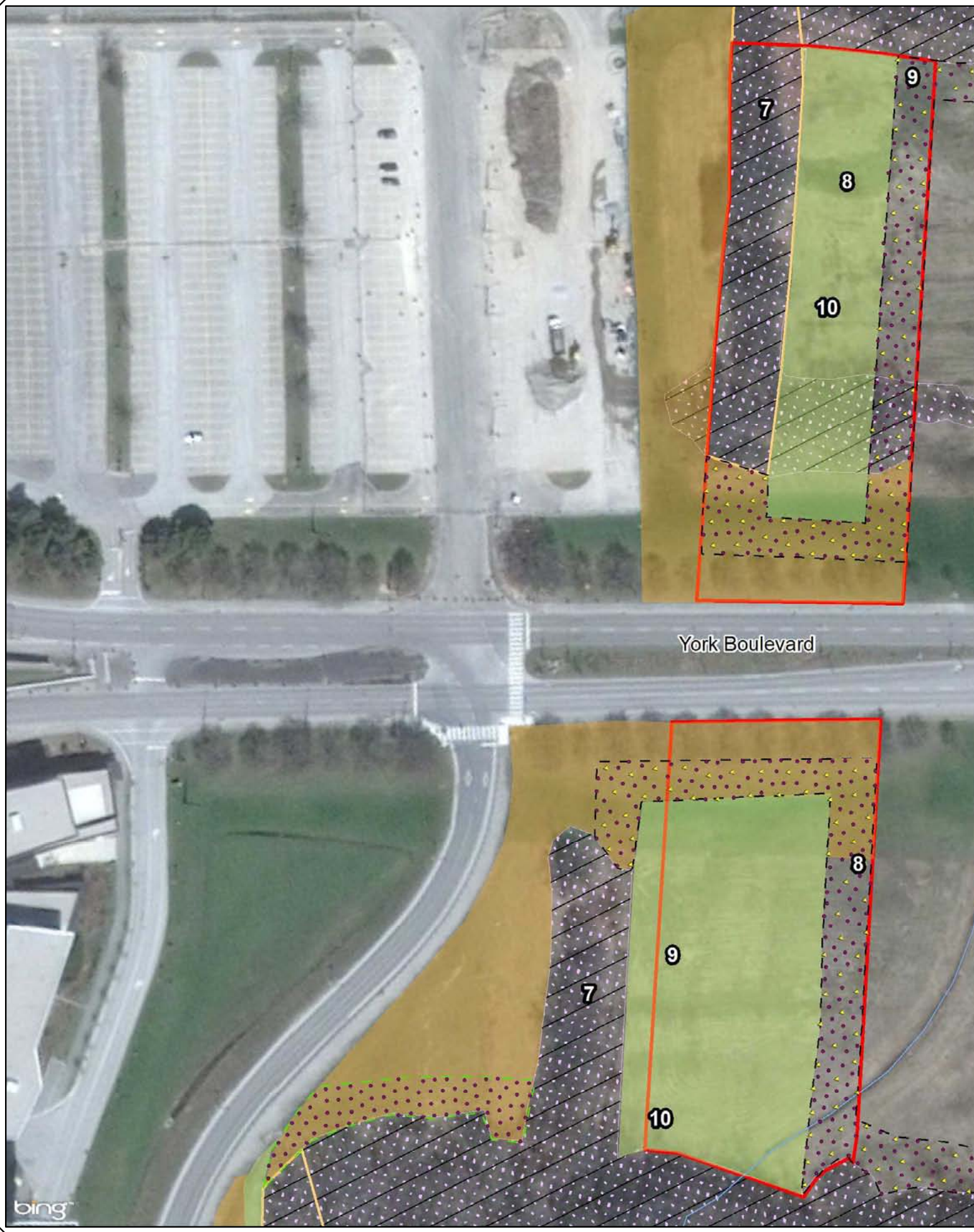
Past channel modifications have severed the historical watercourse connection and meander patterns between Boynton and Danby Woodlots and enclosed the water flow in the urban storm water system below the Boynton Woodlot. This will be a difficult ecological stressor to mitigate. Ideally, restoring the natural meanders and re-connecting the watercourse that was previously cut off would help to restore water retention in soils that were historically wetlands and lower the soil moisture in historically drier habitat. In order to restore a healthy stream, the watershed and the stream should to be looked at. Stream restoration requires coordination across ownership boundaries.

In order to accommodate future development plans within the northern meadow, the drainage swale that runs from the Boynton Woodlot into the northern meadow should be re-aligned to the west so that it runs through the new 50 m wide corridor. This course of action would involve moving the existing culvert that is located under York Boulevard west to the hedgerow. Currently the water is piped underground below the Danby Woodlot. This pipe would have to be re-aligned to the west to connect up with new Boynton Woodlot drainage swale alignment.

Ideally, the new alignment through the Danby Woodlot should be brought above ground to provide more natural water flow to the forest. This new above ground watercourse should run through the new 50 m wide corridor into the Danby Woodlot. Deciding how the infrastructure will be changed will require further discussion. There is significant infrastructure and flooding issues that needs to be looked at prior to deciding upon the appropriate course of action. Re-aligning the drainage swale into the 50 m wide corridor that runs through the Danby and Boynton Woodlots and bringing the piped watercourse above ground through the Danby Woodlot will help to facilitate wildlife passage under the road. This could be carried out when the corner of York Boulevard and Keele Street are developed.

4.2.5 Fragmentation

Boynton Woodlot is fragmented from the other Natural Heritage features on the York University campus. The closest woodlot is the Danby Woodlot to the north. Boynton and Danby Woodlots are currently connected by hedgerows and cultural meadows and separated by York Boulevard. The proposed 50 m wide corridor between Boynton and Danby Woodlots would enable mammals and birds to move between the woodlots in a safer fashion. Additional tree and shrub cover surrounding the open corridors should reduce predation risks and reduce genetic isolation. **Figure 5** delineates the proposed 50 m corridor as well as the tree and shrub planting areas. The 50 m corridor is conceptually located and the location should be confirmed when development is considered in those parcels.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LEGEND

- Drainage Ditch
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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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Proposed 50 m Corridor

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environmental research associates

Project:	TA8152	**Figure:**	6
Date:	March 2013	**Prepared By:**	KDR
Scale:	1 : 1200	**Checked By:**	DEB

4.2.6 Garbage Removal

Light dumping is widespread and evident throughout the Boynton woodlot. Efforts should be made to remove the amount of garbage throughout the Boynton woodlot. Periodic monitoring and removal of trash from the woodlot should occur.

4.2.7 Trail Access

Efforts should be made to minimize anthropogenic disturbance throughout the Boynton woodlot. Only University sanctioned study of the woodlot should be allowed to discourage further anthropogenic impacts to the woodlot. A 10 m buffer should be maintained on the western and northern edges of the Boynton Woodlot and the eastern edge of the proposed corridor to discourage pedestrian access to the woodlot. The buffer should be planted with thorny native trees and plants, including hawthorns, raspberries and rose species to prevent access to the woodlot. The addition of these fruiting plant species should provide nesting habitat and food for local bird species. 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 will discourage pedestrian use of the trails.

4.3 Re-naturalization Plan

4.3.1 Edge Tree and Shrub Planting Areas

Figure 6 delineates the proposed 50 m corridor and **Figure 5** presents the Boynton tree and shrub planting areas. One is situated northeast of the current hedgerow, which is 0.29 hectares. Trees should be planted on 6 m centres while shrubs should be planted on 3 m centres. The proposed 50 m corridor is hypothetically placed and the alignment should be confirmed when the development plans are finalized. Another tree and shrub planting area should be on the western edge of the Boynton Woodlot. The size of the planting area should be 0.18 hectares. Again, trees should be planted on 6 m centres while shrubs should be planted on 3 m centres. Tree and shrub species should consist of a mixture of plants that are found within the FOD9-1, SWD3-3 vegetation communities and within the hedgerow:

Tree species will consist of:

1. Freeman's Maple (*Acer X freemanii*);
2. Sugar Maple (*Acer saccharum*);
3. Bitternut Hickory (*Carya cordiformis*);
4. American Beech (*Fagus grandifolia*);
5. Ironwood (*Ostrya virginiana*);
6. Trembling Aspen (*Populus tremuloides*);
7. Bur Oak (*Quercus macrocarpa*); and,
8. Basswood (*Tilia americana*).

Shrub species will consist of:

1. Silky Dogwood (*Cornus amomum*);
2. Red Panicled Dogwood (*Cornus racemosa*);
3. Red-osier Dogwood (*Cornus sericea*);
4. Native Hawthorn species (*Crataegus sp.*);
5. Chokecherry (*Prunus virginiana*);
6. Staghorn Sumac (*Rhus hirta*);
7. Smooth Rose (*Rosa blanda*);
8. Wild Red Raspberry (*Rubus idaeus ssp. strigosus*);
9. Downy Juneberry (*Amelanchier arborea*);
10. Smooth Juneberry (*Amelanchier laevis*); and,
11. Red-berried Elder (*Sambucus racemsoa*).

Special emphasis should be placed upon selecting native tree and shrub species that produce edible fruit for wildlife and have thorns and bristles to discourage anthropogenic disturbance of the forest edge and proposed corridor. 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.

4.3.2 Edge Shrub Planting Areas

Figure 5 delineates the proposed low shrub planting area (0.07 ha) to provide more cover for mammals moving between the Boynton Woodlot and the adjacent hedgerow (**Figure 5**). The edge shrub planting area is situated along a major animal movement corridor. Shrubs should be planted on 3 m centres.

Shrub species will consist of a mixture of woody plants that are found within the FOD9-1, SWD3-3 vegetation communities and within the hedgerow as well as other native shrubs that have thorns and bristles.

Shrub species will consist of:

1. Alternate-leaved Dogwood (*Cornus alternifolia*);
2. Red-osier Dogwood (*Cornus sericea*);
3. Silky Dogwood (Cornus amomum);
4. Red Panicled Dogwood (Cornus racemosa);
1. Native Hawthorn species (*Crataegus sp.*);
2. Chokecherry (*Prunus virginiana*);
3. Smooth Rose (*Rosa blanda*);
4. Other Native Rose species (*Rosa sp.*);
5. Staghorn Sumac (*Rhus hirta*);
6. Allegheny Blackberry (*Rubus allegheniensis*);
7. Thimbleberry (*Rubus occidentalis*);
8. Wild Red Raspberry (*Rubus idaeus ssp. strigosus*);
9. Downy Juneberry (*Amelanchier arborea*);
10. Smooth Juneberry (*Amelanchier laevis*); and,
11. Red-berried Elder (*Sambucus racemsoa*).

4.3.3 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 FOD9-1, SWD3-3 vegetation communities and within the hedgerow.

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; and,
4. Basswood.

The following shrubs should be planted in small gaps:

1. Chokecherry;
2. Silky Dogwood;
3. Red Panicled Dogwood; 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. Bitternut Hickory;
3. Freeman's Maple; and,
4. Bur Oak.

The following shrubs should be planted in large gaps and along the edges:

1. Staghorn Sumac;
2. Wild Red Raspberry;

3. Smooth Rose;
4. Downy Juneberry;
5. Smooth Juneberry;
6. Red-osier Dogwood; and,
7. 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.

4.3.4 Tree and Shrub Implementation Techniques

1. Prior to tree and shrub planting, all disturbed soils shall be stabilized with a nurse crop and native plant seed mix. If there is no soil disturbance the nurse crop and native plant seed mix should not be required.
2. Where feasible for seeded areas that shall receive further planting treatment, planting application shall be undertaken after one full growing season to allow for stabilization of the area and slopes prior to planting of trees and shrubs.
3. All trees, shrubs and seed mixes shall be native and no cultivars are acceptable.
4. Excavation and preparation of individual tree and shrub planting pits shall be undertaken according to the following general instructions:
    - **a.** Stake or flag out location of tree and shrub planting pits.
    - **b.** Ensure that plant materials do not dry out prior to installation.
    - **c.** Excavate two times the diameter of the Root Ball.
    - **d.** Remove rocks, roots, and debris from excavated material that should be used as backfill.
    - **e.** Plants are to be placed in the planting pit so that the root crown is at the same level as the surrounding grade.
    - **f.** For container stock, remove entire container without damaging the root balls.
    - **g.** Orient plants to present best appearance in relation to adjacent roadways and trails.
    - **h.** Backfill planting holes to finish grade in 150 mm lifts, tamping between lifts. Form watering saucer with excess material.
    - **i.** Do not allow air pockets when backfilling.
    - **j.** Mulch saucer area of tree planting pits with shredded or finely chipped utility mulch.
    - k. Remove tree stakes and ties one year after planting or at end of warranty period if stakes are still required.
5. Measures should be taken to ensure adequate protection and maintenance of the newly planted tree and shrub species, including mulching and watering during the establishment phase. All trees requiring staking and guying should be staked and guyed immediately following planting to ensure vertical alignment and plant stability.

4.3.5 Procurement and Sourcing Plant Materials Plan

Seed, trees and shrubs should be from seed zone 34 or from no greater than 2 adjacent seed zones (32, 33, 35 or 36). Greenhouse/nursery selection will be reviewed by York University.

4.3.6 Watering

Watering of planted trees and shrubs should either be carried out using a pump and hoses or by a watering truck. In order to use a pump and hoses a water source will be required, such as a close by fire hydrant.

Permission from the city would have to be given in order to use the fire hydrant. Otherwise a watering truck will have to be brought in.

Seedlings can be vulnerable to drought as they establish and grow. If rainfall is not regular and sufficient, the plants will benefit from watering. Watering is rarely necessary if seed is used since most seed will not germinate until there is adequate moisture; an exception would be when there is a prolonged dry period and seedlings have become established. The planting area should be monitored and plants shall be watered, as required.

Fall seeded and planted trees and shrubs, will be dormant in the fall when they are planted, but will overwinter, germinate or bud in the following spring. Dormant seedlings, trees and shrubs typically result in higher survivorship than spring planted seed, trees or shrubs, especially if they are not irrigated.

4.3.7 No Mow Zone or Limited Mow Zone

No mowing should occur within 10 m of the Boynton Woodlot or the hedgerow to the north. On the western edge the no mow zone within the meadow should be maintained to allow natural succession to occur. Mowing should be halted in the northern edge of the northern meadow. If possible mowing should cease along Keele Street to allow naturalization to occur, reduce noise and light within the woodlot and to create more cover for wildlife. A no mow zone within the 50 m wide corridor should be set up along York Boulevard to provide as continuous a natural connection between the Boynton and Danby Woodlots.

If this distance is not considered to be safe for pedestrians then the edges near the natural features should only be mown once in the late fall when all of the plants are dormant. This should keep the height of the vegetation down for visibility, while retaining a natural edge. Yearly mowing should 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.

4.4 Stewardship

4.4.1 Labs

Annual labs should be set up in the biology department to monitor the health and level of disturbance within the Boynton 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 Boynton 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. When the watercourse is re-aligned the fluvial geomorphology can also be monitored.

4.4.2 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.

4.5 Measures to Improve Wildlife Habitat

Because of the maturity and uniformity of the woodlot, there is low faunal species diversity. To increase the habitat variety and species numbers, a thinning of the common buckthorn is recommended to create more plant diversity in the understory and ground cover than is present now. As American elm and red ash die this will open up the canopy and allow for new ground growth and bring in species that feed on ground vegetation. Open areas should be planted with native shade intolerant and semi-shade tolerant berry bushes favorable to certain species of wildlife. Considering this woodlot is a wildlife corridor for mammal movement, improving the conditions under which they migrate is recommended.

There are wet areas, smaller ephemeral ponds, within the woodlot every spring. No evidence for amphibian life was recorded, possibly due to the ponds drying up too soon. It is recommended, depending on the water table situation found within the woodlot, to dredge out deeper pond areas to delay the pond dry up and maybe attract some breeding amphibians. The woodlot should be examined to determine if there are large enough trails to get tracked equipment access into the woodlots, such as a skid steer or bobcat.

Safer corridors can be created by adding bushes at the entrance and exit points of the corridors already recorded on the outside edge of the woodlot so as to increase the level of protection from light, noise and predators. Also, more favorable conditions could be created along the edges of the woodlot in less traveled or unused areas to increase corridor activity or enhance the beginnings of new corridors by the local wildlife. Movement corridors between Boynton and Danby Woodlots, via the meadow and hedgerow along the west side of the meadow, are the most active in the area. It has also been observed that the hedgerow migration corridor does not stop at the north and south ends of the Boynton and Danby woodlots respectively. It continues from Boynton across The Pond Road into the large cultural meadow on the south side and then further south to the larger cultural thicket and marsh on the south side of this cultural meadow. It is recommended to continue the 50 meter hedgerow, designated between the Boynton and Danby Woodlots, to extend further south and connect with the cultural thicket. This extension would allow for continued travel protection for both birds and mammals and provide increased nesting habitat for local bird species.

It is recommended to plant new vegetation along the north side of the woodlot where most of the mammals move from the woodlot into the meadow and hedgerow. Adding bushes, like Hawthorns, raspberries and roses to areas along the outside edge of the woodlot would weaken the sharp edge effect between the woodlot and meadow and would create a more gradual change in habitat. Hawthorns added here would create a protected travel zone for mammals moving to and from the woodlot and also provide food and nesting areas for local bird species.

Birds appear to use the woodlot primarily for seasonal migration and as a food source. Little nesting activity was observed. Some of the non-native plants within the Boynton Woodlot could be removed to create open habitat so as to allow for some of the native vegetation to re-establish. Hopefully the creation of a better understory will encourage new bird species to use this woodlot for nesting.

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 60 cm deep leaving 1.6 m of the post exposed. A one metre 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 will 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. Common Gartersnake individuals were encountered numerous times in 2001 and 2002, while one of the LGL biologists was taking courses at York University. The likelihood that there is an abundant snake population within and immediately adjacent to the Boynton 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.

5.0 MONITORING OF BOYNTON 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 Boynton 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 Boynton 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 Boynton 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, edge effects, hydrological changes, invasive species, mowing, trails, trash and other anthropogenic impacts within the Boyer 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 should 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 should 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 six random points in the Boynton Woodlot and at four random points in the proposed corridor (**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 should be carried out for the five year monitoring time period. Plots should be established in areas that when monitored, shall provide the necessary information recommended 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 Boynton Woodlot Management Plan has been approved. Two T-bars shall be placed into the ground at each permanent monitoring station. The GPS co-ordinates shall be recorded to ensure that the same spot is being photographed every year. A Photo Monitoring board shall 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 should 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 should 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 Boynton Woodlot and adjacent natural lands. It should 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 should 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 should 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 Boynton Woodlot and adjacent natural lands shall be described and delineated annually. Invasive plant species monitoring and management should 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 Boynton Woodlot should be carried out yearly to determine how the restorations have enhanced the woodlot. Early spring amphibian surveys should be conducted to see if pond restorations have attracted local species. Amphibian call surveys and egg searches in the ephemeral ponds created are good methods to determine presence or absence of such species.

Breeding bird surveys should be conducted yearly 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 Proposed 50 m Wide Corridor

Monitoring of the Proposed 50 m Wide 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 BOYNTON WOODLOT

6.1 Goals and Guiding Principles for Boynton 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 Boynton 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 Boynton Woodlot. Extensive invasive plant removal programs are recommended 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 along the woodlot edges. The new proposed 50 m wide corridor needs to be implemented. Garbage should be removed and access shall be limited to

reduce further anthropogenic impacts. Landscaping close to the Boynton Woodlot edges and associated hedgerows should be reduced to provide better wildlife corridors through the York University campus. Re-establishment of natural watercourse flow and deepening existing vernal pools should be discussed. **Table 6** describes the implementation schedule.

TABLE 6.
IMPLEMENTATION SCHEDULE

Activity	Season	Timeline (Years)				
		1	2	3	4	5
Discuss Hydrological Restoration and deepening existing vernal pools	January to March	X				
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
Dog Strangling Vine Control	Two applications from late May to early July	X	X	X	X	X
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
Stream Re-alignment – Communication about the proposed development and stream alignment are required prior to creating any stream restoration plan.	?	?	?	?	?	?
Excavate vernal pools to reach the ground water at a lower elevation	?	?	?	?	?	?

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.

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APPENDICES

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

	Scientific Name	Common Name	Status						FQI		Vegetation Community			
			GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
	PINACEAE	**PINE FAMILY**												
*	*Picea abies*	Norway spruce	G?	SE3			+p	L+		5	X			
	Picea glauca	white spruce	G5	S5			+p	L3	6	3		X		
	CUPRESSACEAE	**CEDAR FAMILY**												
	Thuja occidentalis	eastern white cedar	G5	S5			X	L4	4	-3	X	X		
	RANUNCULACEAE	**BUTTERCUP FAMILY**												
*	*Ranunculus acris*	tall buttercup	G5	SE5			+	L+		-2			X	
	BERBERIDACEAE	**BARBERRY FAMILY**												
	Podophyllum peltatum	may-apple	G5	S5			X	L4	5	3	X	X		
	ULMACEAE	**ELM FAMILY**												
	Ulmus americana	white elm	G5?	S5			X	L5	3	-2	X	X		X
	MORACEAE	**MULBERRY FAMILY**												
*	*Morus alba*	white mulberry	G?	SE5			+	L+		0			X	
	JUGLANDACEAE	**WALNUT FAMILY**												
	Carya cordiformis	bitternut hickory	G5	S5			X	L4	6	0	X	X		
	Juglans nigra	black walnut	G5	S4			X	L5	5	3		X		
	FAGACEAE	**BEECH FAMILY**												
	Fagus grandifolia	American beech	G5	S5			X	L4	6	3	X			
	Quercus macrocarpa	bur oak	G5	S5			X	L4	5	1	X	X		X
	Ostrya virginiana	ironwood	G5	S5			X	L5	4	4	X	X		
	TILIACEAE	**LINDEN FAMILY**												
	Tilia americana	basswood	G5	S5			X	L5	4	3	X	X		X

Scientific Name	Common Name	Status						FQI		Vegetation Community			
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
SALICACEAE	**WILLOW FAMILY**												
Populus tremuloides	trembling aspen	G5	S5			X	L5	2	0		X	X	
Salix eriocephala	Missouri willow	G5	S5			X	L5	4	-3		X		
BRASSICACEAE	**MUSTARD FAMILY**												
* *Alliaria petiolata*	garlic mustard	G5	SE5			e	L+		0	X	X		X
* *Hesperis matronalis*	dame's rocket	G4G5	SE5			+	L+		5	X	X		
GROSSULARIACEAE	**GOOSEBERRY FAMILY**												
* *Ribes rubrum*	red currant	G4G5	SE5			+	L+		5	X	X		
ROSACEAE	**ROSE FAMILY**												
Agrimonia gryposepala	tall hairy agrimony	G5	S5			X	L5	2	2		X		
Amelanchier arborea	downy juneberry	G5	S5			X	L4	5	3		X		
Amelanchier laevis	smooth juneberry	G4G5Q	S5			U	L4	5	5	X			
Crataegus punctata	large-fruited thorn	G5	S5			X	L5	4	5	X	X	X	
Fragaria virginiana ssp. *virginiana*	scarlet strawberry	G5T?	SU			X	L5	2	1			X	
Geum aleppicum	yellow avens	G5	S5			U	L5	2	-1	X	X		X
Geum canadense	white avens	G5	S5			X	L5	3	0	X	X	X	
* *Malus baccata*	Siberian crabapple	G?	SE1			+	L+					X	
* *Malus pumila*	common apple	G5	SE5			+	L+		5		X	X	
Physocarpus opulifolius	ninebark	G5	S5			R	L3	5	-2		X		
* *Prunus avium*	sweet cherry	G?	SE4			+	L+		5		X		
Prunus virginiana var. *virginiana*	choke cherry	G5T?	S5			X	L5	2	1	X	X		
Rosa blanda	smooth rose	G5	S5			U	L4	3	3	X			

Scientific Name	Common Name	Status						FQI		Vegetation Community			
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
* *Rubus idaeus* ssp. *idaeus*	red raspberry	G5T5	SE1								X	X	X
FABACEAE	**PEA FAMILY**												
* *Lotus corniculatus*	bird's-foot trefoil	G?	SE5			+	L+		1			X	
* *Medicago lupulina*	black medick	G?	SE5			+	L+		1			X	
* *Melilotus alba*	white sweet-clover	G?	SE5			+	L+		3			X	
* *Vicia cracca*	tufted vetch	G?	SE5			+	L+		5			X	
ELAEAGNACEAE	**OLEASTER FAMILY**												
* *Elaeagnus angustifolia*	Russian olive	G?	SE3			+	L+		4			X	
ONAGRACEAE	**EVENING-PRIMROSE FAMILY**												
Circaea lutetiana ssp. *canadensis*	yellowish enchanter's nightshade	G5T5	S5			X	L5	3	3	X	X	X	
Epilobium ciliatum ssp. *ciliatum*	ciliate willow-herb	G5T?	S5			X	L5	3	3			X	
Oenothera biennis	common evening-primrose	G5	S5			X	L5	0	3			X	
CORNACEAE	**DOGWOOD FAMILY**												
Cornus amomum	silky dogwood	G5T?	S5			R	L4	5	-4		X		X
Cornus racemosa	red panicled dogwood	G5?	S5			X	L4	2	-2		X		
Cornus sericea ssp. *sericea*	red-osier dogwood	G5	S5			X	L5	2	-3		X	X	X
RHAMNACEAE	**BUCKTHORN FAMILY**												
* *Rhamnus cathartica*	common buckthorn	G?	SE5			+	L+		3	X	X	X	X
VITACEAE	**GRAPE FAMILY**												

	Scientific Name	Common Name	Status						FQI		Vegetation Community			
			GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
	Parthenocissus quinquefolia	five-leaved Virginia-creeper	G5	S4?			U?	L5	6	1		X		
	Parthenocissus vitacea	inserted Virginia-creeper	G5	S5			X	L5	3	3	X	X		
	Vitis riparia	riverbank grape	G5	S5			X	L5	0	-2	X	X	X	X
	ACERACEAE	**MAPLE FAMILY**												
	Acer negundo	manitoba maple	G5	S5			+?	L+?	0	-2	X	X		X
*	*Acer platanoides*	norway maple	G?	SE5			+	L+		5	X		X	
	Acer saccharum var. *saccharum*	sugar maple	G5T?	S5			X	L5	4	3	X	X		
	Acer X *freemanii*	freeman's maple					U?	LH			X	X	X	
	ANACARDIACEAE	**SUMAC FAMILY**												
	Rhus hirta	staghorn sumac	G5	S5			X	L5	1	5		X		
	Toxicodendron radicans ssp. *negundo*	poison-ivy	G5T	S5			R	L4	5	-1		X		X
	Toxicodendron rydbergii	western poison-ivy	G5T	S5			X	L5	0	0	X	X	X	
	OXALIDACEAE	**WOOD SORREL FAMILY**												
	Oxalis stricta	upright yellow wood-sorrel	G5	S5			+?	L+?	0	3	X	X		
	GERANIACEAE	**GERANIUM FAMILY**												
*	*Geranium robertianum*	herb-robert	G5	SE5			+?	L+?		5	X	X		
	APIACEAE	**PARSLEY FAMILY**												
*	*Daucus carota*	wild carrot	G?	SE5			+	L+		5			X	
	APOCYNACEAE	**DOGBANE FAMILY**												
	Apocynum cannabinum	Indian hemp	G5T	S5				L5	3	0		X		

	Scientific Name	Common Name	Status						FQI		Vegetation Community			
			GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
	ASCLEPIADACEAE	**MILKWEED FAMILY**												
	Asclepias syriaca	common milkweed	G5	S5			X	L5	0	5			X	
*	*Cynanchum rossicum*	swallow-wort	G?	SE5			+	L+		5	X	X	X	
	SOLANACEAE	**POTATO FAMILY**												
	Physalis heterophylla	clammy ground-cherry	G5	S4			U	L4	3	5	X		X	
	CONVOLVULACEAE	**MORNING-GLORY FAMILY**												
*	*Convolvulus arvensis*	field bindweed	G?	SE5			+	L+		5			X	
	HYDROPHYLLACEAE	**WATER-LEAF FAMILY**												
	Hydrophyllum virginianum	Virginia water-leaf	G5	S5			X	L5	6	-2	X			
	LAMIACEAE	**MINT FAMILY**												
	Lycopus uniflorus	northern water-horehound	G5	S5			X	L4	5	-5		X	X	
*	*Prunella vulgaris* ssp. *vulgaris*	common heal-all	G5T?	SE3			+?	L+?		0			X	
	PLANTAGINACEAE	**PLANTAIN FAMILY**												
*	*Plantago lanceolata*	ribgrass	G5	SE5			+	L+		0		X		
*	*Plantago major*	common plantain	G5	SE5			+	L+		-1			X	
	OLEACEAE	**OLIVE FAMILY**												
	Fraxinus americana	white ash	G5	S5			X	L5	4	3	X	X		
	Fraxinus pennsylvanica	red ash	G5	S5			X	L5	3	-3	X	X	X	X
*	*Syringa vulgaris*	common lilac	G?	SE5			+	L+		5		X		
	SCROPHULARIACEAE	**FIGWORT FAMILY**												
*	*Linaria vulgaris*	butter-and-eggs	G?	SE5			+	L+		5			X	
*	*Verbascum thapsus*	common mullein	G?	SE5			+	L+		5			X	

Scientific Name	Common Name	Status						FQI		Vegetation Community			
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
BIGNONIACEAE	**TRUMPET-CREEPER FAMILY**												
* *Catalpa speciosa*	northern catalpa	GU	SE1			+	L+		3		X		
RUBIACEAE	**MADDER FAMILY**												
* *Galium mollugo*	white bedstraw	G?	SE5			+	L+		5		X		
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**												
* *Lonicera tatarica*	tartarian honeysuckle	G?	SE5			+	L+		3	X	X		X
Sambucus racemosa ssp. pubens	Red-berried elderberry	G4T4T5	S5			X	L5	5	2	X	X		
* *Viburnum opulus*	guelder rose	G5	SE4			+	L+		0	X			
DIPSACACEAE	**TEASEL FAMILY**												
* *Dipsacus fullonum* ssp. *sylvestris*	wild teasel	G?T?	SE5			+	L+		5			X	
ASTERACEAE	**ASTER FAMILY**												
* *Achillea millefolium* var. *millefolium*	common yarrow	G5T?	SE?			+?	L+		3			X	
Ambrosia artemisiifolia	common ragweed	G5	S5			X	L5	0	3			X	
* *Arctium minus*	common burdock	G?T?	SE5			+	L+		5		X		
Aster ericoides var. *ericoides*	white heath aster	G5T?	S5			X	L5	4	4			X	
Aster lanceolatus ssp. *lanceolatus*	tall white aster	G5T?	S5			X	L5	3	-3			X	
* *Cichorium intybus*	chicory	G?	SE5			+	L+		5			X	
* *Cirsium arvense*	Canada thistle	G?	SE5			+	L+		3			X	
* *Cirsium vulgare*	bull thistle	G5	SE5			+	L+		4			X	
Erigeron strigosus	daisy fleabane	G5	S5			X	L5	0	1			X	

Scientific Name	Common Name	Status						FQI		Vegetation Community			
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
Euthamia graminifolia	flat-topped bushy goldenrod	G5	S5			X		2	-2		X		
* *Inula helenium*	elecampane	G?	SE5			+	L+		5			X	
Liatris spicata	spiked blazing star	G5	S3	THR	THR	R	L1	9	0			X	
Rudbeckia hirta	black-eyed Susan	G5	S5			X	L4	0	3			X	
Solidago canadensis	canada goldenrod	G5	S5			X	L5	1	3	X	X	X	X
Solidago canadensis var. *scabra*	tall goldenrod		S5			X	L5	1	3				X
Solidago gigantea	giant goldenrod	G5	S5			X	L5	4	-3		X		
* *Sonchus arvensis* ssp. *arvensis*	field sow-thistle	G?T?	SE5			+	L+		1			X	
Symphyotrichum novae-angliae	New England aster	G5	S5			C	L5	2	-3			X	
* *Tussilago farfara*	coltsfoot	G?	SE5			+	L+		3			X	
ARACEAE	**ARUM FAMILY**												
Arisaema triphyllum ssp. *triphyllum*	small jack-in-the-pulpit	G5T5	S5			X	L4	5	-2	X	X		
JUNCACEAE	**RUSH FAMILY**												
Juncus dudleyi	Dudley's rush	G5	S5			X	L5	1	0			X	X
CYPERACEAE	**SEDGE FAMILY**												
Carex bebbii	Bebb's sedge	G5	S5			U	L5	3	-5	X	X		X
Carex rosea	stellate sedge	G5	S5			X	L5	5	5		X		
Carex tenera	straw sedge	G5T	S5			R	L4	4	-1		X		
Carex vulpinoidea	fox sedge	G5	S5			X	L5	3	-5	X	X		
POACEAE	**GRASS FAMILY**												
* *Agrostis gigantea*	red-top	G4G5	SE5			+	L+		0			X	
* *Bromus inermis* ssp. *inermis*	awnless brome	G4G5T?	SE5			+	L+		5			X	

Scientific Name	Common Name	Status						FQI		Vegetation Community			
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	FOD9-1	SWD3-3	CUM1-1	Hedgerow
* *Dactylis glomerata*	orchard grass	G?	SE5			+	L+		3			X	
* *Echinochloa crusgalli*	common barnyard grass	G?	SE5			+	L+		-3			X	
* *Elymus repens*	quack grass	G?	SE5			+	L+		3			X	
Glyceria striata	fowl meadow grass	G5	S5			X	L5	3	-5		X		
Phalaris arundinacea	reed canary grass	G5	S5			+?	L+?	0	-4		X	X	X
* *Phleum pratense*	timothy	G?	SE5			+	L+		3		X	X	
Poa compressa	Canada blue grass	G?	S5			+?	L+	0	2			X	
Poa pratensis ssp. *pratensis*	Kentucky bluegrass	G5T	S5			+	L+	0	1		X	X	
TYPHACEAE	**CATTAIL FAMILY**												
Typha angustifolia	narrow-leaved cattail	G5	S5			+?	L+	3	-5			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.
RECOMMENDED 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 anytime 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.

Autumn Olive (*Elaeagnus umbellata*) and Russian Olive (*Elaeagnus angustifolia*) Control

Only a limited number of techniques are effective at controlling Autumn Olive. Young seedlings and sprouts can be hand pulled in the early spring when the ground is still moist to allow removal of the entire root system. Autumn olive plants should not be burned, mowed or cut because this causes the plants to re-sprout vigorously (Eckardt 1987a).

The most successful method is to cut the stems and/or stumps and either paint Roundup herbicide in a 10-20 percent solution with a sponge-type paint applicator or spray herbicide on the stump with a low pressure hand-held backpack sprayer. This will kill the root systems and prevent re-sprouting. Herbicide application should occur late in the growing season (July to September), and also during the dormant season. Dormant season application minimizes potential harm to non-target species (Eckardt 1987a).

Roundup shall not be sprayed on the foliage with a backpack sprayer because Roundup is a non-selective herbicide and it will kill or harm non-target species. There is the potential for an excess of spray drift during the foliage application on a large sized tree (Eckardt 1987a). In order to reduce the spray drift, a small portion of the plant could be sprayed later in the season when the plant's reserves are being transferred to the root system, spraying only part of the foliage would reduce the risk to adjacent flora.

If Roundup application fails to kill the autumn olive plants, Garlon Ultra with oil (diesel fuel or vegetable oil) shall be immediately sprayed or painted in the winter on cut stumps. Garlon should be mixed with diesel at a rate of 1 part Garlon Ultra to 3 parts diesel or vegetable oil. Traxit shall be added to the solution to stain the treated stumps blue, thus avoiding overlapping treatments and indicating missed stumps. The stumps should be no higher than 5 to 10 cm in trafficked areas for safety reasons (Giles 2009).

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).

Norway Maple (Acer platanoides)

Norway maple grows quickly, casts heavy shade, produces dense root systems, tolerates and flourishes in urban conditions. Generally, only Norway maple seedlings establish under mature Norway maple trees. As a result there is lower diversity under Norway maple trees. Seedlings and saplings can be hand pulled or dug up. Saplings and mature trees should be cut with a brush cutter or chainsaw and the stump 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 Boynton 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.

Dog Strangling Vine (*Cynanchum rossicum*) Control

Wind disburses dog strangling vine seed, which it produces in abundance at approximately 2,400 seeds / m^2. The plants also spread by rhizomes. Dense stands of dog strangling vine suppress the growth of all ground layer plants (Kaufman, 2007). Light infestations of dog strangling vine can be controlled by removing the plants, including their entire root systems. Larger infestations can be controlled by applying Roundup twice during the growing season, at the onset of flowering and 2 to 3 weeks later. Re-treatments will be required for 2-5 years to eliminate surviving plants and new seedlings.

Dame's Rocket (Hesperis matronalis) Control

Dame's rocket should be controlled where it produces dense stands and it displaces native plant species. Dame's rocket produces high seed production and once it is established it may take a number of years to remove the plants from the seedbank. When the soils are moist prior to or during flowering time the plans can be hand pulled. In large infestations the plants can be sprayed in the late summer or early fall with roundup when the other plants are dormant and Dame's Rocket still has green leaves (Kaufman, 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.

APPENDIX E
PHOTO APPENDIX

PROJECT #TA8152
November 2012

PHOTO APPENDIX E. BOYNTON WOODLOT

View of the east side of the south hedgerow and north edge of Boynton woodlot.

View of Boynton woodlot looking west.

View of the south edge of Boynton woodlot.

View to the west in Boynton woodlot.

PROJECT #TA8152
November 2012

PHOTO APPENDIX E.
BOYNTON WOODLOT

View of the north edge of Boynton woodlot and the south cultural meadow.

View of the west edge of Boynton woodlot.

APPENDIX F
ELC DATA CARDS

PLANT SPECIES LIST	
	SITE: BOYNTON, YORK U
	POLYGON: FOOG-1
	DATE: May 31, August 8, Sept 26/12
	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.
GEUCANA				R	
GEUALEO				A	
CRAPUNC		R	R		
AMELAEV			2		
RIBRUBR				O	
HESMATP				O	
ALLPETI				O	
TILAMER	O	A			
CIRUTE				A	
ROSBLAN			R		
PRUVIRG			A		
GEOROBE				O	
QUASTEL				R	
TOXRYOB				A	
ACEXFRE	A	R			
ACESACC	A	A			
ACERUBR	R	R			
ACENEGU		A			
VITRIPA			A		
PARVIT			R	R	
RHACATH		A	O		
FRAPENN	O	A	A		
FRAAMER	R				
HYDVIRG				O	
PHYAMER				R	
CYNROSS			R	R	
VIBOPUL			R		
SAMNIGR			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
LONTATA			O		
CARVULP				R	
CARRADI				R	
AGITRIP				O	
SOLCANA				O	
OSTVIRG		R	R		
QUEMACR	A	O	R		
FAGGRAN	O	O			
JUGNIGR	R	R			
CARCORD	R	R			
ULMAMER	R	R	R		
PODPELT				A	
THUOCCI	R	R			
PICABIE	R				

STAND CHARACTERISTICS			
	SITE: BOYNTON		POLYGON: FOOG-1
	SURVEYOR(S): DEB, LMC		DATE:
	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	3,4	ACESACC>QUEMACR=ACEXFRE>FRAPENN
3	SUB-CANOPY	3	1	RHACATH>FRAPENN>ACENEG>ACESACC
4	UNDERSTORY	4,5	1	PHYAMER>PRUVIRG>FRAPENN=VITRIP
5	GROUND LAYER	5	2	CIRUTE>GEUALE>PODPELT=TOXRYOB

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%

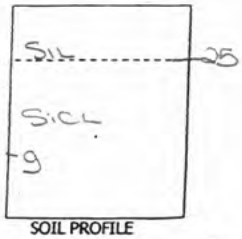
SIZE CLASS ANALYSIS

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

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

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	SiCL			
DEPTH TO MOTTLES	G = 75	G =	G =	G =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	Ø			
DEPTH TO BEDROCK	> 20			
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				COLL.	SPECIES CODE	LAYER				COLL.
	1	2	3	4			1	2	3	4	

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: Boynton
	POLYGON: FODA-1
	DATE: August 8/12
	SURVEYOR(S): DEB, LMC

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	1 / 2
TRACKS AND TRAILS	0 / 0	NOISE	1 / 0
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	1 / 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	0 / 0

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							

PLANT SPECIES LIST	
	SITE: BOYNTON, YORK U
	POLYGON: SUD3-3
	DATE: ?
	SURVEYOR(S): DEB, MC

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.
THUOCC			R	R	
POPGRA				A	
ULMAME	R	R			
CARCOR	O	R			
JUGNIG	R				
FRAPEN	R	R			
OSTVIR			R	R	
ACESPI	O		R	R	
QUEMAC	O	R	R		

SPECIES CODE	LAYER 1	2	3	4	COLL.

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: BOYNTON
	POLYGON: FOOA-1
	DATE: AUGUST 8/12
	SURVEYOR(S): DEB, MC

MANAGEMENT / DISTURBANCE	LEVEL / EXTENT	MANAGEMENT / DISTURBANCE	LEVEL / EXTENT
SUGAR BUSH OPERATIONS	0 0	DUMPING (RUBBISH)	1
GAPS IN THE CANOPY	1	EARTH DISPLACEMENT	0 0
LIVESTOCK (GRAZING)	0 0	RECREATIONAL USE	0 0
PLANTING (PLANTATION)	0 0	ALIEN SPECIES	0 0
TRACKS AND TRAILS	0 0	NOISE	1
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	1	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	0 0

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							

PLANT SPECIES LIST	
	SITE: BOYNTON, YORK J
	POLYGON: SWD3-3
	DATE: May 31, August 8, Sept 26, 12
	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.
BAPRAT				P	
PHLPRAT				O	
PHAARUN				R	
GLYSTRI				O	
PHYOPUL			R	R	
MALPUMI				R	
GEUCANA				O	
GEUVILL				A	
CRAPUNC				R	
AMEARBO				R	
POLCRYP				O	
RIBPRIN				A	
MESMOTT				O	
ALLSETI				O	
SALERIO	R	R			
POPTREM	R	R			
TILAMER	R	A			
CORSERI				R	
CORRACE				R	
CORORBI				R	
CIRLUTE				A	
RUBIDEA				R	
PRUVIRG		R	R		
PRUAVIU		R	R		
PHACATH		A	A		
PARQUIN				R	
PARVITA				R	
VITRIPA				A	R

SPECIES CODE	LAYER 1	2	3	4	COLL.
ACENEGU	R	O	R		
ACERUBR	O	O	O		
RHUHIRT			R		
TOXRAD				A	
TOXRYDB				O	
QUASTRI				O	
GEUROSA				O	
SYRVULG			R		
FRAPENN	O	A	A		
FRAAMER	R				
PHILANG				R	
LYCUNIF				O	
CYNROSS			R	R	
APOCANN				O	
CAREPEL	R				
GALMOLL				O	
LONTATA			O		
SAMNIGR			O		
ARCMINO				R	
TENTORAM				R	
SOLCANO				R	
SOLCIGA				R	
ARITRIF				R	
CIRARVE				O	
CIRROSE				R	
CIRTENE				R	
CIRVULP				R	
PICCILIA					

STAND CHARACTERISTICS	SITE: BOYNTON	POLYGON: SWD3-3
	SURVEYOR(S): DEB, LMC	DATE: AUGUST 8/12
	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; = APPROX. EQUAL TO)
1	EMERGENT			
2	CANOPY	1,2	3,4	ACERUBR >> ACESACC > ULEAMER = FRAPENN = RECORD
3	SUB-CANOPY	3	1	ACERUBR > PHACATH = TILAMER = FRAPENN
4	UNDERSTORY	4,6	1	ACERUBR > PHACATH = RIBVER = FRAPENN > VITRIPA
5	GROUND LAYER	7	2	CIRLUTE = GEUROSA > RUBIDEA = TOXRAD

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%

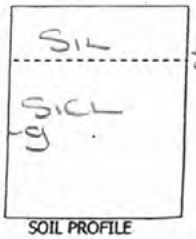
SIZE CLASS ANALYSIS

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

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

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	SICL			
DEPTH TO MOTTLES	0 = 48	0 =	0 =	0 =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	8			
DEPTH TO BEDROCK	7120			
MOISTURE REGIME	4			



SOIL PROFILE

PLANT SPECIES LIST	
	SITE: BOYNTON, YORK U
	POLYGON: SUD3-3
	DATE: ?
	SURVEYOR(S): DEB, MC

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.
THUOCC			R	R	
RUBHIT				A	
ULMAME	R	R			
CARCOR	O	R			
JUGNIG	R				
FAGGRAN	R	R			
OSTVIR		R	R		
ACESPI	O		O	R	
QUEMAC	O	R	R		

SPECIES CODE	LAYER 1	2	3	4	COLL.

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: BOYNTON
	POLYGON: SUD3-3
	DATE: AUGUST 8/12
	SURVEYOR(S): DEB, MC

MANAGEMENT / DISTURBANCE	LEVEL / EXTENT	MANAGEMENT / DISTURBANCE	LEVEL / EXTENT
SUGAR BUSH OPERATIONS	0 0	DUMPING (RUBBISH)	1
GAPS IN THE CANOPY	1	EARTH DISPLACEMENT	0 0
LIVESTOCK (GRAZING)	0 0	RECREATIONAL USE	0 0
PLANTING (PLANTATION)	0 0	ALIEN SPECIES	0 0
TRACKS AND TRAILS	0 0	NOISE	1
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	1	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	0 0

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							

PLANT SPECIES LIST

SITE: BOYNTON
POLYGON: CUM1-1
DATE: May 31, August 8, Sept 21, 12
SURVEYOR(S): LMC, DEB

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.
RANACRI				O	
MORALB			R		
POPTREM	R				
CRABMIC			R		
FRAVIRG				R	
SOLCANA				O	
MIMBACC			R		
MALPUMI			R		
RUBIDEA				O	
LOTCORN				R	
MEDLUPU				O	
MELALBA				O	
VICCRAC				O	
ELYMCANA			R		
CIRMUTE				O	
ERICUL				R	
OENBIEN				R	
CORSERI			R		
CHACATH			R		
VITRIPA				R	
ACEPLAT	R				
ACEXFRE	R				
TOXRYDB				R	
DAUCARO				R	
ASCSYRI				O	
CYNROSS				O	
CONARV				R	
PRUVULG				O	

SPECIES CODE	LAYER 1	2	3	4	COLL.
LYCUNIF				O	
PLAMAJO				R	
FRAPENN	R				
LINVULG				R	
VERTHAP				R	
DIPJUS				O	
ACHMILL				R	
AMBARTE				O	
ASTERIC				A	
ASTLAEV				A	
CICINTY				R	
CIRARV				A	
CIRVULG				O	
ERISTRI				R	
INUHYE				O	
LIASAC				R	
RUDHIRT				R	
SOLCANA				O	
SOLRUE				R	
ASTNOVAE				O	
TUSFARF				O	
JUNVOL				O	
ACHCILIA				O	
BROINER				O	
DACGLOM				O	
ECHCRUS				O	
EVEREF				O	
PHAARU				O	

STAND CHARACTERISTICS

SITE: BOYNTON
POLYGON: CUM1-1
SURVEYOR(S): DEB, LMC
DATE: AUG 8
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; = APPROX EQUAL TO)
1	EMERGENT			
2	CANOPY			
3	SUB-CANOPY			
4	UNDERSTORY			
5	GROUND LAYER	L6.5	5	POAPRA > ASTLAE > SOLCAN > CIRARV

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

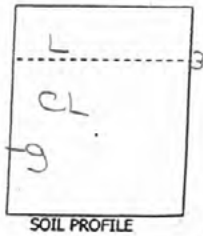
TREES		R	< 10cm	R	10-24cm	R	25-50cm	N	> 50cm
STANDING SNAGS		N	< 10cm	N	10-24cm	N	25-50cm	N	> 50cm
DEADFALL/LOGS	FIRM	N	< 10cm	N	10-24cm	N	25-50cm	N	> 50cm
	DECAYED	N	< 10cm	N	10-24cm	N	25-50cm	N	> 50cm

COMMUNITY MATURITY

☐ PIONEER ☐ YOUNG ☐ MID-AGE ☐ MATURE ☐ OLD-GROWTH

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	CL			
DEPTH TO MOTTLES	0 = 6.5	0 =	0 =	0 =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	0			
DEPTH TO BEDROCK	>150			
MOISTURE REGIME	3			



SOIL PROFILE

PLANT SPECIES LIST	
	SITE: BOYNTON
	POLYGON: CUMI-1
	DATE: ?
	SURVEYOR(S): DEB, LMC

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.
PHLPRAT				D	
RACMAC				O	
BOAPRAT				D	
NEPANCU				O	

SPECIES CODE	LAYER 1	2	3	4	COLL.

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: BOYNTON
	POLYGON: CUMI-1
	DATE: AUG 8/12
	SURVEYOR(S): DEB, LMC

MANAGEMENT / DISTURBANCE	LEVEL / EXTENT	MANAGEMENT / DISTURBANCE	LEVEL / EXTENT
SUGAR BUSH OPERATIONS	0 0	DUMPING (RUBBISH)	1 0
GAPS IN THE CANOPY	0 0	EARTH DISPLACEMENT	0 0
LIVESTOCK (GRAZING)	0 0	RECREATIONAL USE	0 0
PLANTING (PLANTATION)	1 2	ALIEN SPECIES	1 2
TRACKS AND TRAILS	1 2	NOISE	1 2
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	0 0	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	0 0

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							

PLANT SPECIES LIST	SITE: BOYNTON, YORK U
	POLYGON: Hedgerow
	DATE: May 31, August 8, Sept. 26/12
	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.
PHARUN				R	
GEUVALP				A	
ALLPETI				D	
TILAMER	R	R			
CORSERI			A		
CORAMOM			R		
RUBIDAE				O	
TOXRADI				O	
ACEPENN	R	O	O		
VITRIPA		R	A		
RHACATH			D	A	
LONTATA		R	R		
JUNDUDL				R	
CAREBEB				O	
SOLCAN				R	
SOLCANA				A	
QUEMACR	D	R			
ULMAMER	O		A		
FRAPENN	O	R			

SPECIES CODE	LAYER 1	2	3	4	COLL.

STAND CHARACTERISTICS	SITE: BOYNTON	POLYGON: Hedgerow
	SURVEYOR(S): DEB, LMC	DATE: Aug 8
	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			QUEMACR > ULMAMER = FRAPENN
3	SUB-CANOPY			
4	UNDERSTORY			RHACATH > CORSERI = ULMAMER > VITRIPA
5	GROUND LAYER			ALLPETI > RHACATH > QUEMACR > SOLCANA

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%

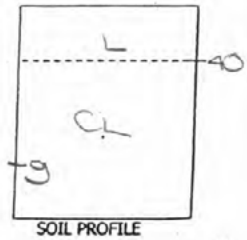
SIZE CLASS ANALYSIS

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

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

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	CL			
DEPTH TO MOTTLES	0 = 70	0 =	0 =	0 =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	Ø			
DEPTH TO BEDROCK	7120			
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				COLL.
	1	2	3	4	

SPECIES CODE	LAYER				COLL.
	1	2	3	4	

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: BOYNTON
	POLYGON: HEDGEROW
	DATE: AUG 8/12
	SURVEYOR(S): DEB, LMC

MANAGEMENT / DISTURBANCE	LEVEL / EXTENT	MANAGEMENT / DISTURBANCE	LEVEL / EXTENT
SUGAR BUSH OPERATIONS	0 0	DUMPING (RUBBISH)	1 0
GAPS IN THE CANOPY	1 1	EARTH DISPLACEMENT	0 0
LIVESTOCK (GRAZING)	0 0	RECREATIONAL USE	1 0
PLANTING (PLANTATION)	1 1	ALIEN SPECIES	0 0
TRACKS AND TRAILS	1 2	NOISE	1 2
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	1 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	0 0

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							