Danby Woodlot Management Plan

Photo Credit: D. Barcza, LGL Limited

Prepared for:

YORK UNIVERSITY
4700 KEELE STREET
NORTH YORK, ONTARIO
M3J1P3

Prepared by:

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Danby Woodlot Management Plan

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1.0 INTRODUCTION

A Management Plan has been prepared for the Danby Woodlot in support of the York University Master Plan Update. Three season field investigations for vegetation and wildlife were conducted in the Danby 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 Danby Woodlot as is documented in **Section 4.0**. A number of reports have been reviewed in order to create the Danby 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 Danby 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.

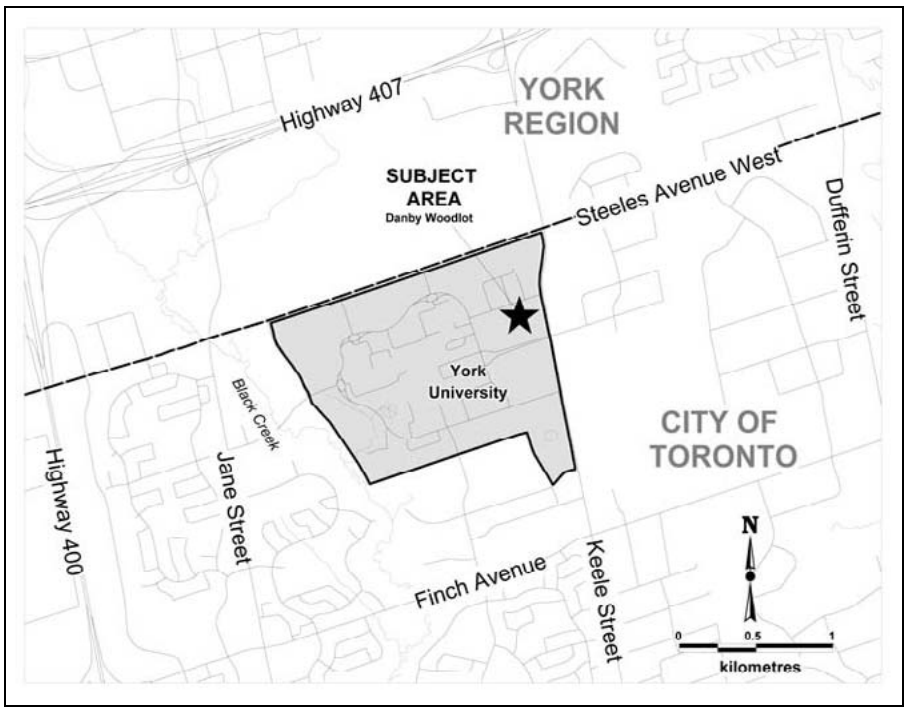


Figure 1. Key Plan of the Danby Woodlot.

1.2 Core Woodlots

The Danby Woodlot is one of four core woodlots on the York University campus (**Figure 2**). The Danby Woodlot covers an area of approximately of 2.16 ha. It is bounded by the Chimneystack Road along the northern edge; hedgerows, manicured grass and parking lots to the west; York Boulevard along the southern edge and Keele Street along the eastern edge. There are three other woodlots on the York University campus, including Boynton, Boyer, and Osgoode woodlots. Separate management plans have been prepared for each of these woodlots.

1.3 Danby Woodlot Study Area

The Danby Woodlot study area is composed of the Danby Woods, the meadow to the south, hedgerows to the north, east, south and west as well as the North Hedgerow that provides some form of corridor to the Boynton Woodlot (**Figure 2**). The Danby 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.

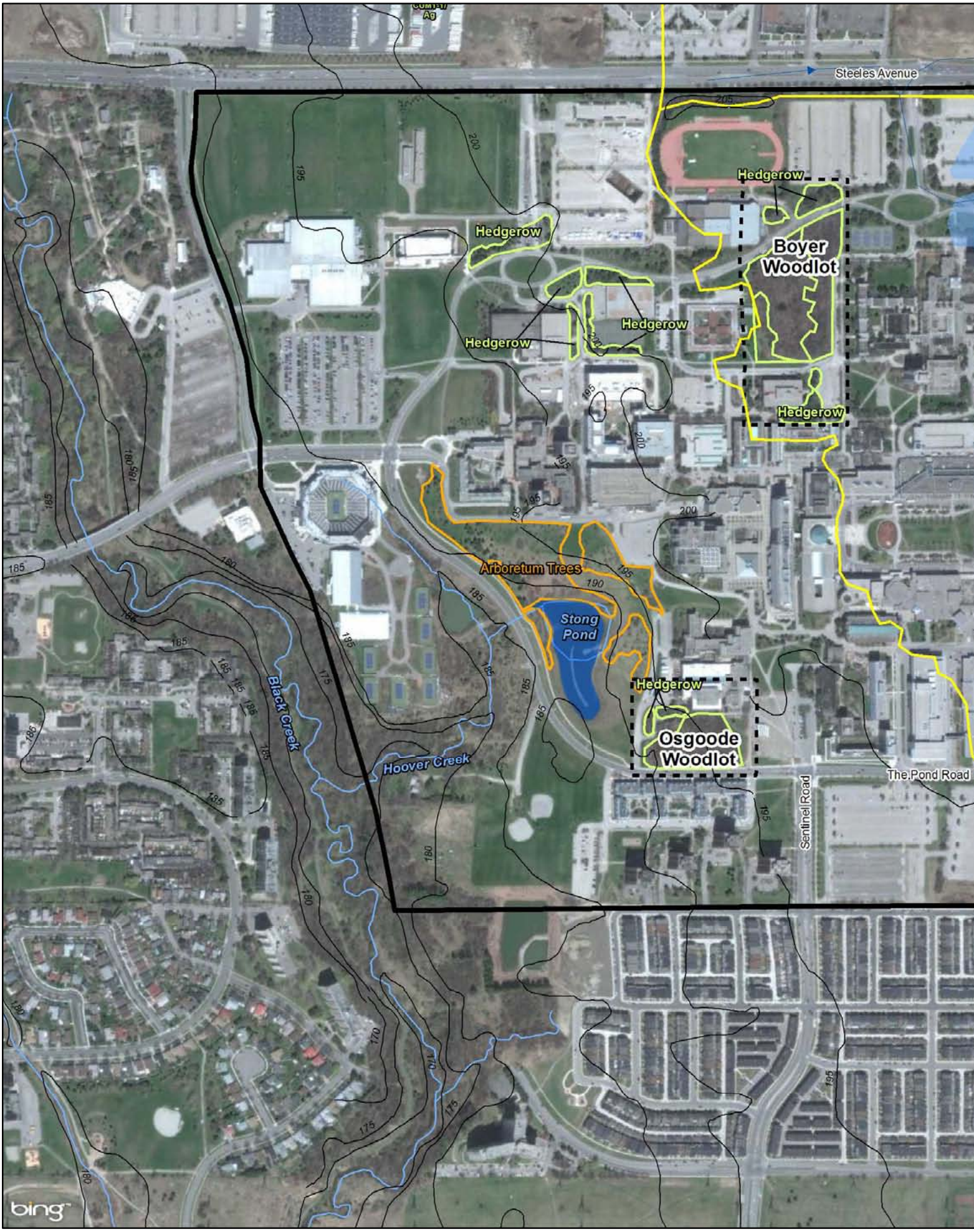
The York University Secondary Plan, Amendment No. 104 to the Official Plan of the City of Toronto, was adopted by Council on December 4, 2009. The Secondary Plan includes policies related to the Natural Heritage System found on campus, including the Boyer, Boynton Danby and Osgoode Woodlots. Specifically,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

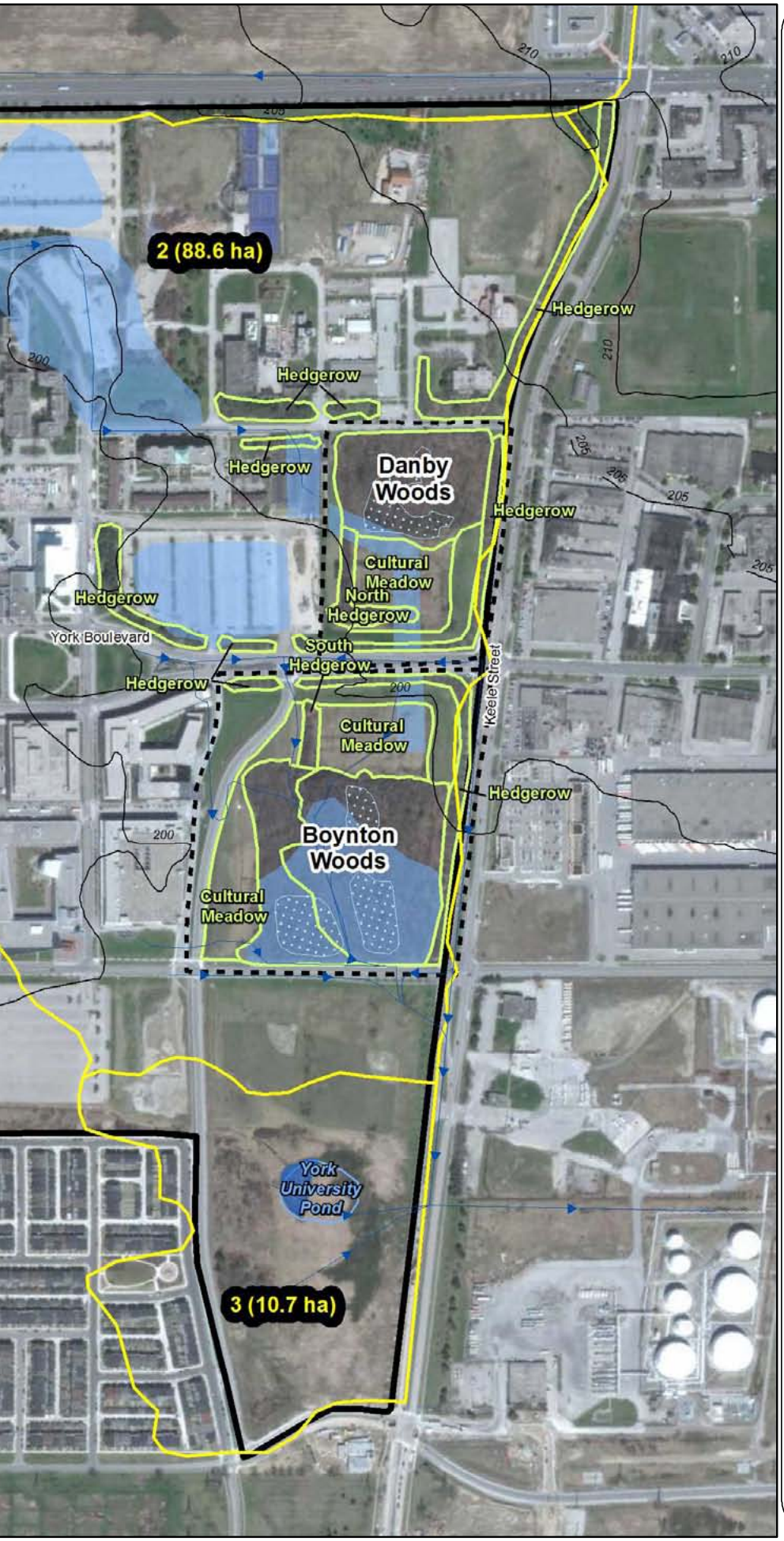
(a) determine and measure the ongoing health of the woodlots;
(b) determine whether the management practices implemented are effective; and,
(c) determine if modifications are required due to unacceptable impacts from adjacent development.

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
Hedgerow
Hedgerow
Hedgerow
Boyer Woodlot
Arboretum Trees
Stong Pond
Hedgerow
Osgoode Woodlot
Black Creek
Hoover Creek
Sentinel Road
The Pond 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 DANBY WOODLOT

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

2.1 Process for Danby Woodlot Ecological Assessment

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

1. Current land use site assessment;
2. Examination of past disturbance regimes and current ecological stressors;
3. A Danby 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 Danby 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 Danby woodlot was conducted within the study area by LGL on May 30, August 1, and September 25, 2012. Semi-natural vegetation communities are those communities that occur without regular management, maintenance or species introduction, but have been sufficiently altered in terms of species composition or vegetation structure by anthropogenic activity (Canadian National Vegetation Classification 2012). The Ecological Land Classification (ELC) for Southern Ontario (Lee et al. 1998) field sampling methods and data cards were used as a template to create more extensive restoration field sheets. Necessary data was collected to describe and classify the vegetation community type, assess the soils, the plant composition, linkages and disturbance regimes according to the ELC. Detailed field sampling techniques, analysis and mapping are described in Lee *et al*. (1998) and Apfelbaum *et al.* (2010).

Detailed site assessments included the following activities:

1) Conducting detailed analysis of the plant composition, structure and function in each vegetation community present at the site;
2) Taking soil cores for analysis of soil composition and soil moisture;
3) Identifying existing linkages;

4) Assessment of vegetation community habitat quality and corridor quality; and,
5) Identifying and analyzing past disturbance regimes for the purpose of assessing management requirements to address the ecological stressors.

2.2.1 Protocol for Vegetation Community, Structure and Function Analysis

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

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

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

2.2.1.1 FLORISTIC QUALITY ASSESSMENT

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

Floristic Quality Index

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

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

Coefficient of Wetness

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

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

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

Sum of Weediness

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

value is a low priority invasive plant. Sum of weediness (Weed) was calculated from pre-assigned scores of weediness for alien species to determine the proportion of high priority invasives to low priority invasives present in each vegetation community. The sum of weediness is calculated by summing the coefficient of weediness (Weed) of an inventory of plants.

2.2.2 Protocol for Soil Sampling

One auger sample was taken per vegetation community within the Danby 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 Danby Woodlot. A Management/Disturbance field sheet was filled out for each vegetation community within the Danby 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 (Danby Woodlot), woodlots on the York University campus, vegetation communities in Danby Woodlot, wildlife migration routes and lastly a Danby 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 Danby Woodlot is located within the Peel Plain Physiographic Region (Chapman and Putnam 1984), which is characterized as imperfectly drained Chingacousy clay loam, with alluvial "Bottomland" soils associated with stream courses (Hoffman and Richards, 1955). There are no significant landform features located within the study area.

3.1.2 Topography

The York University campus is primarily a terrestrial site that is not associated with the waters of a lake or river or with an active shoreline or river valley, with the exception of the west side of the campus where Black Creek has formed a considerable valley. 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 Danby 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 rise in elevation northeast of the Danby Woodlot (**Figure 2**). The only noticeable slope is east of the cultural meadow where there is a raised landscaping berm.

3.1.3 Soil Characteristics

One soil core was taken in each of the ELC vegetation communities. The location of each soil core is delineated in **Figure 3.**

Soil Core 1 (FOD6-5)
The A horizon silt loam goes down to a depth of 15 cm followed by a silty clay loam layer to a depth of 80 cm. The B horizon clay loam goes 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 (clay loam) is retentive (5) with an imperfect (5) soil drainage.

Soil Core 2 (CUM1-1)
The A horizon loam goes down to a depth of 15 cm followed by a 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 (clay loam) is retentive (5) with an imperfect (5) soil drainage.

Soil Core 3 (Hedgerow)
The A horizon silt loam goes down to a depth of 35 cm followed by a silty clay loam layer to a depth of 80 cm. The B horizon clay loam goes to a depth of 120 cm. Mottles were identified at 80 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.

3.1.4 Hydrology

According to Dougan & Associates (2001), the Danby Woodlot is located on an intermittent creek channel that historically drained to the West Don River. 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 Danby Woodlot. The watercourse comes aboveground just south of York Boulevard leading into Boynton Woodlot. Regular runoff from the area north of York Boulevard. 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.

In the Boynton Woodlot 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.

Based on changes in elevation; surface water flows along Steeles Avenue and heads southwards along Founders Road into the York University campus (**Figure 2**). The surface water flows southeast first into Danby Woods and then into Boynton Woods. North and Northeast of the Danby Woodlot, the land is slightly higher in elevation and it is made up of buildings, paved pathways, parking lots and some grass. Most of these landscape features are impervious to water drainage, except for the manicured lawn. The surface water from snowmelt and precipitation flows off of these anthropogenic features into the Danby Woodlot.

There is a seasonally wet area in the central and southern portion of the Danby 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 two ELC vegetation community types were identified by LGL within the study limits (**Figure 3**). These communities include: deciduous forest type (FOD6-5) and cultural meadow type (CUM1-1). There are a number of hedgerows that connect the Danby Woodlot to other surrounding natural areas. Human development has resulted in a fragmented natural landscape. The vegetation communities identified are considered widespread and common in Ontario and secure globally (NHIC 1997). These communities are described in **Table 1**and delineated in **Figure 3**.

Danby Woodlot - Fresh-Moist Sugar Maple Hardwood Deciduous Forest

Danby woodlot is located on the east side of York University campus south of Chimneystack Road and is approximately 2.16 ha in size. The Danby Woodlot is a mid-aged to mature forest. Some sections of the forest 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.

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. FOD6-5 is considered L5 and is a common forest type in the TRCA watershed.


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The Chimneystack Road
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FOD6-5
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North
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CUM1-1
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York Boulevard
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LEGEND

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

Vegetation Community Boundary

- CUM1-1 Dry-Moist Old Field Meadow Type
- FOD6-5 Fresh-Moist Sugar Maple-Hardwood Deciduous Forest 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 DANBY WOODLOT

LGL LIMITED
environmental research associates

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		
FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest	**Canopy:** Sugar maple (*Acer saccharum* ssp. *saccharum*) is dominant with abundant Norway maple (*Acer platanoides*), red ash (*Fraxinus pennsylvanica*) and white ash (*Fraxinus americana*). **Subcanopy:** Sugar maple is dominant with abundant Norway maple, red ash, white ash, ironwood (*Ostrya virginiana*) and common buckthorn (*Rhamnus cathartica*). **Understorey:** Common buckthorn is abundant with occasional blue beech (*Carpinus caroliniana* ssp. *virginiana*), chokecherry (*Prunus virginiana* ssp. *virginiana*), and riverbank grape (*Vitis riparia*). **Ground Cover:** Common buckthorn seedlings are dominant with abundant garlic mustard (*Alliaria petiolata*), yellowish enchanter's nightshade (*Circaea lutetiana* spp. *canadensis*) and yellow avens (*Geum aleppicum*).	• Tree cover > 60% (FO). • Deciduous trees > 75% of canopy cover (D). • Sugar Maple and other Hardwoods are dominant (6-5). • Sand, loam and clay soils that are well to poorly drained, in lower slope and bottomland positions (Fresh-Moist).
Terrestrial/Cultural			
CUM	CULTURAL MEADOW		
CUM1-1	Dry-Moist Old Field Meadow	**Ground Cover:** Tall white aster (*Aster lanceolatus* ssp. *Lanceolatus*) and yellow avens are co-dominant with abundant Red-top (*Agrostis gigantea*), Canada thistle (*Cirsium arvense*), wild red raspberry (*Rubus idaeus* ssp. *strigosus*) and Kentucky bluegrass (*Poa pratensis* ssp. *pratensis*).	• 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.

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

ELC Code	Vegetation Type	Species Association	Comments
H	HEDGEROW		
Hedgerow		**Canopy:** Bur oak is dominant with occasional American elm (*Ulmus americana*) and red ash. **Understorey:** Large-fruited thorn (*Crataegus punctata*) and common buckthorn are co-dominant with abundant red-osier dogwood (*Cornus sericea* ssp. *sericea*) and riverbank grape. **Ground Cover:** Common buckthorn is dominant.	• Cultural community • Tree cover >60%. • Bur Oak is dominant. • Mineral soil.

North Meadow and Hedgerow

The meadow has not been cut for a long period of time. As a result shrubs, such as wild red raspberry (*Rubus idaeus ssp. strigosus*), red-osier dogwood (*Cornus sericea ssp. sericea*) and tree saplings, including white ash (*Fraxinus americana*), red ash (*Fraxinus pennsylvanica*), bur oak (*Quercus macrocarpa*) and American elm (*Ulmus americana*) have dispersed from the north hedgerow and FOD6-5 vegetation community and established within the CUM1-1 vegetation community. The north hedgerow and deciduous forest wrap around the meadow providing a constant woody seed source for the meadow. As a result the meadow contains a much greater proportion of trees and shrubs on the sides that border the adjacent wooded areas. A number of tree species have been planted along the southern edge of the FOD6-5 forest within the meadow. The hedgerow consists primarily of bur oak, large-fruited thorn (*Crataegus punctata*) and common buckthorn (*Rhamnus cathartica*).

There is a wetter portion of the meadow situated in the northwestern corner that contains a higher proportion of hydrophytic macrophytes than the rest of the meadow. The northern edge is rapidly succeeding into forest with abundant young trembling aspen (*Populus tremuloides*) and swamp maple (*Acer X freemanii*) that have recently established or been planted within the meadow. A vernal pool surrounded by bur oak and fowl meadow grass (*Glyceria striata*) is situated five metres from the southern edge of the forest. Within the forest there was severe dieback of a number of previously dominant species within the canopy, including eastern white pine (*Pinus strobus*) and American elm (*Ulmus americana*).

Road and Median

In between the Danby and Boynton 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 119 vascular plant taxa have been recorded within the study area (**Figure 3**). Forty nine 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

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

In addition, the study area contains nine plant species that are considered rare to uncommon in Toronto and one of these species is designated L1 to L3 in the TRCA watershed. **Table 2** provides a summary of regionally rare and TRCA species of concern that were identified within the Danby Woodlot and adjacent habitat

TABLE 2.
SUMMARY OF REGIONALLY RARE PLANT SPECIES

Scientific Name	Common Name	Status		Vegetation Community		
		TRCA	Toronto	FOD6-5	CUM1-1	Hedgerow
Salix nigra	black willow	L3	R3	X		X
Salix amygdaloides	peach-leaved willow		U			X
Oenothera biennis	common evening-primrose		U		X	
Toxicodendron radicans ssp. *negundo*	poison-ivy		R5	X	X	
Sambucus nigra ssp. *canadensis*	common elderberry		U	X	X	
Juncus dudleyi	Dudley's rush		U		X	
Carex tenera	straw sedge		R3			X
Carex bebbii	Bebb's sedge		U	X	X	
Carex rosea	stellate sedge		U		X	

3.2.2.1 Floristic Quality Assessment

The FOD6-5 has a moderate floristic quality index value at 24.84, indicating that this vegetation community has moderate significance and many specialized forest and facultative swamp plant species (**Table 3**). The Hedgerow and Meadow have low floristic quality index (FQI) values at 12.49 and 15.94 respectively. This indicates that these vegetation communities have low significance in terms of their native floristic composition.

Species richness in the FOD6-5 vegetation community is 119. Forty-five percent of the plant species are exotic with a sum of weediness value of -34. The plant composition within the FOD6-5 vegetation community needs some work to remove and control the invasives and to restore a more natural plant composition. Species richness in the CUM1-1 is 67. Twenty-eight percent of the plant species are exotic with a sum of weediness of -26. 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. Species richness in the hedgerow is low at 25. Twenty-eight percent of the plant species are exotic with a low sum of weediness at -13. 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 three vegetation communities are indicative of the surrounding past agricultural land use and the current neighbouring institutional land use of the fragmented woodlot.

TABLE 3.
FLORISTIC QUALITY ASSESSMENT

Vegetation Communities	Hedgerow	FOD6-5	CUM1-1
Number of Native Plants	18	65	48
Number of Exotic Plants	7	54	19
Species Richness	25	119	67
Percent Exotic	28.00	45.38	28.36
Sum of Weediness	-13	-34	-26
Mean Coefficient of Conservatism	2.94	3.41	2.66
Floristic Quality Index (FQI)	12.49	24.84	15.94
Mean Coefficient of Wetness	0.28	1.53	1.22
# of Provincially Rare Species	0	0	0
# of Regionally Rare or Uncommon Species	3	5	6

The FOD6-5 vegetation community contains relatively few regionally significant plant species at five relative to the species richness and the moderate floristic quality index value. The CUM-1 and the Hedgerow contain a decent amount of regionally significant plant species at six and three respectively relative to the species richness. Most of the regionally rare or uncommon plant species in the meadow and hedgerow are facultative and obligate wetland plant species. 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 FOD6-5 vegetation community;
- Abundant alien species with broad distributions are affecting the native plant composition, structure and function of the forest, meadow and hedgerow;
- There are several faint pedestrian/mammal trails throughout the woodland and some well-marked pedestrian trails that are widespread throughout the hedgerow and the western portion of the meadow (**Figure 3**). Recreational users burn deadfall in fire pits, bring picnic tables into the woods, dump rubbish, and introduce invasive plant species. Students make use of the berm near Keele Street and the meadow for recreational purposes;
- Noise is widespread from the adjacent roadways;
- Past tree and shrub plantings in the cultural meadow community, and the hedgerow adjacent to Keele Street and York Boulevard;
- 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;

- There were no signs of Asian Long-horned Beetle and Gypsy Moth observed, but their presence is known to occur within the York University Keele Campus (Royle *et. al.* 2009).

3.3 Wildlife and Wildlife Habitat

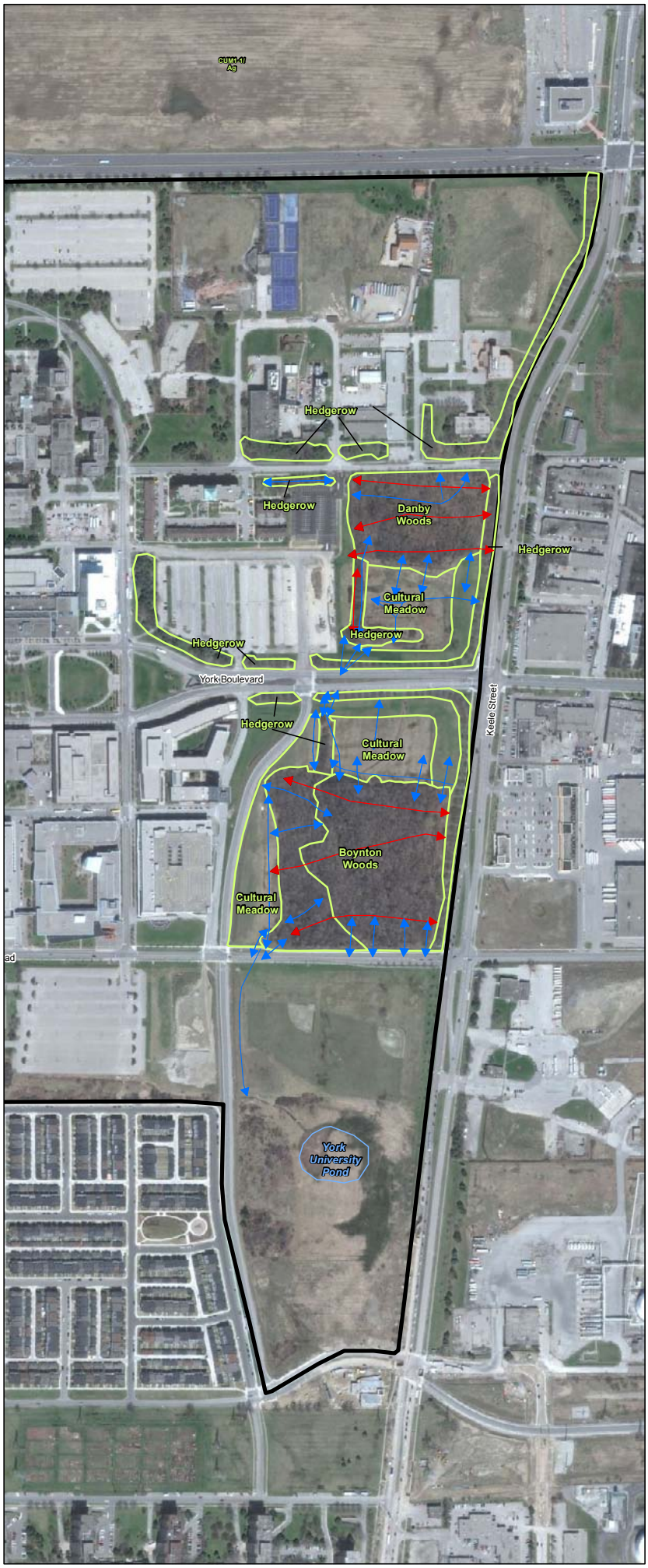
The Danby Woodlot has connection to other natural heritage features to the south within the York University Keele Campus. The Danby Woodlot is highly disturbed due to the proximity of roads on three sides of the woodlot, parking lots to the west and the frequent pedestrian traffic both on lands adjacent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

3.3.1 Fauna in the Danby Woods and Adjacent Meadow

Thirty-seven species of wildlife (33 birds and 4 mammals) were recorded within the Danby Woodlot (**Table 4**). No herpetofauna were observed. Although standing water was observed within the woodlot in the spring season, it was 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 on the south side 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. Yellow-bellied Sapsucker (*Sphyrapicus varius*) and Hermit Thrush (*Catharus guttatus*), vireos, such as Blue-headed Vireo (*Vireo solitarius*) and Warbling Vireo (*Vireo gilvus*), wood warblers, such as Wilson's Warbler (*Wilsonia pusilla*), Black-throated Blue Warbler (*Dendroica caerulescens*) and Blackpoll (*Dendroica striata*) and Emberizids, such as Lincoln Sparrow (*Melospiza lincolnii*) and White-throated Sparrow (*Zonotrichia albicollis*), were all observed feeding while moving east or west through the woodlot in migration numbers.

The woodlot appears to be an east-west 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 open meadow along its south side to the fragmented tree rows to the north and west of the woodlot (**Figure 4**). The presences of large numbers of Monarch Butterfly (Danaus plexippus) were also observed migrating through this woodlot, and the connecting meadow to the south, during the summer/fall investigation.



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	Danby Woods	CUM	COSEWIC	(COSSARO) OMNR	LOCAL (BSC/TRCA)	LEGAL STATUS (SARA (Sched.1-3); FWCA (F),(G),(P); MBCA)	BREEDING STATUS
Birds								
Anas platyrhynchos	Mallard		X			(- / L5)	MBCA	Y
Columba livia	Rock Pigeon	X				(- / L+)		N
Zenaida macroura	Mourning Dove	X				(- / L5)	MBCA	Y
Sphyrapicus varius	Yellow-bellied Sapsucker	X				(L1 / L3)	MBCA	N
Picoides pubescens	Downy Woodpecker	X				(- / L5)	MBCA	?
Colaptes auratus	Northern Flicker	X				(- /L4)	MBCA	Y
Contopus virens	Eastern Wood Pewee	X				(- / L4)	MBCA	?
Empidonax minimus	Least Flycatcher	X				(- / L4)	MBCA	N
Tyrannus tyrannus	Eastern Kingbird	X	X			(L3 / L4)	MBCA	Y
Vireo solitaries	Blue-headed Vireo	X				(L3 / L3)	MBCA	N
Vireo gilvus	Warbling Vireo	X				(- / L5)	MBCA	Y
Vireo olivaceus	Red-eyed Vireo	X				(- / L4)	MBCA	Y
Cyanocitta cristata	Blue Jay	X				(- / L5)	FWCA(P)	?
Poecile atricapillus	Black-capped Chickadee	X	X			(L4 / L5)	MBCA	Y
Catharus guttatus	Hermit Thrush	X				(L4 / L3)	MBCA	N
Turdus migratorius	American Robin	X	X			(- / L5)	MBCA	Y
Dumetella carolinensis	Gray Catbird	X	X			(- / L4)	MBCA	Y
Toxostoma rufum	Brown Thrasher	X	X			(L1 / L3)	MBCA	Y
Sturnus vulgaris	European Starling	X	X			(- / L+)		Y
Bombycilla cedrorum	Cedar Waxwing	X	X			(- / L5)	MBCA	?
Dendroica caerulescens	Black-throated Blue Warbler	X				(L3 / L3)	MBCA	N
Dendroica coronata	Yellow-rumped Warbler	X				(L4 / L3)	MBCA	N
Dendroica striata	Blackpoll Warbler	X				(- / ?)	MBCA	N
Setophaga ruticilla	American Redstart	X				(L2 / L3)	MBCA	N
Wilsonia pusilla	Wilson's Warbler	X				(- / ?)	MBCA	N
Spizella passerina	Chipping Sparrow	X	X			(- / L5)	MBCA	Y
Melospiza melodia	Song Sparrow		X			(- / L5)	MBCA	Y
Passerculus sandwichensis	Savannah Sparrow		X			(L1 / L4)	MBCA	Y
Melospiza lincolnii	Lincoln's Sparrow	X	X			(- / ?)	MBCA	N
Zonotrichia albicollis	White-throated	X				(L2 / L3)	MBCA	N

TABLE 4.
WILDLIFE LIST

Scientific Name	Common Name	Danby Woods	CUM	COSEWIC	(COSSARO) OMNR	LOCAL (BSC/TRCA)	LEGAL STATUS (SARA (Sched.1-3); FWCA (F),(G),(P); MBCA)	BREEDING STATUS
	Sparrow							
Cardinalis cardinalis	Northern Cardinal	X				(- / L5)	MBCA	Y
Pheucticus ludovicianus	Rose-breasted Grosbeak	X				(- / L4)	MBCA	?
Agelaius phoeniceus	Red-winged Blackbird	X	X			(- / L5)		Y
Molothrus ater	Brown-headed Cowbird	X	X			(- / L5)		Y
Icterus galbula	Baltimore Oriole	X				(- / L5)	MBCA	?
Carduelis tristis	American Goldfinch	X	X			(L3 / L5)	MBCA	Y
Mammals								
Sylvilagus floridanus	Eastern Cottontail		X			(- / L4)	FWCA(G)	
Sciurus carolinensis	Gray Squirrel	X				(- / L5)	FWCA(G)	
Mephitis mephitis	Striped Skunk	X	X			(- / L5)	FWCA(F)	
Procyon lotor	Raccoon	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

One fauna species recorded by LGL within the Danby Woodlot, Monarch Butterfly, is listed as Special Concern under the provincial *Endangered Species Act, 2007* and under the federal *Species at Risk Act.* It has a provincial rank of S2 (Imperiled).

Twenty-eight of the thirty-three species of birds recorded are protected under the *Migratory Birds Convention Act* (MBCA) and one species is protected under the *Fish and Wildlife Conservation Act* (FWCA). Thirteen 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 all four 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 Danby 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 Danby Woodlot.

3.3.2 Fauna in the Hedgerow

The wildlife recorded using the hedgerows along the south and west borders of the large meadow just south of Danby Woods 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 south 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 Eastern cottontails. The hedgerow along the west edge of the meadow is the most heavily used and is a direct link to the meadow on the south side of York Boulevard which leads directly to the Boynton Woodlot.

A major trail enters the southwest corner of Danby Woods from the north end of this hedgerow and branches into three travel corridors, at its south end, heading over York Boulevard and into the hedgerow along the west side of the meadow along the south side of York Boulevard (**Figure 4**).

Species at Risk

None of the wildlife species recorded by LGL within the area of the hedgerow are considered of any federal, provincial or regional significance according to the NHIC.

3.4 East Campus Precinct Proposed Development Plans

According to the York University Secondary Plan (2009) the Danby 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 will be protected, restored and enhanced.

3.5 Constraints and Impact Analysis

Efforts should be taken to minimize impacts to the Danby Woodlot mid-aged to mature forest; and associated meadow and 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 meadow. A minimum ten metre buffer should be placed around the FOD6-5 vegetation community. Hedgerows should be maintained and enhanced where possible. Connectivity between the Danby and Boynton 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 FOD6-5 deciduous forest should be used for the plantings. This will enhance the function for dispersal of wildlife and forest plants. Further native plantings within the road median would also enhance the connectivity.

3.5.2 North Hedgerow Development

A portion of the north hedgerow that is located just south of the Danby Woodlots is situated within the East Campus Precinct Proposed Development. The north hedgerow is shaped like an L and it consists primarily of bur oak, large-fruited thorn and common buckthorn (**Figure 3**). The proposed development within the north meadow will displace approximately 50 metres of the eastern most section of the north hedgerow that runs east to west. The loss of native tree and shrubs within the north hedgerow should be mitigated for by plantings trees and shrubs within a new proposed corridor that is outlined in **Section 4.0**.

3.6 Ecosystem Services

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

4.0 MANAGEMENT AND RESTORATION

4.1 Goals and Guiding Principles for the Danby Woodlot Restoration

Some guiding principles have been followed to improve the Danby 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 Danby 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 Danby Woodlot;
3. **Fragmentation** - from surrounding natural areas; and,
4. **Anthropogenic influences** – Current land use practices within and adjacent to the Danby 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 Danby Woodlot, the following management techniques are recommended to improve the habitat:

1. **Woody Plant Control** – To remove unwanted invasive woody vegetation, focusing on common buckthorn (*Rhamnus cathartica*), Autumn olive (*Elaeagnus umbellata*), Russian olive (*Elaeagnus angustifolia*), common pear (*Pyrus communis*), red currant (*Ribes rubrum*), spindle tree (*Euonymus europaea*), Norway maple (*Acer platanoides*), common privet (*Ligustrum vulgare*) and Tartarian honeysuckle (*Lonicera tatarica*);
2. **Herbaceous Invasive Species Control** - Herbicide application to remove invasive plant species that outcompete native plants, including garlic mustard (*Alliaria petiolata*), dog strangling vine (*Cynanchum rossicum*) and Dame's rocket (*Hesperis matronalis*);
3. **Hydrologic Restoration** - involves restoring historical watercourse modifications between Danby and Boynton woodlots; and,
4. **Fragmentation** – creating a 50 m wide corridor between Danby and Boynton Woodlots will help reduce the Danby 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 Danby Woodlot. **Figure 5** delineates where common buckthorn should be removed from within the Danby Woodlot and the southern 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 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, Tartarian honeysuckle, red currant, sweet cherry, common pear, Russian olive, spindle tree, Norway maple, common privet, Guelder rose (*Viburnum opulus*) and Bending wayfaring-tree (*Viburnum lantana*). 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 will 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 Danby 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 three species of ash present within the Danby Woodlot, including abundant red ash (*Fraxinus pennsylvanica*), rare European ash (*F. excelsior*) and rare white ash (*Fraxinus americana*) in the FOD6-5 vegetation community. White ash and red ash are rare in the CUM1-1 vegetation community and red ash is rare in the hedgerows.


The Chimneystack Road
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York Boulevard
bing

LEGEND

- 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.

25 12.5 0 25 Metres

N

DANBY WOODLOT RESTORATION SITE PLAN

LGL LIMITED
environmental research associates

Project:	TA8152	**Figure:**	5
Date:	March 2013	**Prepared By:**	KDR
Scale:	1 : 1200	**Checked By:**	DEB

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

> "The Canadian Food Inspection Agency (CFIA) confirmed the presence of Emerald Ash Borer in 2007 within Toronto. All ash trees in Toronto are at risk of dying from this infestation. Mortality takes between 1 to 3 years once infestation has started" (City of Toronto 2012).
>
> New pesticide application techniques and products have provided a potential new solution to Emerald Ash Borer as is described by the City of Toronto (2012):
>
> "Pesticide injection can be used to protect trees for a certain period of time, in order to provide an extended control the injection needs to be repeated every two years. Repeated injections may affect the long term health of the tree given the impact of drilling holes into the main stem. However, a study of wound response conducted on City-owned trees, showed that over 90% of injection site wounds were completely healed after 2 growing seasons."

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

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

4.2.2.2 Dutch Elm Disease Control

Dutch Elm Disease is the primary cause of mortality of all of the elm (*Ulmus*) trees. There is one species of elm present within the Danby Woodlot: white elm (*Ulmus americana*). White elm trees are found rarely within the FOD6-5 and CUM1-1 vegetation communities. It is found abundantly within the hedgerows.

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 Danby Woodlot study area, including **horse chestnut** (**Aesculus):** horse chestnut (*Aesculus hippocastanum*); **birch (*Betula*):** white birch (*Betula papyrifera*); **maple (*Acer*):** Manitoba maple (*Acer negundo*), silver maple (*A. saccharinum*), sugar maple (*A. saccharum*), Norway maple (*Acer platanoides*), and Freeman's maple (*A.X freemanii*); **poplar (*Populus*):** eastern cottonwood (*Populus deltoides*) and trembling aspen (*P. tremuloides*); **willow (*Salix*):** peach-leaved willow (*Salix amygdaloides*) and black willow (*Salix nigra*); and, **elm (*Ulmus*):** white elm (*Ulmus americana*) (Canadian Food Inspection Agency, 2006B). If any trees with signs of Asian Long-horned Beetle are encountered during monitoring; York University faculty and the Canadian Food Inspection Agency will be notified immediately.

4.2.2.4 Gypsy Moth (Lymantria dispar) Monitoring

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

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

A number of host tree species are present within the Danby Woodlot study area, including **oak (*Quercus*):** abundant bur oak (*Quercus macrocarpa*), rare red oak (*Q. rubra*), and rare planted pin oak (*Q. palustris*), which are all the Gypsy Moth's main host genus. Other host species in the Danby Woodlot study area include: **maple (*Acer*):** Manitoba maple (*Acer negundo*), silver maple (*A. saccharinum*), sugar maple (*A. saccharum*), Norway maple (*Acer platanoides*), and Freeman's maple (*A.X freemanii*); **birch Betula (*Betula*):** white birch (*Betula papyrifera*); **hawthorn (*Crataegus*):** large-fruited thorn (*Crataegus punctata*) and downy thorn (*Crataegus mollis*); **beech (*Fagus*):** American beech (*Fagus grandifolia*); **apple (*Malus*):** common apple (*Malus pumila*); **poplar (*Populus*):** eastern cottonwood (*Populus deltoides*) and trembling aspen (*P. tremuloides*); **willow (*Salix*):** peach-leaved willow (*Salix amygdaloides*) and black willow (*Salix nigra*); **cherry (*Prunus*):** sweet cherry (*Prunus avium*) and choke cherry (*P. virginiana*); **basswood (*Tilia*):** American basswood (*Tilia americana*) and little leaf linden (*Tilia cordata*) and many other tree and shrub species (Canadian Food Inspection Agency, 2006c). If any trees or shrubs with signs of Gypsy Moth are encountered during monitoring; York University faculty and the Canadian Food Inspection Agency will be notified immediately.

4.2.3 Invasive Plant Control

The following herbaceous invasive plant species should be removed: garlic mustard, dog strangling vine and dame's rocket. **Figure 5** delineates where garlic mustard should be removed either through hand pulling and/or RoundUp herbicide application within the Danby Woodlot and the North Hedgerow.

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 Danby 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 Danby 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 Danby Woodlot		
Common Name	**Scientific Name**	**Abundance and Distribution**
Common Buckthorn	*Rhamnus cathartica*	Abundant in the understory and dominant in the ground layer of the FOD6-5 and in the hedgerow.
Dog Strangling Vine	*Cynanchum rossicum*	Rare in the ground layer of the FOD6-5 and hedgerow. Occasional in the ground layer of the cultural meadow.
Garlic Mustard	*Alliaria petiolata*	Occasional in the ground layer in the FOD6-5 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 Danby 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 be looked at. Stream restoration requires coordination across ownership boundaries.

In order to accommodate future development plans within the Danby Woodlot southern meadow, the drainage swale that runs from the Boynton Woodlot into the Boynton Woodlot northern meadow should be re-aligned to the west so that it runs through the new 50 m wide corridor and parallel to the existing north to south hedgerow. This course of action would involve moving the existing culvert that is located under York Boulevard to the west to the proposed 50 m wide corridor. 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

Danby Woodlot is fragmented from the other Natural Heritage features on the York University campus. The closest woodlot is the Boynton Woodlot to the south. Danby and Boynton Woodlots are currently connected by hedgerows and cultural meadows and separated by York Boulevard. The proposed 50 m wide corridor between Danby and Boynton 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.

4.2.6 Garbage Removal

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

4.2.7 Trail Access

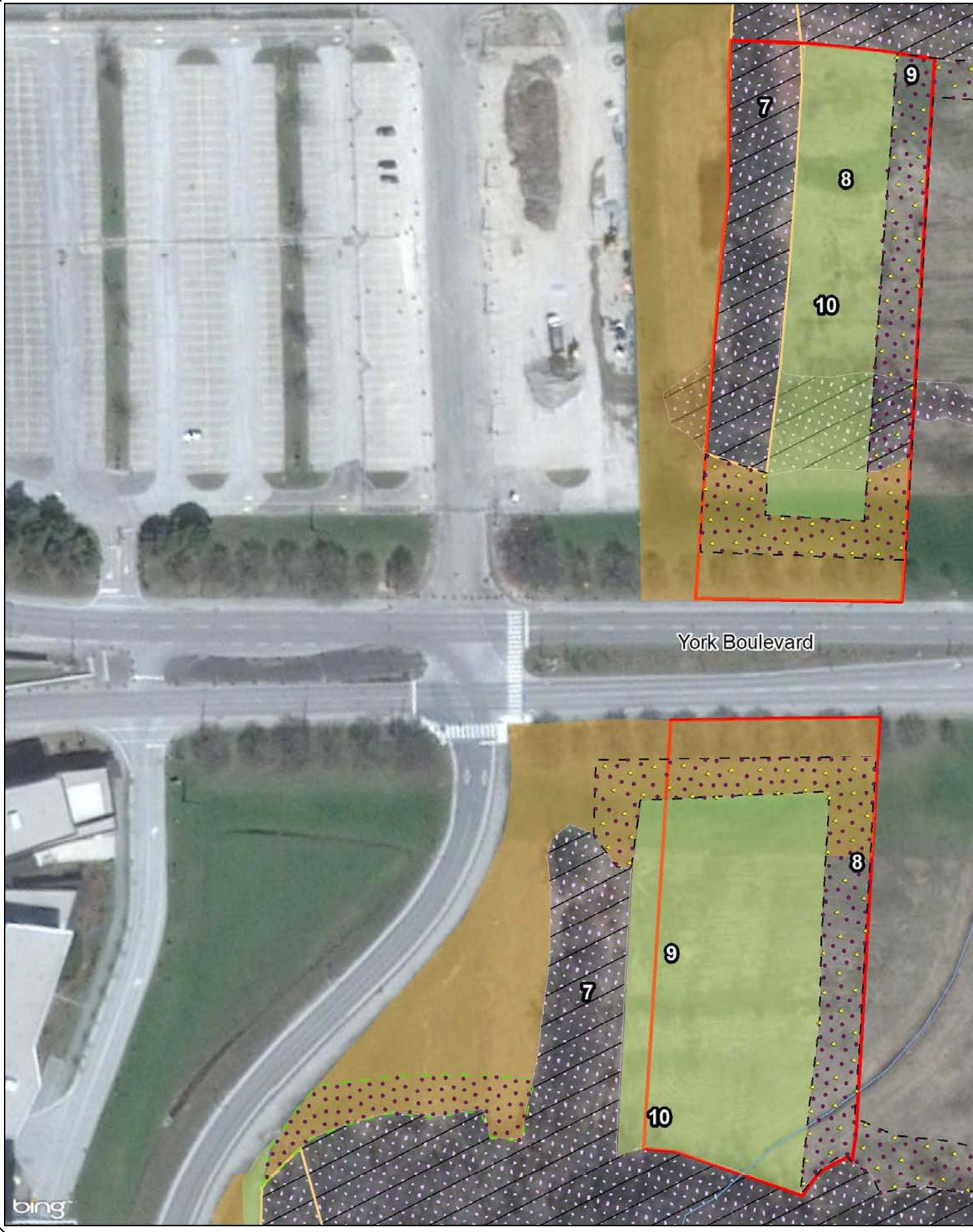
Efforts should be made to minimize anthropogenic disturbance throughout the Danby woodlot. Only University sanctioned study of the woodlot should be allowed to discourage further anthropogenic impacts to the woodlot. A 10 m buffer should be maintained on the southern edge of the Danby woodlot and the western 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 Danby tree and shrub planting area east of the existing hedgerow and south of the Danby Woodlot, which is 0.267 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 (**Figure 6**).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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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Proposed 50 m Corridor

LGL LIMITED
environmental research associates

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

Tree and shrub species will consist of a mixture of woody plants that are found within the FOD6-vegetation community.

Tree species will consist of:

1. Silver Maple (*Acer saccharinum*);
2. Sugar Maple (*Acer saccharum*);
3. Paper Birch (*Betula papyrifera*);
4. Bitternut Hickory (*Carya cordiformis*);
5. American Beech (*Fagus grandifolia*);
6. Ironwood (*Ostrya virginiana*);
7. Eastern White Pine (*Pinus strobus*);
8. Eastern Cottonwood (*Populus deltoides*);
9. Trembling Aspen (*Populus tremuloides*);
10. Bur Oak (*Quercus macrocarpa*);
11. Red Oak (*Quercus rubra*);
12. Black Willow (*Salix nigra*); and,
13. Basswood (*Tilia americana*).

Shrub species will consist of:

1. Alternate-leaved Dogwood (*Cornus alternifolia*);
2. Red-osier Dogwood (*Cornus sericea*);
3. Native Hawthorn species (*Crataegus sp.*);
4. Chokecherry (*Prunus virginiana*);
5. Staghorn Sumac (*Rhus hirta*);
6. Wild Red Raspberry (*Rubus idaeus ssp. strigosus*);
7. Peach-leaved Willow (*Salix amygdaloides*); and,
8. Common Elderberry (*Sambucus nigra* ssp. *canadensis*).

Special emphasis will 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. 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 areas to provide more cover for mammals moving between the Danby Woodlot and the adjacent hedgerows. The first is located at the northwest corner of the woodlot (0.014 ha) and the other is located in the southeast corner (0.034 ha) (**Figure 5**). Both are situated along major animal movement corridors. Shrubs should be planted on 3 m centres.

Shrub species will consist of a mixture of woody plants that are found within the FOD6-vegetation community 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. Native Hawthorn species (*Crataegus sp.*);
4. Chokecherry (*Prunus virginiana*);
5. Native Rose species (*Rosa sp.*);
6. Staghorn Sumac (*Rhus hirta*);
7. Alleheny Blackberry (*Rubus allegheniensis*);
8. Thimbleberry (*Rubus occidentalis*);
9. Wild Red Raspberry (*Rubus idaeus ssp. strigosus*); and,
10. Common Elderberry (*Sambucus nigra* ssp. *canadensis*).

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 FOD6-5 vegetation community.

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. Alternate-leaved Dogwood;
2. Chokecherry;

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

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

1. Trembling Aspen;

2. Eastern White Pine;
3. Bitternut Hickory;
4. Silver Maple;
5. Eastern Cottonwood;
6. Paper Birch;
7. Black Willow;
8. Bur Oak; and,
9. Red Oak.

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

1. Staghorn Sumac;
2. Peach-leaved Willow;
3. Wild Red Raspberry;
4. Red-osier Dogwood;
5. Common Elderberry; and,
6. 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 Planting 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 should 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 the Proposed 50 m Corridor or west of the hedgerow all the way to the parking lots (**Figure 5**). 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 southeastern edge of the woodlot on the western side of the berm. 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 as possible.

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 Danby 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 Danby 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.

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 is recommended to plant new vegetation along the south 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 Danby 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. The likelihood that there is an abundant snake population within and immediately

adjacent to the Danby 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 DANBY 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 Danby 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 Danby 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 Danby 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 Danby Woodlot for it to become self-sustaining. Ecosystem restoration in an urban environment is a commitment forever. As the York University campus grows in size the impacts will become greater unless they are managed in the future.

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

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

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

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

5.2 Monitoring Station Site Selection

Permanent photo monitoring stations should be established at six random points in the Danby 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 required to assess the status of habitat restoration efforts, species diversity and invasive plant abundance on a micro scale.

5.3 Photo Monitoring Methods

Photo monitoring should be conducted three times (mid May, mid July and mid September) at each permanent photo monitoring station location for a five year monitoring time period once the Danby 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 Danby 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 will 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 Danby Woodlot and adjacent natural lands shall be described and delineated annually. Invasive plant species monitoring and management will be necessary for a minimum of five years to help exhaust the growth of any invasive plant species present.

5.5 Faunal Monitoring

Spring surveys for wildlife in the Danby Woodlot should be carried out yearly to determine how the restoration initiatives have enhanced the woodlot. 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 DANBY WOODLOT

6.1 Goals and Guiding Principles for Danby 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 Danby 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 Danby 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 Danby Woodlot edges and associated hedgerows should be reduced to provide better wildlife corridors through the York University campus. Re-establishment of natural watercourse flow 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	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.	?	?	?	?	?	?

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.

7.0 REFERENCES

Apfelbaum, S.I. and A. Haney. 2010. *Society for Ecological Restoration International: Restoring Ecological Health to Your Land.* Island Press: Washington.

Canadian National Vegetation Classification. 2012. *Glossary*. Website available online: http://cnvc-cnvc.ca/page.cfm?page=3.Chapman, L.J. and D.F. Putnam. 1984. *The Physiography of Southern Ontario*; Ontario Geological Survey, Special Volume 2, 270 p. Accompanied by Map P.2715 (coloured), scale 1:600 000.

Crow, G.E. and C.B. Hellquist. 2000. *Aquatic and Wetland Plants of Northeastern North America. Volume One Pteridophytes, Gymnosperms, and Angiosperms: Dicotyledons.* The University of Wisconsin Press. Madison, Wisconsin.

Crow, G.E. and C.B. Hellquist. 2000. *Aquatic and Wetland Plants of Northeastern North America. Volume Two Angiosperms: Monocotyledons.* The University of Wisconsin Press. Madison, Wisconsin.

Dougan & Associates. 2001. *York University South Keele Woodlot Sustainability Study.* Prepared for York University.

Farrar, J.L. 1995. *Trees in Canada.* Fitzhenry and Whiteside Limited and the Canadian Forest Service. Markham, Ontario. 502 pp.

Flora Ontario - Integrated Botanical Information System (FOIBIS) 2006 species scientific names obtained March 2007 from the University of Guelph. Newmaster 2005.

Gleason, H.A. and A. Cronquist. 1991. *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*. New York Botanical Garden Press. New York.

Havinga, D. and the Ontario Invasive Plants Working Group. 2000. *Sustaining Biodiversity: A Strategic Plan for Managing Invasive Plants in Southern Ontario.* City of Toronto. Society for Ecological Restoration, Ontario. Ecological Outlook.

Hoffman, D.W., and N.R. Richards. 1955 (Reprinted 1990). Soil Survey of York County. Report No. 19 of the Ontario Soil Survey, Guelph, Ontario. 104 p.

Holmgren, N.H., P.K. Holmgren, R.A. Jess, K.M. McCauley, and L. Vogel. 2004. *Illustrated Companion to Gleason and Cronquist's Manual. Illustrations of the Vascular Plants of Northeastern United States and Adjacent Canada.* New York Botanical Garden Press. New York.

Irvine, D.E., K.A. Denholm and L.W. Schut. 2003. *Field Manual for Describing Soils in Ontario.* 4th edition. Department of Land Resource Science. University of Guelph.

Kaufman, S.R. and W. Kaufman. 2007. *Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species.* Stackpole Books.

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. 1998. *Ecological Land Classification for Southern Ontario: First Approximation and Its Application.* Ontario Ministry of Natural Resources, Southcentral Sciences Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. North Bay, Ontario.

LGL Limited. 2008. *York University Secondary Plan Update: Natural Heritage Report*. Prepared for York University Development Corporation.

LGL Limited. 2008. *York University Secondary Plan Update Natural Heritage Report – Addendum.* Prepared for York University Development Corporation.

LGL Limited. 2011. *Natural Heritage Impact Study: Pan American Games 2015 Athletics Stadium Track and Field Facility York University.* Prepared for York University.

Natural Heritage Information Centre. 1997. *Southern Ontario Vegetation Communities List.* Natural Heritage Information Centre, Ontario Ministry of Natural Resources. Peterborough, Ontario. Last revised January 1997.

Natural Heritage Information Centre. 2007. *Lists of Ontario Plants, Birds, Reptiles, Amphibians, Mammals, Fish and Crustaceans*. Peterborough, Ontario.

Natural Resources, Ministry of. *Natural Heritage Information Centre website* (http://www.mnr.gov.on.ca/MNR/nhic/nhic.cfm). Ministry of Natural Resources. Peterborough, Ontario.

Newcomb, L. 1977. *Newcomb's Wildflower Guide*. Little, Brown and Company. Boston, Massachusetts. 490 pp.

Newmaster, S.G. 2005. *Flora Ontario - Integrated Botanical Information System (FOIBIS) 2006* species scientific names obtained March 2007 from the University of Guelph.

Newmaster, S.G., A. Lehela, P.W.C. Uhlig, S. McMurray and M.J. Oldham. 1998. *Ontario Plant List*. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario.

Newmaster, S.G., A.G. Harris and L.J. Kershaw. 1997. *Wetland Plants of Ontario*. Lone Pine Publishing and Queen's Printer. Edmonton, Alberta.

Oldham, M.J. 1999. Natural Heritage Resources of Ontario: *Rare Vascular Plants. Natural Heritage Information Centre*, Ontario Ministry of Natural Resources, Peterborough, Ontario.

Oldham, *et al.* 1995. *Floristic Quality Assessment System for Southern Ontario.*

Ontario Ministry of Natural Resources. 2007. *Vulnerable, Threatened, Endangered, Extirpated or Extinct Species of Ontario*. Species at Risk Project. Peterborough, Ontario.

Soper, J.H. and M.L. Heimburger. 1982. *Shrubs of Ontario*. The Royal Ontario Museum. Toronto, Ontario. 495 pp.

Toronto Region Conservation Authority. 2009a. Flora Scores and Ranks.

Toronto Region Conservation Authority. 2009b. Vegetation Community Scores.

Varga, S., D. Leadbeater, J. Webber, J. Kaiser, B. Crins, J. Kamstra, D. Banville, E. Ashley, G. Miller, C. Kingsley, C. Jacobsen, K. Mewa, L. Tebby, E. Mosley and E. Zajc. 2000. Distribution and Status of the Vascular Plants of the Greater Toronto Area. Ontario Ministry of Natural Resources. Aurora, Ontario. 103 pp.

Voss, E.G. 2001. *Michigan Flora. A Guide to the Identification and Occurrence of the Naturalized Seed-plants of the State. Part I Gymnosperms and Monocots.* Cranbrook Institute of Science Bulletin 55 and University of Michigan Herbarium 1972. Edwards Brothers, Inc.

Voss, E.G. 2001. *Michigan Flora. A Guide to the Identification and Occurrence of the Naturalized Seed-plants of the State. Volume 2 Dicots (Saururaceae - Cornaceae).* Cranbrook Institute of Science Bulletin 59 and University of Michigan Herbarium 1985. Edwards Brothers, Inc.

Voss, E.G. 1996. *Michigan Flora. A Guide to the Identification and Occurrence of the Naturalized Seed-plants of the State. Volume 3 Dicots (Pyrolaceae - Compositae).* Cranbrook Institute of Science Bulletin 61 and University of Michigan Herbarium 1996. Edwards Brothers, Inc.

APPENDICES

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

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Scientific Name	Common Name	Status						FQI		Vegetation Community		
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	CUM1-1	CUS1/ H	FOD5-6
PINACEAE	**PINE FAMILY**											
Abies concolor	white fir							0	0	X		
* *Larix decidua*	European larch	G?	SE2			X	L+		5			X
Pinus strobus	eastern white pine	G5	S5			X	L4	4	3			X
CUPRESSACEAE	**CEDAR FAMILY**											
Thuja occidentalis	eastern white cedar	G5	S5			X	L4	4	-3	X	X	X
RANUNCULACEAE	**BUTTERCUP FAMILY**											
Ranunculus abortivus	kidney-leaf buttercup	G5	S5			X	L5	2	-2			X
* *Ranunculus acris*	tall buttercup	G5	SE5			X	L+		-2	X		X
Thalictrum dioicum	early meadow-rue	G5	S5			X	L5	5	2			X
BERBERIDACEAE	**BARBERRY FAMILY**											
Podophyllum peltatum	may-apple	G5	S5			X	L4	5	3			X
ULMACEAE	**ELM FAMILY**											
Ulmus americana	white elm	G5?	S5			X	L5	3	-2	X	X	X
JUGLANDACEAE	**WALNUT FAMILY**											
Carya cordiformis	bitternut hickory	G5	S5			X	L4	6	0			X
Juglans nigra	black walnut	G5	S4			X	L5	5	3			X
FAGACEAE	**BEECH FAMILY**											
Fagus grandifolia	American beech	G5	S5			X	L4	6	3			X
Quercus macrocarpa	bur oak	G5	S5			X	L4	5	1	X	X	X
Quercus palustris	pin oak	G5	S4					9	-3	X		

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		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	CUM1-1	CUS1/ H	FOD5-6
Quercus rubra	red oak	G5	S5			X	L4	6	3			X
BETULACEAE	**BIRCH FAMILY**											
Betula papyrifera	white birch	G5	S5			X	L4	2	2	X		X
Carpinus caroliniana ssp. *virginiana*	blue beech	G5T	S5			X	L4	6	0			X
Ostrya virginiana	ironwood	G5	S5			X	L5	4	4			X
CARYOPHYLLACEAE	**PINK FAMILY**											
* *Stellaria graminea*	grass-leaved stitchwort	G?	SE5			X	L+		5	X		
POLYGONACEAE	**SMARTWEED FAMILY**											
* *Polygonum aviculare*	prostrate knotweed	G?	SE5			X	L+		1	X		
* *Rumex crispus*	curly-leaf dock	G?	SE5			X	L+		-1	X		
GUTTIFERAE	**ST. JOHN'S-WORT FAMILY**											
* *Hypericum perforatum*	common St. John's-wort	G?	SE5			X	L+		5	X		
TILIACEAE	**LINDEN FAMILY**											
Tilia americana	basswood	G5	S5			X	L5	4	3	X	X	X
* *Tilia cordata*	small leaf linden	G?	SE1				L+					X
VIOLACEAE	**VIOLET FAMILY**											
Viola sororia	woolly blue violet	G5	S5			X	L5	4	1	X		
SALICACEAE	**WILLOW FAMILY**											
Populus deltoides ssp. *deltoides*	eastern cottonwood	G5T?	SU			X	L5					X
Populus tremuloides	trembling aspen	G5	S5			X	L5	2	0	X	X	X

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			GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	CUM1-1	CUS1/ H	FOD5-6
	Salix amygdaloides	peach-leaved willow	G5	S5			U	L4	6	-3		X	
	Salix nigra	black willow	G5	S4?			R3	L3	6	-5		X	X
	BRASSICACEAE	**MUSTARD FAMILY**											
*	*Alliaria petiolata*	garlic mustard	G5	SE5			X	L+		0	X		X
*	*Barbarea vulgaris*	yellow rocket	G?	SE5			X	L+		0	X		
*	*Hesperis matronalis*	dame's rocket	G4G5	SE5			X	L+		5	X		X
	GROSSULARIACEAE	**GOOSEBERRY FAMILY**											
*	*Ribes rubrum*	red currant	G4G5	SE5			X	L+		5		X	X
	ROSACEAE	**ROSE FAMILY**											
	Crataegus mollis	downy thorn	G5	S5					4	-2		X	
	Crataegus punctata	large-fruited thorn	G5	S5			X	L5	4	5		X	X
	Fragaria virginiana ssp. *virginiana*	scarlet strawberry	G5T?	SU			X	L5	2	1	X		
	Geum aleppicum	yellow avens	G5	S5			X	L5	2	-1			X
	Geum canadense	white avens	G5	S5			X	L5	3	0	X	X	X
*	*Geum urbanum*	wood avens	G5	SE2			X	L+		5	X	X	X
*	*Malus pumila*	common apple	G5	SE5			X	L+		5			X
*	*Prunus avium*	sweet cherry	G?	SE4			X	L+		5			X
	Prunus virginiana var. *virginiana*	choke cherry	G5T?	S5			X	L5	2	1			X
*	*Pyrus communis*	common pear	G5	SE4			X	L+		5			X
*	*Rubus idaeus* ssp. *idaeus*	red raspberry	G5T5	SE1							X		X

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	Rubus occidentalis	thimble-berry	G5	S5			X	L5	2	5			X
	FABACEAE	**PEA FAMILY**											
*	*Lotus corniculatus*	bird's-foot trefoil	G?	SE5			X	L+		1			X
*	*Medicago lupulina*	black medick	G?	SE5			X	L+		1	X		
*	*Medicago sativa* ssp. *sativa*	alfalfa	G?T?	SE5			X	L+		5	X		
*	*Trifolium pratense*	red clover	G?	SE5			X	L+		2	X		
*	*Vicia cracca*	tufted vetch	G?	SE5			X	L+		5	X		
	ELAEAGNACEAE	**OLEASTER FAMILY**											
*	*Elaeagnus angustifolia*	Russian olive	G?	SE3			X	L+		4			X
*	*Elaeagnus umbellata*	Autumn olive	G?	SE3			X	L+		3			X
	ONAGRACEAE	**EVENING-PRIMROSE FAMILY**											
	Circaea lutetiana ssp. *canadensis*	yellowish enchanter's nightshade	G5T5	S5			X	L5	3	3			X
	Oenothera biennis	common evening-primrose	G5	S5			U	L5	0	3	X		
	CORNACEAE	**DOGWOOD FAMILY**											
	Cornus alternifolia	alternate-leaved dogwood	G5	S5			X	L5	6	5			X
	Cornus sericea ssp. *sericea*	red-osier dogwood	G5	S5			X	L5	2	-3	X	X	X
	CELASTRACEAE	**STAFF-TREE FAMILY**											
*	*Euonymus europaea*	spindle tree	G?	SE2			X	L+		5			X

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RHAMNACEAE	**BUCKTHORN FAMILY**											
* *Rhamnus cathartica*	common buckthorn	G?	SE5			X	L+		3	X	X	X
VITACEAE	**GRAPE FAMILY**											
Parthenocissus quinquefolia	five-leaved Virginia-creeper	G5	S4?				L5	6	1			X
Parthenocissus vitacea	inserted Virginia-creeper	G5	S5			X	L5	3	3	X	X	X
Vitis riparia	riverbank grape	G5	S5			X	L5	0	-2	X	X	X
HIPPOCASTANACEAE	**BUCKEYE FAMILY**											
* *Aesculus hippocastanum*	horse chestnut	G?	SE2			X	L+	0	5	X		
ACERACEAE	**MAPLE FAMILY**											
Acer negundo	Manitoba maple	G5	S5			X	L+?	0	-2			X
Acer saccharum spp. *saccharum*	sugar maple	G5Q	S4?			U	L4	7	3			X
* *Acer platanoides*	Norway maple	G?	SE5			X	L+		5			X
Acer saccharinum	silver maple	G5	S5			X	L4	5	-3	X		X
Acer X freemanii	freeman's maple					X	LH					X
ANACARDIACEAE	**SUMAC FAMILY**											
Rhus hirta	staghorn sumac	G5	S5			X	L5	1	5	X	X	
Toxicodendron radicans ssp. *negundo*	poison-ivy	G5T	S5			R5	L4	5	-1	X		X
Toxicodendron rydbergii	western poison-ivy	G5T	S5			X	L5	0	0			X
GERANIACEAE	**GERANIUM FAMILY**											

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* *Geranium robertianum*	herb-robert	G5	SE5			X	L+?		5			X
APIACEAE	**PARSLEY FAMILY**											
* *Daucus carota*	wild carrot	G?	SE5			X	L+		5	X	X	X
ASCLEPIADACEAE	**MILKWEED FAMILY**											
Asclepias syriaca	common milkweed	G5	S5			X	L5	0	5	X		
* *Cynanchum rossicum*	dog strangling vine	G?	SE5			X	L+		5	X	X	X
HYDROPHYLLACEAE	**WATER-LEAF FAMILY**											
Hydrophyllum virginianum	Virginia water-leaf	G5	S5			X	L5	6	-2			X
BORAGINACEAE	**BORAGE FAMILY**											
* *Cynoglossum officinale*	hound's-tongue	G?	SE5			X	L+		5			X
VERBENACEAE	**VERVAIN FAMILY**											
Verbena hastata	blue vervain	G5	S5			X	L5	4	-4	X		
OLEACEAE	**OLIVE FAMILY**											
Fraxinus americana	white ash	G5	S5			X	L5	4	3	X		X
* *Fraxinus excelsior*	European ash	G?	SE2				L+					X
Fraxinus pennsylvanica	red ash	G5	S5			X	L5	3	-3	X	X	X
* *Ligustrum vulgare*	common privet	G?	SE5			X	L+		1			X
SCROPHULARIACEAE	**FIGWORT FAMILY**											
* *Linaria vulgaris*	butter-and-eggs	G?	SE5			X	L+		5	X		
* *Verbascum thapsus*	common mullein	G?	SE5			X	L+		5	X		
CAPRIFOLIACEAE	**HONEYSUCKLE FAMILY**											

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*	*Lonicera tatarica*	Tartarian honeysuckle	G?	SE5			X	L+		3			X
	Sambucus nigra ssp. *canadensis*	common elderberry	G5	S5			U	L5	5	-2	X		X
*	*Viburnum lantana*	bending wayfaring-tree	G?	SE2			X	L+		5	X		X
*	*Viburnum opulus*	guelder rose	G5	SE4			X	L+		0		X	
	DIPSACACEAE	**TEASEL FAMILY**											
*	*Dipsacus fullonum* ssp. *sylvestris*	wild teasel	G?T?	SE5			X	L+		5	X		
	ASTERACEAE	**ASTER FAMILY**											
*	*Achillea millefolium* var. *millefolium*	common yarrow	G5T?	SE?			X	L+		3	X		
	Ambrosia artemisiifolia	common ragweed	G5	S5			X	L5	0	3	X		
*	*Arctium minus*	common burdock	G?T?	SE5			X	L+		5	X		
	Aster ericoides var. *ericoides*	white heath aster	G5T?	S5				L5	4	4	X		
	Aster lanceolatus ssp. *lanceolatus*	tall white aster	G5T?	S5			X	L5	3	-3	X	X	
*	*Cirsium arvense*	Canada thistle	G?	SE5			X	L+		3	X		
*	*Cirsium vulgare*	bull thistle	G5	SE5			X	L+		4	X		
	Erigeron philadelphicus var. *philadelphicus*	Philadelphia fleabane	G5T?	S5			X	L5	1	-3	X		X
	Euthamia graminifolia	flat-topped bushy goldenrod	G5	S5			X		2	-2	X		
*	*Inula helenium*	elecampane	G?	SE5			X	L+		5	X	X	X
	Rudbeckia hirta	black-eyed Susan	G5	S5			X	L4	0	3			X
	Solidago canadensis	Canada goldenrod	G5	S5			X	L5	1	3			X

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

	Scientific Name	Common Name	Status						FQI		Vegetation Community		
			GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	CUM1-1	CUS1/ H	FOD5-6
	Solidago canadensis var. *scabra*	tall goldenrod		S5			X	L5	1	3	X		X
	Symphyotrichum novae-angliae	New England aster	G5	S5			X	L5	2	-3	X		
	ARACEAE	**ARUM FAMILY**											
	Arisaema triphyllum ssp. *triphyllum*	small jack-in-the-pulpit	G5T5	S5			X	L4	5	-2			X
	JUNCACEAE	**RUSH FAMILY**											
	Juncus dudleyi	Dudley's rush	G5	S5			U	L5	1	0	X		
	CYPERACEAE	**SEDGE FAMILY**											
	Carex bebbii	Bebb's sedge	G5	S5			U	L5	3	-5	X		X
	Carex rosea	stellate sedge	G5	S5			U	L5					X
	Carex tenera	straw sedge	G5T	S5			R3	L4	5	5			X
	Carex vulpinoidea	fox sedge	G5	S5			X	L5	4	-1	X		X
*	*Agrostis gigantea*	red-top	G4G5	SE5			X	L+	3	-5	X		
*	*Agrostis stolonifera*	redtop	G5	S5			X	L+?		0		X	X
*	*Bromus inermis* ssp. *inermis*	awnless brome	G4G5T?	SE5			X	L+	0	-3	X		
	Glyceria striata	fowl meadow grass	G5	S5			X	L+		5			
	Phalaris arundinacea	reed canary grass	G5	S5			X	L+?	0	-4	X	X	X
	POACEAE	**GRASS FAMILY**											
*	*Phleum pretense*	timothy	G?	SE5			X	L+		3	X		X
	Poa pratensis ssp. *pratensis*	Kentucky bluegrass	G5T	S5			X	L+	0	1	X		X
	TYPHACEAE	**CATTAIL FAMILY**											

APPENDIX A
WORKING VASCULAR PLANT CHECKLIST

Scientific Name	Common Name	Status						FQI		Vegetation Community		
		GRank	SRank	MNR	COSEWIC	Toronto	TRCA	FQI CC	FQI CW	CUM1-1	CUS1/ H	FOD5-6
Typha latifolia	broad-leaved cattail	G5	S5			X	L4	3	-5	X		
LILIACEAE	**LILY FAMILY**											
Maianthemum racemosum ssp. *racemosum*	false Solomon's seal	G5T	S5			X	L5	0	1			X
ORCHIDACEAE	**ORCHID FAMILY**							4	3			
* *Epipactis helleborine*	common helleborine	G?	SE5			X	L+		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

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).

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.

Common Pear (Pyrus communis) Control

Dense and thorny thickets of common pear prevent colonization of native trees and shrubs at woodland edges. Birds and small mammals eat the fruits and disperse the seeds. Tree seedlings should be hand pulled or dug up with a shovel. Larger trees can be girdled if they are in the interior of the woodlot. If the larger trees are near the woodland edge they should be cut down and painted/sprayed with Garlon (Kaufman, 2007).

Common Privet (Ligustrum vulgare) Control

Common Privet grows along woodland edges, forests, and in meadows. It is a very adaptable species that will grow in lowland and upland conditions. It can form dense stands that out compete native understorey and ground cover for space, light and water. Birds eat the fruits and disperse the seeds to forest gaps and into meadows. Seedlings can be hand pulled or dug up with a shovel. Dense stands should be cleared using a brush cutter. The cut stumps should be sprayed with Garlon immediately after cutting (Kauffman, 2007).

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

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

Norway Maple (Acer platanoides) Control

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).

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.

Spindle Tree (Euonymus europaea) Control

Spindle tree can establish dense stands that out compete native understorey plants for light and space. Birds on the fruits and disperse the seeds. Shrub seedlings are easily hand pulled when the ground is moist. Larger shrubs can be dug up by shovel. Large stands should be brush cut and the stumps should be painted with Garlon (Kaufman, 2007).

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).

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 Danby 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).

APPENDIX E
PHOTO APPENDIX

PROJECT #TA8152
November 2012

PHOTO APPENDIX E.
DANBY WOODLOT

View of the south edge of Danby woodlot.

View of the east side of the north hedgerow and the north cultural meadow.

View of the west in Danby woodlot.

View to the west of the north hedgerow.

PROJECT #TA8152
November 2012

PHOTO APPENDIX E.
DANBY WOODLOT

View of the north edge of Danby woodlot and the north cultural meadow.

APPENDIX F
ELC DATA CARDS

PLANT SPECIES LIST	
SITE:	DANBY, YORK U
POLYGON:	FO05-6
DATE:	May 30, August 1, Sept. 28/12
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.
EPINEU				R	
MAIRACE				R	
ROAGRAT				R	
PHLPRAT				O	
PHAARUN				R	
AGRSTOL				R	
CARVULP				R	
CARTENE				R	
OSTVIRG		A	O		
CARCARO	R		R		
BETPAPY	R				
QUERUBR	R		R		
QUEMACR	A	A	R		
FAGGRAN	R	R	R		
JUGNIGR	O	R			
CARCORD			O		
ULMAMER		R	R		
ROSPELT				A	
THAOCCI				R	
RANACRI				R	
RANABOR				R	
THUOCCI		R			
PINSTRO	R				
LARDECI		R			
RUBIDEA				R	
RIBCOMM			R		
PRUVIRG			O		
PRUAVIU			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
MALPUMI		R			
GEUURBA				A	
GEUCANA				A	
GEUVALP				A	
CRATONC		R	R		
RIBRUBR				R	
HESMATR				A	
ALLPETI				A	
SALNIGR	R				
POPTREM	O	O	R		
POPDELT	R		R		
TILCORD	O	O	A		
TILAMER			R		
ACENEGU		R			
VITRIPA			O	R	
PARVITA				O	
PARQUIN				O	
RHAGATH		A	A	A	
EUONUMO			O		
CORALTE			R		
CORSERI			R		
CIRLUTE				A	
ELYTRIGU			R		
ELYTUMBE			R		
RUBOCCI			R		
LONCORN				R	
LONTATA			R		
LIGVULG			R		

STAND CHARACTERISTICS			
SITE:	DANBY	POLYGON:	FO05-6
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			ACESACA > ACEPLAT = FRAPENN = FRAAMER
3	SUB-CANOPY			ACESACA > ACEPLAT = FRAPENN = FRAAMER = OSTVIR
4	UNDERSTORY			RHACATH > CARCAR = PRUVIRG = VITRIPA
5	GROUND LAYER			RHACATH > ALLPETI = CIRLUTE = GEUVALP

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%

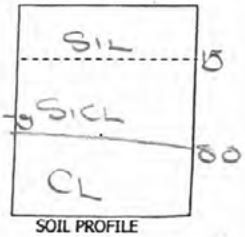
SIZE CLASS ANALYSIS

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

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

SOIL ASSESSMENT

	1	2	3	4
TEXTURE	CL			
DEPTH TO MOTTLES	g = 75	g =	g =	g =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	Ø			
DEPTH TO BEDROCK	>100			
MOISTURE REGIME	3			



SOIL PROFILE

PLANT SPECIES LIST	
SITE:	DANBY, YORK U
POLYGON:	FOD5-6
DATE:	May 30, August 1, Sept 28/12
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.
FRAMENN	A	A			
FRAPENL	R				
FRAAMER	A	A			
CYNOFFI				R	
HYDVIRG				D	
CYNROSS				R	
DAUCARO				R	
GERROBE				R	
TOXRYDB				D	
TOXRADI				R	
ACEXPAT			R		
ACESACC	O	O	R		
ACEPLAT	D	A	R		
ACESASA	D	D	A		
SAMCANA				R	
VIBLANT			R		
ERIPHIL				R	
INUHELE				R	
RHUHIRT				R	

SPECIES CODE	LAYER 1	2	3	4	COLL.
SOLCANA				R	
SOLCASC				R	
ARITRID				O	
CAMPERR				R	
CARROSE				R	

DISTURBANCE and STAND CHARACTERISTICS	
SITE:	DANBY
POLYGON:	FOD5-6
DATE:	AUGUST 1
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 / 0	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 / 0
NATURAL DISTURBANCES	**LEVEL / EXTENT**	**NATURAL DISTURBANCES**	**LEVEL / EXTENT**
DISEASE / PESTS / DEATH	1 / 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: Danby York U
	POLYGON: CUM1-1
	DATE: May 30, August 1, Sept. 25/12
	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.
ABIEBAL	R				
THUOCCI	R				
RANACRI				R	
ULMAMER	R				
QUEMACR				O	
QUEPALU	O				
BETPAPY	R				
STEGRAM				R	
PLANTE					
RUMCRIS				R	
HYPPERF				R	
TILAMER	R				
VIOSORO				R	
POPTREM	A			R	
ALLPETI				O	
BARVULG				R	
MESMATR				R	
FRAVIRG				A	
GEUCANA				A	
GEUALEP				A	
RUBIOFA				R	
MEOLUPU				R	
MEOSATI				R	
TRIPRAT				R	
VICCRAC				A	
OENBIEN				R	
CORSERI			R		
RHACATH	R			R	

SPECIES CODE	LAYER 1	2	3	4	COLL.
PAPVITA				R	
VITRIPA			R		
ACESARG					
RHUHIRT	A				
TOVRADI				R	
DAUCARO				A	
ASCSYRI				O	
CYNROSS				O	
VERHAST				R	
FRAAMER	R				
FRAPENN	R				
LINVULG				R	
VERTHAP				R	
SANCANA				R	
VIBLANT			R		
DIPFUSY				R	
ACHMILL				R	
AMBARTE				R	
ARCMINU				R	
ASTERIC				R	
ASTLANC				D	
CIRARVE				R	
CIRVULG				R	
ERIPHIL				R	
EUTGRAN				R	
INULHELE				A	
ASTNOVAE				O	
SOLCAEC				R	

STAND CHARACTERISTICS		
SITE: Danby		POLYGON: CUM1-1
SURVEYOR(S): DEB, LMC		DATE: Aug 1
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			
3	SUB-CANOPY			
4	UNDERSTORY			
5	GROUND LAYER			ASTLANC=CIRVULG=ARCMINU=SOLCAEC=PAPVITA

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%

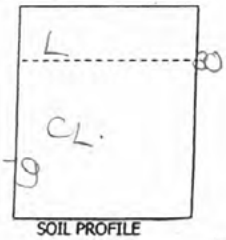
SIZE CLASS ANALYSIS

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 = 100	0 =	0 =	0 =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	Ø			
DEPTH TO BEDROCK	>100			
MOISTURE REGIME	3			



SOIL PROFILE

PLANT SPECIES LIST	
SITE:	DANBY
POLYGON:	CUM1-1
DATE:	May 30, August 1, Sept 28/10
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.
JUNIOUL				O	
CARBER				R	
TYPLATI	R				
POAPRAT				O	
PHLPRAT				O	
PHAARUN				O	
BOOLINE				R	
ACICILIA				A	
CARVULP				O	
ACSHIPP	R				

SPECIES CODE	LAYER 1	2	3	4	COLL.

DISTURBANCE and STAND CHARACTERISTICS	
SITE:	DANBY
POLYGON:	CUM1
DATE:	AUG 1/12
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 / 0	ALIEN SPECIES	1 / 0
TRACKS AND TRAILS	1 / 0	NOISE	1 / 0
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: DANBY, York U
	POLYGON: CUS1/H
	DATE: May 30, August 1, Sept 20/12
	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.	SPECIES CODE	LAYER 1	2	3	4	COLL.
THUOCCI			R								
ULMAMER	O	A									
QUEMACR	D	A	O								
TILAMER		R									
POPTREM	R	R									
SALAMYG		R									
SALNIGR		R									
RIBRUBR				R							
CRAMOLL			R								
CRAPUNC			O								
GELCANA				A							
GELURBA				A							
CORSERI			O								
RHACATH			D	D							
PARVIRA			R								
VITRIPA			O	R							
RHUHIRT				L							
DAUCARO				R							
CYNROSS				R							
FRAPENN	O	L	L								
VIBOPUL			R								
ASTLANC				R							
INUHELE				R							
PHRARUN				R							
AGRSTOL				R							

STAND CHARACTERISTICS			
	SITE: DANBY		POLYGON: CUS1/H
	SURVEYOR(S): DEB, LMC		DATE: Aug 1
	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			CRAPUNC = RHACATH > CORSERI = VITRIPA
5	GROUND LAYER			RHACATH > GELCANA = GELURBA

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%

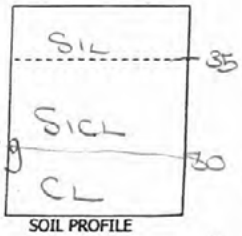
SIZE CLASS ANALYSIS

TREES		D	< 10cm	A	10-24cm	O	25-50cm	R	> 50cm
STANDING SNAGS		R	< 10cm	O	10-24cm	R	25-50cm	N	> 50cm
DEADFALL/LOGS	FIRM	R	< 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	g = 30	g =	g =	g =
DEPTH TO GLEY	G =	G =	G =	G =
DEPTH OF ORGANICS	8			
DEPTH TO BEDROCK	>120			
MOISTURE REGIME	3			



SOIL PROFILE

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

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

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

DISTURBANCE and STAND CHARACTERISTICS	
	SITE: DANBY
	POLYGON: CDBVH
	DATE: AUGUST 1
	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	0 / 0	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							