



Conservation
Halton

CONSERVATION HALTON

Landscaping and Tree Preservation Guidelines

April 2010

The following guidelines were developed for use by landscape architects and other practitioners preparing landscaping plans, restoration plans and tree preservation plans for submission to Conservation Halton. The manual identifies planting design techniques, which have been found to be effective within Conservation Halton's jurisdiction. Application of these guidelines is intended to expedite the review process. There may be individual projects and/or sites where site-specific requirements may vary from the criteria outlined in these guidelines. Pre-consultation is always encouraged regardless of the project.

*These guidelines are independent of any other Federal, Provincial or Municipal requirements. They are updated on a periodic basis and current as of **April 2010**.*

*The appendices are current as of **September 2013**.*

Please check www.conservationhalton.ca for the latest update.

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INTRODUCTION

Conservation Halton is a community based environmental agency that works with municipal, provincial and federal partners as well as watershed landowners to protect, restore and manage the natural resources in its watershed. Staff includes ecologists, environmental planners, engineers, foresters and educators along with a network of volunteers who are guided by a Board of Directors comprised of municipally elected councillors and appointed citizens. Conservation Halton is recognized for stewardship of creeks, forests and Niagara Escarpment lands through science-based services and sustainable recreation programs.

Conservation Halton implements the *Conservation Authorities Act*, and Ontario Regulation 162/06: Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation, and acts as a commenting agency under the *Planning Act* and the Provincial Policy Statement (PPS). Conservation Halton also has a Level 2 Agreement with Fisheries and Oceans Canada for reviewing impacts to fish habitat under Section 35(1) of the *Fisheries Act*. Comments by Conservation Halton regarding planting plans and tree preservation plans can in some instances be included under an Ontario Regulation 162/06 permit, as a condition of site plan approval or a subdivision agreement.

Landscaping plans are normally submitted as a condition of approval when Conservation Halton reviews an application made under the Planning Act, through Permit applications made pursuant to Ontario Regulation 162/06, and reviewed under Section 35(1) of the *Fisheries Act*. Conservation Halton also provides comments to municipalities under Conservation Halton's Memoranda of Understanding (MOU) with the Region of Halton, City of Hamilton (formerly Region of Hamilton-Wentworth), the Region of Peel, and County of Wellington. These plans are submitted for works within regulated areas, areas adjacent to natural heritage features and stormwater management (SWM) ponds as outlined in the table below:

Table 1: Review Schedule

Project Type	MOU's	Ontario Regulation 162/06	Fisheries Act Section 35(1)
Within and Adjacent to Creeks/Fish Habitat	➔➔	➔➔	➔➔
Shorelines	➔➔	➔➔	➔➔
Adjacent to Natural Heritage Features	➔➔	➔➔	
Woodland Plantings	➔➔		
SWM Pond	➔➔	➔➔	
SWM Outlets to Creeks		➔➔	➔➔
Tree Preservation Plans	➔➔	➔➔	➔➔

* In areas not regulated by Conservation Halton, comments regarding planting plans constitute recommendations to the relevant municipality.

PART ONE: LANDSCAPING

GENERAL STANDARDS

The following section outlines the general standards that should be applied to all landscaping plans regardless of their location. This section focuses on appropriate species selection, planting according to moisture zone, topsoil recommendations, stabilization recommendations, when to plant, post planting care, and drawing recommendations.

1. Species Selection

There is an ever-increasing variety of native plant species available from the nursery trade covering a broad range of application requirements. Depending on the habitat requirements for each, it is possible to select species tolerant to wetness, drought, road salt, steep slopes, trampling etc. The use of locally native, non-invasive plant species for planting plans represents an ecologically appropriate alternative to the use of non-indigenous and exotic horticultural species, particularly in a setting where plantings are intended to complement and enhance the functions of the natural environment. Seed and stock collected from within Conservation Halton's seed zone (Zone 34) are ideal for use, as they contain genetic traits that have developed through long-term adaptations by the species to local micro-climates. The impact of invasive, non-native species on natural ecosystems is considered the greatest threat to global biodiversity because the introduction of non-indigenous plant species can contribute to a decrease in species diversity, impair ecological functions, promote the spread of disease and pests, and reduce the diversity of the local gene pool. These and other impacts reduce the level of resiliency of the natural environment. For this reason, proponents are encouraged to use locally native seed and stock sources in their plans. It is recommended that plant material be sourced early to avoid unnecessary project delay.

In addition to locally native, non-invasive species, consideration should be given to the increasing threat of pests on our native flora. For example, municipalities may have restrictions on the types of species planted in their jurisdiction based on the presence of emerald ash borer or Asian long-horned beetle. Conservation Halton recommends taking this into consideration when developing a landscaping plan and refers proponents to the Canadian Food Inspection Agency webpage (www.inspection.gc.ca) to determine native alternatives that are not host species to various pests. Note that some species on this list may be rare in Halton Region, and are therefore not recommended unless they are planted under the direction of a recovery strategy. The status of these species may change over time, so pre-consultation with Conservation Halton is recommended. Consideration should also be given to the source of the stock as the transfer of these species from different regions may occur.

The following summarizes the recommended standards for plantings of trees and shrubs, ground cover, aquatic species, and species at risk and provincially rare species for landscaping plans.

a) Trees and Shrubs

TIP:
Use thorny shrubs to deter access to potentially hazardous or environmentally sensitive areas

- All specified tree and shrub material should consist of entirely native, non-invasive species that are considered indigenous to the site's respective region (Halton, Wellington, Hamilton, and Peel). Plans must include botanical names of species to be used. See Appendix 1 for a list of appropriate species.
- Cultivars are not acceptable when planting adjacent to natural areas or in stormwater management facilities. Non-invasive, non-natives may be considered in non-natural areas for sediment and erosion control and on a site-by-site basis, as determined through consultation with Conservation Halton staff.

- No single species should account for more than 20% of the total tree or shrub quantity, unless otherwise directed by Conservation Halton staff.
- Plantings should include no fewer than four tree species and four shrub species depending on the size of the area to be planted.
- Tree planting stock should include a variety of sizes and successional species to accelerate establishment of a natural vegetation structure. Requested size variations for watercourse realignments, SWM facilities and natural features are outlined in the appropriate sections below.
- Plantings adjacent to high quality vegetation communities or Environmentally Sensitive/Significant Areas (ESAs) should strive to include species representative of existing vegetation or edge habitat communities associated with the specific habitat. Early successional species should be integrated into the edge management design.
- Species selection should reflect site conditions (i.e. soil and light conditions, drainage, slope, aspect, etc.).
- Species selection should reflect natural plant associations and appropriate successional stage.
- Bioengineering measures should be used where appropriate (refer to Bioengineering Section).
- Planting plan layout should be naturalistic rather than geometric to mimic nature to the greatest extent possible.
- Cover structure and layering (groundcover, understory canopy, etc.) should be designed to maximize structural complexity.
- Larger trees (300cm in height or greater) should be used to shade permanent pools of streams and SWM ponds. Plantings should be placed immediately adjacent to pools to maximize the immediate shading and stabilizing benefits. Smaller species can be interspersed in these areas to allow for gradual growth and stabilization.
- Spreading or suckering vegetation should be set back from private property and roads a minimum of 3.0m.
- Variable age classes should be used to avoid even-aged communities.
- Trees to be transplanted within a site should be restricted to specimens under 200mm dbh.
- Non-native species (see Appendix 2) are not appropriate for transplanting or salvaging.
- All substitutions to an approved species list must be discussed and re-approved by Conservation Halton.
- When planting caliper and potted stock, rootbound individuals should have their roots loosened and splayed immediately before planting. If roots need to be pruned, only sharp tools should be used to ensure a clean cut. Pruned ends should face obliquely downwards. When planting in clay or compacted soils, the sides of the planting hole should be scarified to loosen soil and allow for ease of root growth.
- Trees should be planted at ground level, not mounded or depressed. Shrubs should be planted slightly above grade, by no more than 25mm.
- Soil within the planting hole should be loosened in order to encourage ease of root growth. Substantial rocks and large stones should be removed. No air pockets should be present during backfill.
- Vegetation should be monitored to ensure survival and replaced, as necessary.

b) Ground Cover/Erosion Control

- Erosion control methods should be executed as soon as possible to avoid additional project expenses and potential off-site effects.
- Ground cover should be applied by using an appropriate native seed mix in a nutrient-rich medium (e.g. Terraseeding,) or through the use of "sod blocks". This medium must be free of weeds and the source of the material is required.

- Consideration should be taken when choosing a distribution method for seed. Some native seed is very small and may get caught in hydroseeding slurry and not germinate. Therefore, the size of seed and hydroseeding medium (tackifier and mulch) should be appropriately paired or an alternative method (e.g. drillseeding, Terraseeding, broadcast spreading) used.
- Traditional sod is not appropriate for most situations.
- Ground cover must be specified within landscape plans, including botanical names of species to be used and percent composition of the seed mix. The method of application must be specified on the plans (e.g., hydroseeding, Brillion, broadcast spreading), as well as the application rate (kg/ha).
- Nurse crops consisting of fast growing annual grasses should be added to the mix to establish quick vegetative cover. Nurse crops potentially reduce erosion, improve soil quality and suppress weeds. Plans should include botanical names of species to be used and percent composition of the seed mix. Refer to Appendix 3 for acceptable nurse crop species.
- Planting plans for areas within or adjacent to natural heritage features must use a completely locally native ground cover, which is suitable for site conditions and blends with existing ground cover.
- Both native graminoids and wildflowers are encouraged in suitable applications.
- Species should be chosen with consideration given to the environmental characteristics (e.g. moisture regime, shade, soil type, etc.) of the site. Suitable species can be found in Appendix 1.
- Deep-rooting species are recommended in erosion control efforts and sites with steep slopes. For additional details related to sediment and erosion controls please refer to “Erosion & Sediment Control Guideline for Urban Construction” (GGHCA 2006).
- Prior to planting, all substitutions to an approved species list must be discussed and re-approved by Conservation Halton. Conservation Halton suggests that this should be taken into consideration when developing a timeline for a project.

c) Aquatic Species Selection

- Use on-site wetland seed bank from areas that have been approved for disturbance, where appropriate.
- Roadside ditch material is not acceptable for this application.
- Plant material should consist of locally native, non-invasive species.
- If plant material is sourced from an off-site location (i.e. nurseries), plans should include botanical names of species to be used.
- All substitutions to an approved species list must be discussed and re-approved by Conservation Halton.

d) Species at Risk and Provincially Rare Species

- Conservation Halton does not support the planting of any species at risk, provincially rare or locally rare species unless undertaken specifically under the direction of a recovery program. The planting of these species may lead to genetic issues as well as potential future complications for landowners by the creation of habitat for these species. Please ensure current species status is confirmed prior to submission. At the time of writing, current federal status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) <http://www.cosewic.gc.ca/eng/sct5/index_e.cfm> and current provincial status is prepared by the Committee on the Status of Species at Risk in Ontario (COSSARO) <http://www.mnr.gov.on.ca/STEL02_163859.pdf>. In addition, provincially rare species (i.e. S1 to S3 species) are ranked by the Natural

Heritage Information Centre (NHIC) <http://nhic.mnr.gov.on.ca/nhic_.cfm> and locally rare species can be found in the Halton Natural Areas Inventory (Dwyer 2006).

2. Planting According to Moisture Zone

For SWM facilities, riparian and wetland planting areas, it is necessary to consider the gradation of natural hydrologic/moisture regimes. The following five zones describe typical conditions encountered. The hydrologic/moisture zones designate the degree of tolerance plants exhibit to differing degrees of water inundation. Figure 1 and Table 1 outline these moisture zones and provide a planting guide that is suitable for these areas. Additionally, Table 1 and Table 2 in Appendix 1 summarize a list of locally native species and the appropriate zones for each species.

Figure 1: Moisture Zones (Stormwater Management Planning and Design Manual, MOE 2003).

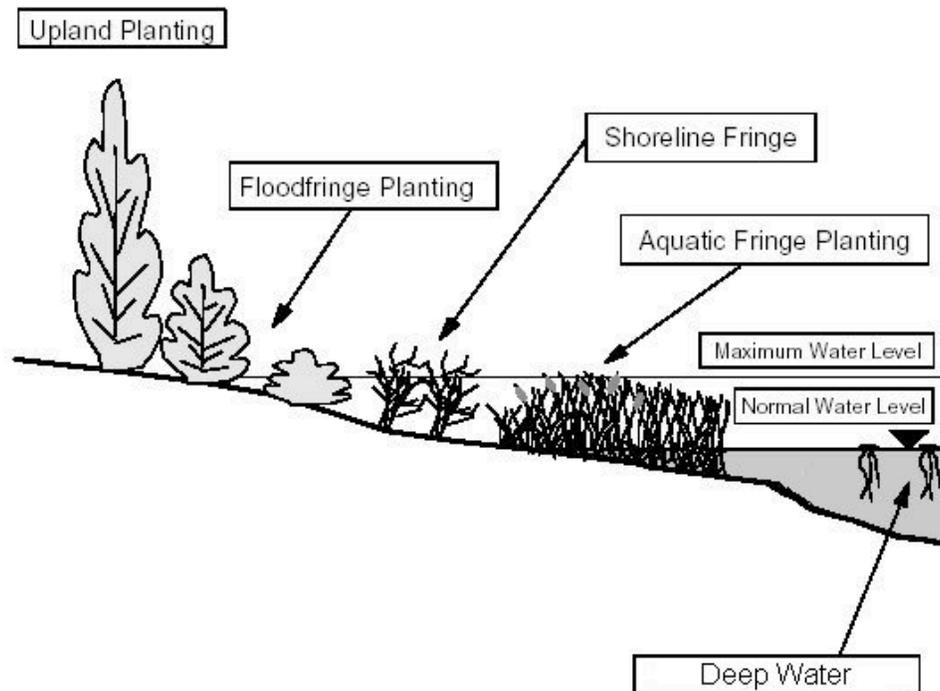


Table 2: Hydrologic/Moisture Zone Planting Guide

Moisture Zone (See Figure 1)	Recommended Planting time	Plant Form	Vegetation Layer			
			Tree	Shrub	Ground Cover	Aquatic
Upland (little to no flooding)/ Flood Fringe (infrequent flooding as a result of 1 to 2 year storms or greater)	<ul style="list-style-type: none"> ▪ Trees/Shrubs: early spring, after water levels have subsided. ▪ Grass: fall. ▪ Wildflowers: spring. 	<ul style="list-style-type: none"> ▪ Trees/Shrubs: ball and burlap, potted, bare root. ▪ Grass/Wildflower: seed. 	✓	✓	✓	
Shoreline Fringe (frequent flooding as a result of storm events)	<ul style="list-style-type: none"> ▪ Trees/Shrubs: early spring, after water levels have subsided. ▪ Grass: fall. ▪ Wildflowers: spring. 	<ul style="list-style-type: none"> ▪ Trees/Shrubs: ball and burlap, potted, bare root, live stakes. ▪ Grass/Wildflower: seed. 	✓	✓	✓	
Aquatic Fringe (water depth < 0.3m)	<ul style="list-style-type: none"> ▪ Late May to early June. ▪ Submerged plants in late spring or early summer. 	<ul style="list-style-type: none"> ▪ Sprigs, seeds, shoots or plugs. ▪ Submerged plants should be planted as mature vegetative growth. 				✓
Deep water (water depth >0.3m to 0.75m)	<ul style="list-style-type: none"> ▪ Mid to late spring. 	<ul style="list-style-type: none"> ▪ Submerged plants should be planted as mature vegetative growth. 				✓

Please refer to Table 3 for further instructions on when to plant.

3. Density of Plantings

The Halton's Regional Official Plan (2006) defines a woodland as being at least 1000 trees of any size per hectare (10 trees per 100m²), where a tree is defined as 'any species of woody perennial plant, including its root system, which has reached or can reach a height of at least 4.5m above ground at physiological maturity'. For these reasons, Conservation Halton strives to have its natural areas revegetated using specific densities that will achieve the desired function and forest cover of the area as well as providing connectivity and linkage to other natural heritage features. Appropriate planting densities for natural areas should be established through the policies and guidance included in the Subwatershed Studies and Secondary Plans. In the absence of specified planting densities in a Subwatershed Study or Secondary Plan, endorsed by Conservation Halton, the densities outlined in this guideline will be used.

At a minimum, planting densities for restoration purposes and watercourse realignments is 10 trees per 100m² and for SWM facilities is 5 trees per 100m² of the dry land area. Vegetation is an integral part of the function of SWM facilities including filtration, uptake of nutrients, stabilization of banks/slopes, mitigation of temperature and dissolved oxygen, aesthetic benefits etc. The intent is to maximize SWM function. Therefore the required tree density is less than those for other natural areas.

Regardless of the planting location, the shrub to tree ratio should be 5:1, with trees planted no closer than 2.5m on centre and shrubs planted between 0.75m and 1.5m apart.

Staff recommend that pre-consultation be initiated prior to the development of any landscaping plan in order to decrease the number of submissions required.

4. Topsoil

Topsoil should be stripped prior to grading works and stockpiled on site outside of Conservation Halton's regulated limits. Silt fencing or equivalent should be erected around the topsoil pile to prevent sediment-laden runoff from reaching watercourses and other ecologically sensitive areas. When topsoil is imported to the site, it should be tested to ensure it meets MOE standards as well as tested to determine if it contains pesticides/herbicides, its nutrient level and its quality as a growing medium.

a) Terrestrial Areas (including riparian and shoreline):

- The amount of topsoil that should be applied to a site will depend on the current site conditions as well as what is being planted and the overall intent of the planting (e.g. creation of a woodland, restoration of a prairie, etc.). A minimum depth of 0.15m of clean topsoil should be spread evenly in a continuous layer throughout the area to be seeded with groundcover, however, the amount should be determined through consultation with Conservation Halton to ensure successful planting.

b) Stormwater Management Ponds:

- The Ministry of Environment's Stormwater Management Planning and Design Manual (MOE 2003) recommends 0.30m of clean topsoil for the first 1.0m below the permanent water level along the edge of the pond. Above the permanent water level, 0.45m to 1.0m of clean topsoil in planting beds is recommended.
- Design engineer and/or supervisor should review suitability of subsoil material and compaction with landscape architect.

5. Stabilization Recommendations

a) Terrestrial Areas (including riparian and shoreline):

- Stabilize topsoil as soon as possible within the construction year's growing season – if this cannot be achieved then topsoil should not be spread until the following spring. The depth of this topsoil will have to be re-evaluated prior to planting if not stabilized immediately.
- If hydroseeding is to occur, additional topsoil is not required for groundcover, however additional topsoil for any trees or shrubs will be required.
- Stabilize topsoil prior to planting trees/shrubs – use locally native, non-invasive herbaceous seed mixes for groundcover. Biological names of species in the seed mix should be specified in the site plans.
- Depending on timing of work, additional stabilization measures (i.e. hydroseeding in combination with engineered methods such as erosion matting) may be required due to seasonal conditions (e.g. fall/winter rains).
- Biodegradable and/or photodegradable erosion matting such as jute blankets should be used for short-term stabilization. For additional details please refer to "Erosion & Sediment Control Guideline for Urban Construction" (GGHCA 2006).
- Pit and mound construction can be an appropriate topographic solution to slope stabilization when used in conjunction with a planting regime. To minimize erosion and runoff, each pit should be surrounded on four sides by a mound, and vice versa.

The varied topography and consequent microhabitats pit and mound construction creates increases the chances of plant survival, especially during drought conditions as ‘pits’ will typically contain more moisture than the surrounding mounds.

- Mulch is a useful material for keeping non-desirable species from establishing in a planted area. Mulch also reduces soil erosion and can contribute to the overall soil structure of the site. In addition, mulch can retain moisture and therefore limit the amount of watering required. Mulch can consist of chipped woody material or be decomposing organic material (e.g. compostable mulch). No more than 5cm of mulch should be applied to a site as per International Society of Arboriculture (ISA) manuals. Compostable mulch should be free from foreign objects. The Region of Halton’s compost facility is a good source of compost since they require that all material be free of plastics.
- If watering plant material after applying mulch, care should be taken to ensure that water penetrates through the mulch and reaches plant roots within the soil.
- If the season permits, plant material should be installed soon after construction and/or site preparation is completed. Native perennial grass species are particularly useful for soil stabilization as many species put out dense root systems. Consultation with a landscape architect, environmental consultant, or Conservation Halton staff is encouraged in order to select appropriate species for site conditions.
- Many native grass, sedge and rush species are appropriate for soil stabilization on wetland edges. Plugs or potted stock will deliver more immediate, effective results than plants grown from seed.

b) Aquatic Areas:

- Plant cattails (*Typha latifolia*) and pioneer rush and bulrush species, (such as *Juncus effusus*, *Juncus torreyi* and *Scirpus cyperinus*, for example) as interim vegetation in the sediment forebay to aid in sediment trapping (Note: it is recognized that this material will be removed with sediment clean-out prior to assumption).
- Choose fast-growing native species for initial plantings in order to maximize soil stabilization and vegetation cover. Planting a diversity of species is encouraged; the species mentioned above are not an exhaustive list. Refer to the plant list in Appendix 1, Table 1. Consultation with conservation Halton is encouraged.

6. When to Plant

The following table outlines the appropriate time to plant various vegetation types.

Table 3: When to Plant New Stock

Vegetation Type	Material Type	Time of Year (April to November)							
		Apr.	May	June**	July**	Aug.**	Sept.	Oct.	Nov.
Trees & Shrubs	Bareroot stock	■	■						
	Container Grown, Potted, Ball and Burlap	■	■	■	■	■	■	■	■
Seeds	Nurse Crop	■	■	■	■	■	■	■	
	Dormant Wildflower Seed		■	■	■				
	Dormant Native Grass Seed							■	■
Herbaceous Plants	Seedlings, Plugs			■	■	■	■	■	■

*When transplanting trees and shrubs, it is recommended that deciduous trees be transplanted in the fall after leaves drop or in the spring before the leaves come out, while conifers should be planted in the spring.

**Caution should be used when planting during the typical high temperature summer months due to the need for additional watering, which may be problematic if a source is not readily available.

7. Creating Habitat

a) Topographic Diversity

- A fundamental characteristic of ecosystems is that biological complexity and diversity requires habitat complexity. Structural complexity creates an array of microhabitats that provide for the needs of an assortment of species.
- The proponent could consider incorporating small pocket wet meadow/wetlands within the newly graded areas which would aim to provide greater variety in terrestrial habitat, short term water retention and in some locations, a more natural flood plain form. The plan form of these wetland features could be designed to mimic hummocky features or varied microtopography. The features could also be designed to mimic the form of oxbows found in nature providing additional variability and micro-habitat.

b) Brush Piles

- Woody debris on the ground is an important component of wildlife habitat. Small piles of brush can provide hiding cover and denning sites for small mammals. These piles should be 1 to 2m in height, 3 to 5m in width and 5 to 10m in length.

- These piles should consist of cut limbs of trees and shrubs and larger logs.
- Prior to installation, brush pile locations should be reviewed with staff.

c) Hibernacula

- As the creation of hibernacula is rather involved and not easily created, if a hibernaculum is proposed for a site, consultation with Conservation Halton staff should be completed at detailed design.

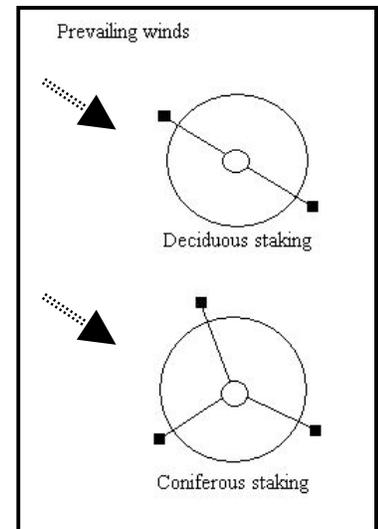
d) Perching Trees for Raptors

- The retention of tall trees for perching especially in areas where there is suitable foraging habitat nearby is recommended. Trees should be de-limbed and left standing as snags for other wildlife habitat as well.
- The location of perching trees should be discussed with staff to ensure appropriate locations are selected.

e) Instream Habitat (Refer to Bioengineering Section for more information.)

8. Post-Planting Care

- Vegetation monitoring plans should be included with all landscape plan submissions. This should include monitoring of the performance and effectiveness of interim measures (e.g. nurse crops) and monitoring of plant health during droughts.
- Monitoring and watering activities should continue for two years after planting to ensure survivability.
- Mulch saucers should be placed and maintained around the base of trees to retain water.
- Tree protection measures such as rodent guards should be used and removed at the appropriate time after planting.
- All caliper trees should be staked and tied in order to prevent uprooting in high wind conditions. Ties should consist of tree ties, or galvanized wire in conjunction with protective material at the point of contact with the tree trunk. Stakes should be placed outside of the rootball so as not to damage the roots of the tree. Ties should hold the tree firmly in place while being loose enough to allow some *gentle* swaying of the trunk, and should not come into contact with branches. Deciduous trees should have two stakes each, placed parallel to prevailing winds. Coniferous trees should have three stakes each placed in an equidistant tripod, with one point of the triangle facing away from the prevailing winds. The stakes should be placed in the ground at an angle, with the tops of the stakes meeting at the trunk of the tree and secured with rope or tree ties. Tree stakes and ties should be removed between one and two years after planting. Stake and tie removal should be specified in the planting plans.
- All dead or damaged tree and shrub branches should be pruned with sharp tools only.
- Prior to the end of the warranty period from the nursery, mortalities should be inventoried and replaced.



9. Submission and Drawings

- A qualified professional (i.e. landscape architect in good standing in their association) must complete planting plans.

- Planting details illustrating non-chemical rodent protection, mulching, and staking should be included with landscape designs.
- Botanical names and quantity must be listed for all species. Seed mixture composition must include the percentage of species being used as well as botanical names for all species.
- Extent of disturbed area must be shown on all drawings.
- Areas of retention and/or species to be protected should be illustrated on all drawings. Refer to Tree Preservation Plans section for more information.
- A summary table providing the calculations for the total plantable area for the areas to be vegetated (excluding any infrastructure such as trails), and the total number of trees and shrubs proposed for planting, should be included in each submission to expedite the review process and ensure more accurate density calculations. Calculations must be in metres squared.
- Existing watercourse(s), banks, valley slopes and existing vegetation must be shown on all drawings.
- Key plan to include project name and location, name and contact information for applicant/owner and landscape architect.
- A copy of the invoice for stock material that identifies the composition of seed mixes and source must be submitted prior to application.
- Drawings should be folded to standard letter size (8 1/2" x11").
- Following construction, a certified letter from the landscape architect should be submitted confirming that plans were implemented as proposed. Discrepancies between the proposed and as-built plans should be noted and rationale behind the changes should be explained. In the case of significant deviation from the approved plans, remediation may be required.
- The Landscaping Checklist, signed by the Landscape Architect, must be included as part of any submission. Submissions will be considered incomplete if this checklist is not filled out. Please refer to Appendix 6 for a copy of this checklist.
- For all resubmissions, a cover letter outlining the changes to the revised landscaping plan must be included. This will expedite review of the plans.

REALIGNED WATERCOURSE STANDARDS

Plantings associated with realigned watercourses are reviewed with respect to stabilizing the side slopes and floodplain of the creek block, preventing erosion on meander bends, and enhancing fish and wildlife habitat, as well as the natural heritage system. To accomplish this, the watercourse standards apply to the entire width of the creek block, including floodplain, side slopes and setbacks (excluding trails).

In addition to the General Standards, the following criteria should be used along watercourses to provide direct and indirect fish habitat and contribute to the overall integrity of the watercourse (including stream realignments, erosion control works, stream enhancements etc.):

- The proponent must consider plantings to provide both general and species-specific fish habitat as appropriate. Pre-consultation with staff is recommended to determine the requirements prior to submission.
- It is recommended that the following percentages be used to determine the amount of each size to plant:
 - 10% caliper, balled and burlap and/or wire basket material.
 - 50% whip and/or saplings.
 - 40% seedling and/or plugs.

Please note that the above terms are based on those provided in the Canadian Standards for Nursery Stock, Eighth Edition or as amended (CNLA 2006). Should different terminology be used, it is required that the source of the definition be provided. The above are general percentages and variations to these numbers may be considered on a site by site basis.

- Vegetation should provide shade on 60-80% of the surface of coldwater streams. Tree and shrub plantings should be provided within the first metre adjacent to the creek to maximize the benefit of shading and instream habitat. In some cases where sediment fencing is present adjacent to the creek, plantings should be up to the watercourse edge.
- Bioengineering, root wads, etc. along banks is encouraged (refer to Bioengineering Section).
- Ground cover application should generally occur through the entire cross-section for intermittent channels and to the approximate bank full limits for permanent channels.
- Topsoil should be tapered to a skim layer near the bottom of the bank or low flow limits.
- For additional details on sediment and erosion control practices please refer to “Erosion & Sediment Control Guideline for Urban Construction” (GGHCA 2006).

STANDARDS ADJACENT TO NATURAL AREAS

Plantings adjacent to natural areas are important to preserving the health of the natural area, especially when the adjacent land use is altered. Rehabilitation of these adjacent areas is integral to a fully functioning natural heritage system (EC 2004). Plantings adjacent to natural areas can increase the amount of interior forest habitat, provide transitional habitat for wildlife, reduce stress to the natural area, and create a barrier to the movement of exotic species. These are referred to as buffers; natural vegetated zones or strips adjacent to natural areas. Natural areas in these guidelines refer to all wetlands, Significant Woodlands, Significant Valleylands, Life Science Areas of Natural and Scientific Interest, Environmentally Sensitive Areas or those areas prescribed in an approved Subwatershed Study, Environmental Impact Study or similar. A naturally occurring buffer around a natural area will be considered within these planting guidelines and may reduce the density and size requirements for planting. This will be determined on a site by site basis and as long as existing buffers are not disturbed during any phase of construction.

In addition to the General Standards, the following criteria should be used when landscaping adjacent to natural areas to ensure appropriate species are being planted and to contribute to the overall integrity of the natural area:

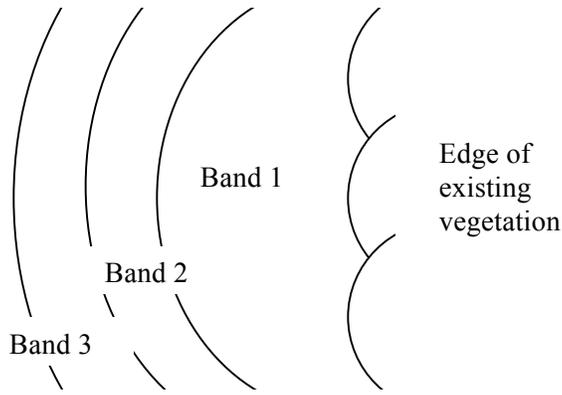
- Wildlife habitat should be included where appropriate [i.e. use plant species that provide a source of food for wildlife (see Appendix 1, Table 2), construct brush piles, hibernacula, perch trees].
- Use contours to create microhabitats, where appropriate.
- Provide winter habitat for wildlife by clumping conifers and using small shade tolerant conifers as understorey among deciduous trees.
- Rodent protection and other tree protection measures should be implemented after planting to ensure survival. These must be removed at the appropriate time to prevent girdling of the species.
- Restoration of disturbed areas will be looked at on a site by site basis, given that each site will have specific requirements in determining what will be suitable for restoration.

Natural areas vary in type and quality throughout Conservation Halton's watershed. In recognition of this a variety of planting guidelines are recommended below. These are based on the most commonly prescribed buffers requirements in this watershed. Buffers for other natural areas, such as meadows, will be reviewed on a site by site basis. Width of buffers, which generally speak to the protection of the quality of a natural area, will not be addressed in this document.

Woodlands/Forests/Treed wetlands

- It is recommended that the following percentages be used to determine the amount of each size to plant:
 - 5% caliper, balled and burlap and/or wire basket material.
 - 50% whip and/or saplings.
 - 45% seedling and/or plugs.
- The minimum planting densities will be broken down into three bands as follows (see Figure 2):
 - Band 1 represents the portion of the buffer immediately adjacent to the natural area. This should be planted with a tree density of 5 trees per 100m² following the size guidelines indicated above. Shrubs should also be planted in this band at a shrub to tree ratio of 5:1.
 - Band 2 represents the portion of the buffer that occurs between band 1 and 3. This should be planted with a density of 3 trees per 100m² following the guidelines indicated above. Shrubs should also be planted in this band at a shrub to tree ration of 5:1.
 - Band 3 represents the portion of the buffer immediately adjacent to the development. This should be planted with a ground cover mix as prescribed in the General Standards section of this document.
- The width of Band 1 should be a minimum of 5m or half the width of the buffer, whichever is greater. The final width of this and each of the remaining bands will be determined on a site by site basis and will vary depending on the quality of the natural area to be buffered.
- Proposed trails should generally be located beyond the limits of Band 1.
- Caliper trees assist in the rapid development of the canopy and as trees this size are more tolerant of vegetation competition (Daigle and Havinga 1996).

Figure 2: Band Designations for Buffers Adjacent to Woodlands/Forests/Treed Wetlands.



Shrub wetlands

- It is recommended that a density of 25 shrubs/100m² be required within a band immediately adjacent to the natural area.
- This would transition along a gradient with a mix of ground cover species planted adjacent to the development.
- The width of these two bands will be determined on a site by site basis and will vary depending on the quality of the natural area to be buffered.

Herbaceous wetlands

- As with all natural areas, encroachment into the area from new adjacent land uses can be extensive (Matlack 1993). Therefore shrub plantings are recommended adjacent to herbaceous wetlands.
- A density of 15 shrubs/100m² should be planted in a gradient with the majority of shrubs located adjacent to the remaining natural area. A secondary band of herbaceous cover should be planted adjacent to the proposed development.
- The width of these two bands will be determined on a site by site basis and will vary depending on the quality of the natural area to be buffered.

Conservation Halton recognizes the variability of ecological community types that might be classified as natural areas. Therefore the details provided above pertain to woodlands, forests, treed wetlands, shrub wetlands and herbaceous wetlands, as these comprise the majority of natural areas that require adjacent landscaping. Landscaping adjacent to all other ecological community types will be dealt with on a site by site basis.

STORMWATER MANAGEMENT FACILITY STANDARDS

Ministry of Environment's Stormwater Management Planning and Design Manual (2003) identifies plantings as a feature that contributes to the proper functioning of SWM ponds. Appropriate planting within SWM facilities also prevents the release of sediment into local creeks and tributaries by stabilizing the side slopes of the pond. If not addressed, sediment release can have detrimental effects on fish and fish habitat present in the creek to which the pond outlets.

SWM facilities and their associated vegetation perform many functions including: receiving runoff from developed lands; holding excess water during storm events; reducing the exchange of sediments and toxins into watercourses; contributing to groundwater recharge; and reducing water temperatures. Appropriate species selection for these areas is critical for long-term survivability of the vegetation and function of the facility.

SWM facility plantings are not intended to contribute to wildlife habitat, however, habitat may be indirectly created as a result. The potential toxic nature of these facilities may negatively affect the health of wildlife including birds, aquatic insects, amphibians, turtles, fishes and small mammals. Providing habitat enhancement materials (e.g. bird houses, bat boxes etc.) in and around SWM ponds is discouraged. Introductions of domestic pets (e.g. gold fish, turtles) and non-native aquatic plants are also discouraged.

SWM facilities are routinely maintained (e.g. dredging of collected sediment) in order to sustain the water quality and quantity functions for which they were designed. These activities are not conducive to continual use by most aquatic wildlife.

In addition to the General Standards, the following criteria should be taken into consideration.

- Signage in the SWM pond area is recommended, indicating the purpose of the pond and that there should be no mowing of vegetation.
- Tree planting stock should include a variety of sizes and successional species to accelerate establishment of a natural vegetation structure. It is recommended that the following percentages be used to determine the amount of each size to plant:
 - 10% caliper, balled and burlap and/or wire basket material.
 - 50% whip and/or saplings.
 - 40% seedling and/or plugs.

Please note that the above terms are based on those provided in the Canadian Standards for Nursery Stock, Eighth Edition or as amended (CNLA 2006). Should different terminology be used, it is required that the source of the definition be provided. The above are general percentages and variations to these numbers may be considered on a site by site basis.

- To reduce thermal warming, shade southern exposure of pond, inflow and outflow channels whenever possible. Consideration should be given to planting a portion of the required caliper species on the south side of the pond.
- A minimum of four aquatic plant species should be included.
- Aquatic species should include at least one species of submergent or floating-leaved plant, and at least one species of robust, broadleaved or narrow-leaved emergent.
- Ground cover must include no-maintenance, non-invasive species with locally native herbaceous species and grasses.
- Aquatic plants should be planted in groupings and spaced 0.5m to 1m apart and cover 40% (at full growth) of the area defined by the normal water level up to 0.75m deep.

TIP:
Geese use water as an escape route from predators. Planting dense shrubs around the perimeter of the pond will deter geese from the area, as their line of sight to the water will be obstructed.

- Provide cattails (*Typha latifolia*) as interim vegetation in sediment forebay to aid in sediment trapping (NOTE: it is recognized that this material will be removed during sediment dredging operations). Plantings of cattails should be limited to areas away from maintenance access areas. Other aquatic species should not be planted in the sediment forebay as they may be less likely to re-colonize following dredging. *Typha latifolia* should be used instead of *T. angustifolia* or *T. x glauca* which are invasive and non-native. The latter seed prolifically and can spread even from temporary detention areas to adjacent natural areas. *Typha latifolia* seeds germinate and grow extremely rapidly and can be directly sown onto sites.
- Protection from waterfowl may be required. Dense shrubby vegetation placed close to the permanent waterline will help to discourage loafing and nesting geese, however, protection of planting nodes may also be required.
- A two year guarantee of the planted material is required.

BIOENGINEERING TECHNIQUES

The following does not constitute a standard, specification, or regulation, rather it is a brief summary of some soil bioengineering techniques. Conservation Halton recommends coordinated efforts between qualified engineers, landscape architects, fluvial geomorphologists, biologists and hydrologists when determining an appropriate bioengineering approach for streambank stabilization. Refer to Ontario Stream Rehabilitation Manual (Heaton et al. 2002).

In-stream habitat for fish is comprised of a variety of components including riparian and in-water vegetation. Vegetation is an extremely important factor in providing basic needs for fish and wildlife. Not only does it provide soil and bank stability, but it also provides food, cover, habitat complexity, temperature control and water quality benefits.

Soil bioengineering is an established method of stabilizing or protecting erodible soils through the use of dormant cuttings of hardy, native plant material. Structures provide immediate mechanical stability whilst a vigorous root matrix is established within the soil. As the stabilization is provided by living vegetation, reinforcement provided grows stronger and more effective over time.

In addition to providing fish habitat, living “structures” are beneficial as they are attractive, cost effective, and materials are readily available and easy to plant. Although some initial maintenance may be required, once vegetation is established it will generally become self-sustaining through re-growth (Bentrup and Hoag 1998). Before contemplating bioengineering for streambank stabilization, various aspects need to be considered. Existing landscape (topography and vegetation), site stability, causes of erosion, soils, hydrology, fluvial geomorphology, sunlight availability and climate are some of the factors that should be considered when designing a project (Allen and Leech 1997, Bentrup and Hoag 1998).

Once soil bioengineering has been determined to be appropriate, the type of application should be determined. The following are various techniques that may be used independently or in combination with one another.

Live Staking: Cuttings from live, rootable woody species should be approximately 1 to 4cm in diameter and 50 to 100cm in length (USDA-NRCS 1992). Side branches should be removed and the basal end should be cut on a 45° angle. Stakes should be tamped into the ground at right angles with dead blow hammers ensuring no damage occurs. Rooting ends of live stakes should be inserted into the hyporheic layer. Stakes should protrude approximately 10cm above the ground and should be compacted firmly with soil (Harrington 2007).

Stakes should be installed so that 80% of the length of the stake is located underground, while 20% of the length of the stake is located aboveground. Live stakes are typically used at non-complicated sites or to enhance other bioengineering techniques (e.g. live fascines).

Live Fascines: A collection of native riparian shrub live cuttings bound together in a cylindrical formation. Bundles should be placed in shallow contour trenches running parallel to stream flow (ODNR 2007) such as at the bank-water interface or toe of slope. Live fascines are typically applied to control erosion associated with over-bank run off and are secured with live stakes.

Brush Layer: Involves the placement of cuttings perpendicular to the slope n excavated benches on the slope. Brush layers effectively separate the slope length into a series of shorter slopes, protecting the bank from runoff erosion (USDA-NRCS 1992). Cut ends are placed in the bank, ideally within the hyporheic zone while the leafing ends should protrude slightly from the finished bank slope once they have been final graded.

Live Crib Wall: Interlocking box-like arrangement of timber backfilled with soil and containing layers of brush cuttings and live stakes between the logs. Live crib wall is an effective technique for stabilizing the toe of slope in areas of higher velocity where a more vertical solution is required e.g. up to 50cm (USDA 1992).

Collection of Materials

- Cuttings should include regionally native, non-invasive species that root easily from cuttings (Appendix 3). Rooted stock may also be considered for bioengineering projects.
- Cuttings should be free of disease and insect infestations and collected in the dormant season, after leaves have dropped in the fall and before buds break in the spring (Bentrup and Hoag 1998). Harvesting and planting in a non-dormant state will decrease the survival of cuttings (Allen and Leech 1997).
- Cuttings should be obtained from dormant plants (between November and March) so the plant's energy will be directed towards root growth rather than leaf growth.
- Cuttings should be stored and transported in a dark, cool and moist state, and if stored for longer than 12 hours, leave cut ends submerged in water (Harrington 2007).
- Cuttings should be species approved and identified by a qualified botanist.
- Planting should ideally take place within 24 hours of cutting, or up to a maximum of 72 hours (ODNR 2007, Harrington 2007).
- Planting should be in the fall or late winter to allow for some rooting before spring floods, but may occur in the early spring if water levels are not expected to be above normal flows.
- Moist, excavated soil should be used for backfilling. Backfill should be firmly compressed to eliminate all voids, ensuring contact with plant material to promote rooting. Topsoil is preferred over clay soils to improve the rate of success of establishment.

SHORELINE RESTORATION

Shoreline plantings provide a challenging opportunity due to the extreme conditions that are present along the Lake Ontario shoreline. Due to this harsh environment, bank stabilization behind the shoreline protection works should be discussed with a qualified coastal and geotechnical engineer as the suggested vegetation plantings and species are not suitable for use in bioengineering and stabilization works alone. Appendix 5 provides a list of species that are suitable for planting along the shoreline. These species are typically resistant to wind, tolerant to sun and fluctuating water levels.

It is essential that ground cover be considered in the planting plan. Exposed areas are subject to erosion via wind and rain. Ground cover can protect these areas to prevent topsoil loss and sediment release into the water. Ground cover should consist of locally native, non-invasive grasses and wildflowers. Trees should be planted a minimum of 2.5m apart on centre. Shrubs can be spaced 0.75 to 1.5m apart. Please consult Appendix 5 for suggested species.

The Problem with Geese

Canada Geese are protected by law under the *Migratory Birds Convention Act* however they can be a nuisance in some areas. They are typically found grazing near shorelines, beaches, and other open grassed areas near water. Canada Geese use water as an escape route from predators. To deter geese from settling in an area it is essential to create a visual barrier between the geese and their escape route. This can be accomplished by planting a dense swath of vegetation along the waters edge. Plantings should include at minimum a dense shrub layer. Along Lake Ontario taller plantings (taller shrubs and trees) may also be required. A low fence (30 – 60cm high) located within the shrubs plantings may also restrict goose access to and from the water.

For more information on controlling Canada Geese please contact Canadian Wildlife Service Ontario Region online at www.on.ec.gc.ca/wildlife.

PART TWO: TREE PRESERVATION PLANS

Successful tree preservation begins at the **start** of a project and continues through the design (Matheny and Clark 1998). The following are minimum standards that are required for Tree Preservation Plan submissions. Staff recommend that the appropriate municipality be contacted to determine if there will be Tree-cutting By-law requirements.

General Guidelines

- Tree Preservation Plans should be submitted with the draft plans.
- The plan must identify a configuration for the site plan/subdivision, which maximizes tree preservation potential.
- The tree protection zone should extend at least 1m past the dripline.
- Tree protection fencing should consist of posts and t-bars with paige wire fencing and filter cloth (or similar).
- Vegetation inventory must be completed including species, size, location, biological condition (noting potential stresses), presence of rare or significant species, etc. All species greater than 15cm diameter at breast height (dbh) must be illustrated on the plans.
- Collection of colour photographs should be prepared showing typical seasonal appearance of natural features in undisturbed areas of the woodland, potential hazards (e.g. dead trees, debris, etc.), drainage features, and other features of interest.
- Dominant soil types within the natural area should be classified.
- Where an Environmental Impact Study has not been completed, ecosystem function should be identified including specialized habitat and the function/importance of the woodland within a landscape context.
- Mitigation and compensation measures should be discussed in the submission.
- Trees larger than 15cm in diameter which are proposed to be removed but are physically sound and do not pose a hazard to pedestrians or residents and are outside of the construction limits should be de-branched of lower limbs and topped, and left standing in place at 3m in height or more for wildlife habitat where possible. This should also be considered for standing dead wood.
- Branches and logs should be left in place to provide wildlife habitat.
- Tree clearing and canopy management should be conducted during the dormant season when possible.
- Transplanted stock should be restricted to specimens under 200mm dbh and should only be considered for locally native, non-invasive species. Invasive species are not suitable for transplanting (see Appendix 2).
- Where woody vegetation is proposed to be removed adjacent to the creek, rooting systems should be left as much as possible in the ground to maintain the soil cohesion provided by the trees and instream habitat potentially provided by instream roots.
- Monitoring should occur to identify if any existing or new tree related problems arise during the construction. Further monitoring may be required post construction.
- There may be municipal requirements that need to be addressed in conjunction with preparing the tree preservation plan (e.g. tree cutting by-law requirements).

Tree Preservation Drawings/Reports

- A qualified professional (i.e., certified arborist, consulting arborist or landscape architect) must complete the tree preservation plans.
- The dripline of existing individual trees and/or woodlands should be shown to scale on the plan.

- Trees must be accurately located on all plans.
- Trees to be removed or preserved should be clearly indicated and labelled on the plans.
- Size, health, species (including botanical name) and justification for removal should be included for all trees to be removed.
- Size, health, and species (including botanical name) should be included for all species to be preserved.
- Plans must show details indicating how existing species will be protected during construction (e.g. t-bar and paige wire fencing, etc).
- Existing vegetation may potentially be considered when determining the amount of vegetation required. Therefore remaining vegetation should be detailed on the drawings.
- Protection fencing should be placed a minimum of dripline plus 1m. Protection fencing and sediment controls must be removed from the site once construction is complete and the site has stabilized.
- Plans must include the proposed site plan/subdivision layout and limits of all grading.

Edge Management

- Details regarding edge management are required for all woodlands where an existing edge will be disturbed by grading or other damage due to construction, including the elimination of portions of existing woodlands.
- Traditional sod is not appropriate for use in edge areas.
- All species (including seed mixes) to be included in edge management plans should be locally native.
- Edge treatment plans should include a dense shrub layer on the outer edge of the woodland. This will limit the amount of debris that enters the woodland.
- Planting along this edge should take into consideration the light and moisture conditions of the area and should mimic natural succession.

REFERENCES

- Allen, H. H., and J.R. Leech. 1997. **“Bioengineering for streambank erosion control; Report 1, Guidelines,”** Technical Report EL-97-8, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Bentrup, G and J.C. Hoag. 1998. **The Practical Streambank Bioengineering Guide: a user’s guide for natural streambank stabilization techniques in the arid and semi-arid Great Basin and Intermountain West.** Interagency Riparian/Wetland Project, Plant Materials Center, USDA-NRCS, Aberdeen, ID.
- Canadian Nursery Landscape Association (CNLA). 2006. **Canadian Standards for Nursery Stock, 8th Edition.**
- Daigle, J. and D. Havinga. 1996. **Restoring Nature’s Place. A Guide to Naturalizing Ontario Parks and Greenspace.** Toronto: Ontario Parks Association and Ecological Outlook Consulting.
- Dwyer, J.K., 2006. **Halton Natural Areas Inventory Volume 1, Site Summaries and Volume 2, Species Checklists.** Halton/North Peel Naturalists’ Club, Conservation Halton, South Peel Naturalists’ Club, Halton Region and Hamilton Naturalists’ Club.
- Environment Canada (EC). 2004. **How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern (Second Edition).**
- Greater Golden Horseshoe Conservation Authorities (GGHCA) 2006. **Erosion & Sediment Control Guidelines For Urban Construction.** Available online:
http://www.sustainabletechnologies.ca/Portals/_Rainbow/Documents/ESC%20Guideline%20-%20December%202006.pdf
- Heaton, M. G., R. Grillmayer and J. G. Imhof. 2002. Ontario’s Stream Rehabilitation Manual. Ontario Streams, Belfountain, Ontario. Available online: <http://www.ontariostreams.on.ca>
- Harrington, G. 2007. **Soil bioengineering techniques and project examples.** Course notes for “Introductory Bioengineering Course” offered by the American Fisheries Society Ontario Chapter, St. Clements, ON October 2007.
- Matheny, N.P. and J.R. Clark. 1998. **Trees and Development: A Technical Guide to Preservation of Trees During Land Development.** International Society of Arboriculture, Illinois.
- Matlack, G. R. 1993. **Microenvironment variation within and among forest edge sites in the eastern United States.** Biological Conservation 66:185–194.
- Ohio Department of Natural Resources (ODNR). 2007. **Ohio Stream Management Guide, Guide No. 14, Live Fascines.**
- Ontario Ministry of the Environment (MOE) 2003. **Stormwater Management Planning and Design Manual.** Queen’s Printer for Ontario, Ontario Canada.
- Regional Municipality of Halton, 2006. Official Plan for the Halton Planning Area.

United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS). 1992.
Soil Bioengineering for Upland Slope Protection and Erosion Reduction in Engineering Field
Handbook. Part 650, Chapter 18.

GLOSSARY OF TERMS

Ball and Burlap	The intact ball of earth containing the roots of nursery stock that has been hand dug, balled and wrapped in burlap.
Bare Root	The root system of nursery stock without a ball of earth.
Caliper	The above ground diameter of a distinct part of a nursery stock stem, measures in accordance with the Canadian Standards for Nursery Stock.
Crown	Part of the plant directly above where the branching begins.
Cultivar	A variety of a plant developed from a natural species and maintained under cultivation.
Dripline	The edge of the canopy.
Hyporheic Zone	The area under the stream channel and floodplain where groundwater and surface waters of the stream are exchanged freely.
Live Stake	Cuttings from live, rootable woody species.
Locally Native	A species that has been identified as naturally occurring within a specified jurisdiction (e.g. Halton Region).
Locally Rare Species	A species considered rare at a local (e.g. local or regional municipality) level.
Native	Indigenous to a region, having evolved there as part of an ecosystem over a long period of time.
Natural Heritage Feature	Features and areas, including significant wetlands, significant coastal wetlands, fish habitat, significant woodlands, significant valleylands, significant habitat of endangered species and threatened species, significant wildlife habitat, and significant areas of natural and scientific interest, which are important for their environmental and social values as a legacy of the natural landscapes of an area.
Naturalized	Non-native species which are established in a region and is able to reproduce successfully and live alongside native species in the wild. Naturalized species may be introduced intentionally or unintentionally.
Non-Native	A species that does not originate from a specified jurisdiction (e.g. Halton Region).
Plugs	A cylinder of soil in which a plant is grown, generally used for seedlings and rooted cuttings.
Potted	Plants with an intact soil ball and placed in a container, in lieu of burlap.
Provincially Rare Species	A species with a subnational (provincial) rank of S1 to S3.
Shoot	A bud, young leaf, or other new growth on a plant.
Sod Block	A mat of existing vegetation that is removed from a site prior to works and stored to be used in the rehabilitation of the site post construction.
Species at Risk	A species that has been designated by either the Committee on the Status of Endangered Wildlife in Canada or the Ontario Ministry of Natural Resources as being Extinct, Extirpated, Endangered, Threatened or Special Concern.
Stormwater Management	The control of rainfall, snowmelt and runoff from activities such as watering lawns, washing cars and draining pools, that seeps into the ground or runs off

	the land into storm sewers, watercourses and lakes.
Stormwater Management Facility	The entire stormwater management area including the pond and accessory areas.
Stormwater Management Pond	<p>Dry - A dry pond is a detention basin designed to temporarily store collected stormwater runoff and release it at a controlled rate through an outlet. Dry ponds may have a deep pool of water in the sediment forebay to reduce scour and re-suspension of sediment, but do not have a permanent pool of water in the main basin. This means that there is no opportunity for settling of contaminants between storm events and dilution of stormwater contaminants during storms.</p> <p>Wet - A wet pond is a detention basin designed to temporarily store collected stormwater runoff and release it at a controlled rate. It is different from a dry pond in that it maintains a permanent pool of water between storm events which provide quality control.</p>
Topsoil	Upper, outermost layer of soil, with the most organic matter and nutrients.
Watershed	All land and water within the confines of a drainage basin.
Whip	A young tree without branches.
Woodland	Forested, treed, and woodlot areas, including cultural Vegetation Types as defined the Ecological Land Classification system.

**APPENDIX 1
NATIVE SPECIES LIST
(HERBACEOUS AND WOODY)**

Appendix 1

Table 1 Native Herbaceous Vegetation List

The following list is comprised of herbaceous flora locally native to the Halton Region. The species are categorized into broad moisture zones and vegetation types. This list is not all inclusive. It is presented to give guidance regarding appropriate species and planting locations. Additional species will be considered on a site by site basis.

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
Emergent Vegetation						
<i>Alisma plantago-aquatica</i>	Water Plantain			*		Emergent
<i>Asclepias incarnata</i>	Swamp Milkweed		*			Emergent
<i>Calla palustris</i>	Water Arum			*		Emergent
<i>Carex bebbii</i>	Bebb's Sedge		*			Emergent
<i>Carex comosa</i>	Bristly Sedge		*			Emergent
<i>Carex crinita</i>	Fringed Sedge		*			Emergent
<i>Carex hystericina</i>	Porcupine Sedge		*			Emergent
<i>Carex intumescens</i>	Bladder Sedge		*			Emergent
<i>Carex lacustris</i>	Lake-Bank Sedge			*		Emergent
<i>Carex lupulina</i>	Hop Sedge		*			Emergent
<i>Carex pseudo-cyperus</i>	Cyperus-Like Sedge		*			Emergent
<i>Carex stipata</i>	Awl-Fruited Sedge		*			Emergent
<i>Carex stricta</i>	Tussock Sedge		*			Emergent
<i>Carex utriculata</i>	Beaked Sedge			*		Emergent
<i>Carex vulpinoidea</i>	Fox Sedge		*			Emergent
<i>Chelone glabra</i>	Turtlehead		*			Emergent
<i>Cyperus esculentus</i>	Yellow Nutsedge		*			Emergent
<i>Eleocharis erythropoda</i>	Red-based Spike-rush			*		Emergent
<i>Eleocharis obtusa</i>	Spike Rush		*			Emergent
<i>Eleocharis smallii</i>	Spike Rush		*			Emergent
<i>Equisetum fluviatile</i>	Water Horsetail			*		Emergent
<i>Iris versicolor</i>	Wild Blue Flag		*			Emergent
<i>Juncus articulatus</i>	Jointed Rush		*			Emergent
<i>Juncus canadensis</i>	Canada Rush		*			Emergent
<i>Juncus tenuis</i>	Path Rush		*			Emergent
<i>Juncus torreyi</i>	Torrey's Rush		*			Emergent
<i>Ludwigia palustris</i>	Water-purslane			*		Emergent
<i>Pontederia cordata</i>	Pickernelweed			*		Emergent
<i>Sagittaria latifolia</i>	Broad-Leaved Arrowhead			*		Emergent
<i>Scirpus atrovirens</i>	Green Bulrush		*			Emergent

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
<i>Scirpus cyperinus</i>	Wool Grass Bulrush		*			Emergent
<i>Scirpus pendulus</i>	Pendulus Bulrush		*			Emergent
<i>Scirpus validus</i>	Softstem Bulrush			*	*	Emergent
<i>Sparganium emersum</i>	Green-fruited Bur-reed			*		Emergent
<i>Typha latifolia</i>	Broad-Leaved Cattail			*		Emergent
Submergent Vegetation						
<i>Ceratophyllum demersum</i>	Coontail				*	Submergent
<i>Potamogeton pectinatus</i>	Sago Pondweed				*	Submergent
<i>Utricularia vulgaris</i>	Common Bladderwort				*	Submergent
Floating Aquatics						
<i>Lemna minor</i>	Lesser Duckweed				*	Floating
<i>Lemna trisulca</i>	Star Duckweed				*	Floating
<i>Nuphar variegatum</i>	Yellow Pond Lily				*	Floating
<i>Polygonum amphibium</i>	Water Smartweed			*		Floating
<i>Sparganium eurycarpum</i>	Common Bur-Reed			*		Floating
Ferns/Horsetails						
<i>Adiantum pedatum</i>	Northern Maidenhair Fern	*				Ferns/Horsetails
<i>Equisetum arvense</i>	Field Horsetail		*			Fern/Horsetail
<i>Dryopteris carthusiana</i>	Spinulose Wood Fern		*			Ferns/Horsetails
<i>Dryopteris clintoniana</i>	Clinton's Wood Fern			*		Ferns/Horsetails
<i>Dryopteris cristata</i>	Crested Wood Fern			*		Ferns/Horsetails
<i>Dryopteris intermedia</i>	Glandular Wood Fern	*				Ferns/Horsetails
<i>Dryopteris marginalis</i>	Marginal Wood Fern	*				Ferns/Horsetails
<i>Equisetum hyemale ssp. affine</i>	Scouring-rush		*			Ferns/Horsetails
<i>Gymnocarpium dryopteris</i>	Oak Fern	*				Ferns/Horsetails
<i>Matteuccia struthiopteris</i>	Ostrich Fern		*			Fern/Horsetail
<i>Onoclea sensibilis</i>	Sensitive Fern		*			Fern/Horsetail
<i>Osmunda cinnamomea</i>	Cinnamon Fern		*			Fern/Horsetail
<i>Osmunda regalis</i>	Royal Fern		*			Fern/Horsetail
<i>Polystichum acrostichoides</i>	Christmas Fern		*			Fern/Horsetail
<i>Thelypteris palustris</i>	Marsh Fern		*			Fern/Horsetail
Grasses						
<i>Andropogon gerardii</i>	Big Bluestem	*				Grass
<i>Agrostis stolonifera</i>	Creeping Bentgrass	*				Grass
<i>Agrostis perennans</i>	Autumn Bent Grass	*				Grass
<i>Bromus ciliatus</i>	Fringed Brome Grass		*			Grass
<i>Calamagrostis canadensis</i>	Canada Bluejoint		*			Grass
<i>Danthonia spicata</i>	Poverty Oat Grass	*				Grass
<i>Elymus canadensis</i>	Canada Wild Rye	*				Grass

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
<i>Elymus hystrix</i>	Bottle-Brush Grass	*				Grass
<i>Elymus virginicus</i>	Virginia Wild Rye	*				Grass
<i>Bromus pubescens</i>	Canada Brome	*				Grass
<i>Glyceria borealis</i>	Northern Manna Grass			*		Grass
<i>Glyceria grandis</i>	Tall Manna Grass			*		Grass
<i>Glyceria septentrionalis</i>	Eastern Manna Grass			*		Grass
<i>Glyceria striata</i>	Fowl Manna Grass		*			Grass
<i>Glyceria striata</i>	Fowl Manna Grass		*			Grass
<i>Leersia virginica</i>	White Grass		*			Grass
<i>Leersia oryzoides</i>	Rice Cut-Grass		*			Grass
<i>Muhlenbergia mexicana</i> var. <i>mexicana</i>	Muhly Grass		*			Grass
<i>Poa palustris</i>	Fowl Bluegrass	*				Grass
<i>Schizachyrium scoparium</i>	Little Bluestem	*				Grass
<i>Sporobolus cryptandrus</i>	Sand Dropseed	*				Grass
Sedges						
<i>Carex albursina</i>	White-bear Sedge	*				Sedge
<i>Carex pensylvanica</i>	Pennsylvania Sedge	*				Sedge
<i>Carex plantaginea</i>	Plantain-leaved Sedge	*				Sedge
<i>Carex platyphylla</i>	Broad-leaved Sedge	*				Sedge
<i>Carex radiata</i>	Sedge	*				Sedge
<i>Carex rosea</i>	Sedge	*				Sedge
Wildflowers						
<i>Actaea pachypoda</i>	White Baneberry	*				Wildflower
<i>Actaea rubra</i>	Red Baneberry	*				Wildflower
<i>Anaphalis margaritacea</i>	Pearly Everlasting	*				Wildflower
<i>Anemone canadensis</i>	Canada Anemone	*	*			Wildflower
<i>Anemone cylindrica</i>	Long-Fruited Anemone	*				Wildflower
<i>Anemone virginiana</i>	Tall Anemone	*				Wildflower
<i>Antennaria neglecta</i>	Pussy-Toes	*				Wildflower
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	*				Wildflower
<i>Aquilegia canadensis</i>	Wild Columbine	*				Wildflower
<i>Aralia racemosa</i> ssp. <i>racemosa</i>	Spikenard	*				Wildflower
<i>Asclepias syriaca</i>	Common Milkweed	*				Wildflower
<i>Asclepias tuberosa</i>	Butterfly-Weed	*				Wildflower
<i>Asarum canadense</i>	Wild Ginger	*				Wildflower
<i>Bidens cernua</i>	Nodding Bur-Marigold		*			Wildflower
<i>Bidens frondosa</i>	Common Beggar-Ticks		*			Wildflower
<i>Caltha palustris</i>	Marsh-marigold		*			Wildflower

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
<i>Cicuta maculata</i>	Water Hemlock		*			Wildflower
<i>Clintonia borealis</i>	Bluebead Lily	*				Wildflower
<i>Coreopsis lanceolata</i>	Lance-Leaved Coreopsis	*				Wildflower
<i>Cypripedium calceolus var. parviflorum</i>	Small Yellow Lady's-slipper		*			Wildflower
<i>Desmodium canadense</i>	Showy Tick-Trefoil	*				Wildflower
<i>Desmodium glutinosum</i>	Pointed-leaved Tick-trefoil	*				Wildflower
<i>Epilobium angustifolium</i>	Fireweed	*				Wildflower
<i>Erythronium americanum</i>	Trout Lily	*				Wildflower
<i>Eupatorium maculatum</i>	Joe Pye-Weed		*			Wildflower
<i>Eupatorium perfoliatum</i>	Boneset		*			Wildflower
<i>Eupatorium rugosum</i>	White Snakeroot	*				Wildflower
<i>Eurybia macrophylla</i>	Large-Leaved Aster	*				Wildflower
<i>Fragaria virginiana</i>	Common Strawberry	*				Wildflower
<i>Fragaria vesca ssp. americana</i>	Woodland Strawberry	*				Wildflower
<i>Galium palustre</i>	Marsh Bedstraw		*			Wildflower
<i>Helianthus divaricatus</i>	Woodland Sunflower	*				Wildflower
<i>Hydrophyllum canadense</i>	Canada Waterleaf		*			Wildflower
<i>Hydrophyllum virginianum</i>	Virginia Waterleaf		*			Wildflower
<i>Impatiens capensis</i>	Spotted Touch-Me-Not		*			Wildflower
<i>Impatiens pallida</i>	Pale Touch-Me-Not		*			Wildflower
<i>Lilium michiganense</i>	Michigan Lily		*			Wildflower
<i>Lobelia cardinalis</i>	Cardinal Flower		*			Wildflower

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
<i>Lobelia siphitica</i>	Blue Lobelia		*			Wildflower
<i>Lycopus americanus</i>	Water Horehound		*			Wildflower
<i>Lysimachia ciliata</i>	Fringed Loosestrife		*			Wildflower
<i>Mimulus ringens</i>	Monkey Flower		*			Wildflower
<i>Mitchela repens</i>	Partridgeberry	*				Wildflower
<i>Monarda fistulosa</i>	Wild Bergamot	*				Wildflower
<i>Oenothera biennis</i>	Hairy Yellow Evening-primrose	*				Wildflower
<i>Oenothera parviflora</i>	Evening Primrose	*				Wildflower
<i>Penstemon digitalis</i>	White Beardtongue	*	*			Wildflower
<i>Penstemon hirsutus</i>	Hairy Beardtongue	*				Wildflower
<i>Penthorum sedoides</i>	Ditch Stonecrop		*			Wildflower
<i>Phlox divaricata</i>	Blue Phlox	*				Wildflower
<i>Polygala senega</i>	Seneca Snakeroot	*				Wildflower
<i>Polygonatum pubescens</i>	Soloman's Seal	*				Wildflower
<i>Potentilla anserina ssp. anserina</i>	Silverweed	*	*			Wildflower
<i>Prenanthes alba</i>	White Lettuce	*				Wildflower
<i>Prenanthes altissima</i>	Tall White Lettuce	*				Wildflower
<i>Rudbeckia hirta</i>	Black-Eyed Susan	*	*			Wildflower
<i>Rudbeckia laciniata</i>	Green-Headed Coneflower		*			Wildflower
<i>Rumex orbiculatus</i>	Great Water Dock		*			Wildflower
<i>Sanguinaria canadensis</i>	Bloodroot	*				Wildflower
<i>Scutellaria galericulata</i>	Marsh Skullcap		*			Wildflower
<i>Sisyrinchium montanum</i>	Common Blue-Eyed Grass	*				Wildflower
<i>Sium suave</i>	Water Parsnip		*			Wildflower
<i>Solidago altissima var. altissima</i>	Tall Goldenrod	*				Wildflower
<i>Solidago bicolor</i>	Silverrod	*				Wildflower
<i>Solidago caesia</i>	Blue-Stemmed Goldenrod	*				Wildflower
<i>Solidago canadensis</i>	Canada Goldenrod		*			Wildflower
<i>Solidago flexicaulis</i>	Zig-zag Goldenrod	*				Wildflower
<i>Solidago gigantea</i>	Late Goldenrod		*			Wildflower
<i>Solidago juncea</i>	Early Goldenrod	*				Wildflower
<i>Solidago nemoralis</i>	Grey Goldenrod	*				Wildflower
<i>Solidago patula</i>	Rough-leaved Goldenrod		*	*		Wildflower
<i>Solidago rugosa</i>	Rough-Stemmed Goldenrod	*	*			Wildflower
<i>Symphotrichum cordifolium</i>	Heart-Leaved Aster	*				Wildflower
<i>Symphotrichum ericoides var. ericoides</i>	Heath Aster	*				Wildflower

Botanical Name	Common Name	Moisture Zone				Vegetation Type
		Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Deep Water	
<i>Symphotrichum laeve</i> var. <i>laeve</i>	Smooth Aster	*				Wildflower
<i>Symphotrichum novae-angliae</i>	New England Aster		*			Wildflower
<i>Symphotrichum pilosum</i> var. <i>pilosum</i>	White Heath Aster	*				Wildflower
<i>Symphotrichum puniceum</i>	Swamp Aster		*			Wildflower
<i>Thalictrum pubescens</i>	Tall Meadow Rue		*			Wildflower
<i>Trillium erectum</i>	Purple Trillium	*				Wildflower
<i>Trillium grandiflorum</i>	White Trillium	*				Wildflower
<i>Trientalis borealis</i>	Star Flower	*				Wildflower
<i>Triosteum aurantiacum</i>	Wild Coffee	*				Wildflower
<i>Urtica dioica</i> sp. <i>gracilis</i>	Stinging Nettle		*			Wildflower
<i>Verbena hastata</i>	Blue Vervain		*			Wildflower
<i>Verbena urticifolia</i>	White Vervain	*				Wildflower
<i>Viola canadensis</i>	Canada Violet	*				Wildflower
<i>Waldsteinia fragarioides</i>	Barren Strawberry	*				Wildflower

Appendix 1
Table 2 Native Woody Vegetation List

The following list is comprised of woody flora locally native to the Halton Region. The species are categorized into broad moisture zones, environmental tolerances and vegetation types. This list is not all inclusive. It is presented to give guidance regarding appropriate species and planting locations. Additional species will be considered on a site by site basis.

Botanical Name	Common Name	Successional Status	Moisture Zone				Environmental Tolerances/Conditions					Vegetation Type
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife		
Shrubs												
<i>Alnus incana</i> spp. <i>Rugosa</i>	Speckled Alder	Early		*	*	Low		Full Sun	Variable			Shrub
<i>Amelanchier arborea</i>	Juneberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*		Shrub
<i>Amelanchier laevis</i>	Saskatoon-Berry	Early - Mature	*					Full Sun - Part Shade		*		Shrub
<i>Amelanchier sanguinea</i>	Round-Leaved Serviceberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*		Shrub
<i>Amelanchier spicata</i>	Shadbush Serviceberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*		Shrub
<i>Ceanothus americanus</i>	New Jersey Tea	Early	*				Moderate	Full Sun - Part Shade	Well Drained			Shrub
<i>Cephalanthus occidentalis</i>	Buttonbush	Early		*	*			Full Sun	Variable	*		Shrub
<i>Cornus alternifolia</i>	Alternate-Leaved Dogwood	Mature	*	*		Low		Partial Shade	Well Drained	*		Shrub
<i>Cornus amomum</i> ssp. <i>obliqua</i>	Silky Dogwood	Early		*		Low		Sun - Full Shade	Moist - Well Drained	*		Shrub
<i>Cornus canadensis</i>	Bunchberry	Mature	*					Sun - Part Shade	Clay, Sand, Loam, Humus	*		Shrub
<i>Cornus foemina</i> (<i>racemosa</i>)	Grey Dogwood	Early		*		Low		Sun - Full Shade	Moist - Well Drained	*		Shrub
<i>Cornus rugosa</i>	Round-Leaved Dogwood	Early	*					Part Shade - Shade	Sandy Loam	*		Shrub
<i>Cornus stolonifera</i>	Red Osier Dogwood	Early		*	*	Low		Full Sun	Moist	*		Shrub
<i>Corylus cornuta</i>	Beaked Hazelnut	Early	*				High	Full Sun - Part Shade	Loam	*		Shrub
<i>Crataegus</i> spp.	Hawthorn	Early	*			Low			Loam, Clay	*		Shrub
<i>Diervilla lonicera</i>	Bush Honeysuckle	Early	*				High	Full Sun - Shade	Sandy Loam			Shrub
<i>Dirca palustris</i>	Leatherwood	Mature	*					Shade	Sandy Loam			Shrub
<i>Euonymus obovata</i>	Running Strawberry-bush	Mature	*					Shade	Enriched Soils			
<i>Hamamelis virginiana</i>	Witch Hazel	Mature	*			High	High	Full Sun - Part Shade	Moist			Shrub
<i>Ilex verticillata</i>	Winterberry	Early		*		High		Full Sun - Part Shade	Acidic, Organic	*		Shrub
<i>Lindera benzoin</i>	Spicebush			*			Moderate	Full Sun - Part Shade	Moist	*		Shrub

Botanical Name	Common Name	Successional Status	Moisture Zone				Environmental Tolerances/Conditions					Vegetation Type
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife		
<i>Lonicera canadensis</i>	Fly-honeysuckle		*				Moderate	Sun - Partial Shade	Moist	*	Shrub	
<i>Lonicera dioica</i>	Wild Honeysuckle	Early	*			High			Loam	*	Shrub	
<i>Nemopanthus mucronatus</i>	Mountain Holly			*				Full Sun - Part Shade	Loamy Organic		Shrub	
<i>Prunus pensylvanica</i>	Pin Cherry	Early	*				High	Full Sun	Sandy Loam	*	Shrub	
<i>Prunus virginiana</i>	Choke Cherry	Early	*	*		Low		Full Sun - Part Shade	Sandy Loam, Clay	*	Shrub	
<i>Rhamnus alnifolia</i>	Alder-Leaved Buckthorn			*				Full Sun	Acidic		Shrub	
<i>Rhus typhina</i>	Staghorn Sumac	Early	*			High		Full Sun	Sandy Loam, Clay		Shrub	
<i>Ribes americanum</i>	Wild Black Currant	Early	*	*				Full Sun - Part Shade	Sandy Loam, Clay	*	Shrub	
<i>Ribes cynosbati</i>	Prickly Gooseberry	Early	*					Full Sun - Part Shade	Sandy Loam, Clay	*	Shrub	
<i>Ribes triste</i>	Swamp Red Currant	Early	*	*				Full Sun - Part Shade	Sandy Loam, Clay	*	Shrub	
<i>Rosa blanda</i>	Smooth Wild Rose	Early	*					Full Sun	Sandy Loam, Clay		Shrub	
<i>Rosa carolina</i>	Pasture Rose	Early	*			High	Moderate	Full Sun - Part Shade	Sand	*	Shrub	
<i>Rosa palustris</i>	Swamp Rose			*				Full Sun	Variable		Shrub	
<i>Rubus allegheniensis</i>	Common Blackberry	Early - Mature	*					Full Sun - Part Shade	Clay, Sand, Loam	*	Shrub	
<i>Rubus idaeus ssp. melanolasius</i>	Wild Red Raspberry	Early - Mature		*				Full Sun - Part Shade	Sand, Loam, Humus	*	Shrub	
<i>Rubus occidentalis</i>	Black Raspberry	Early - Mature	*					Full Sun - Part Shade	Clay, Sand, Loam	*	Shrub	
<i>Rubus odoratus</i>	Purple-Flowering Raspberry	Early - Mature	*	*				Full Sun - Part Shade	Loam	*	Shrub	
<i>Rubus pubescens</i>	Dwarf Raspberry	Early - Mature		*						*	Shrub	
<i>Salix amygdaloides</i>	Peach-Leaved Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Salix bebbiana</i>	Beaked Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Salix discolor</i>	Pussy Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Salix eriocephala</i>	Woolly Headed Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Salix exigua</i>	Sandbar Willow	Early		*	*	High		Full Sun	Variable	*	Shrub	
<i>Salix lucida</i>	Shining Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Salix petiolaris</i>	Slender Willow	Early		*		High		Full Sun	Variable	*	Shrub	
<i>Sambucus canadensis</i>	Elderberry			*				Full Sun - Part Shade	Rich, Damp	*	Shrub	

Botanical Name	Common Name	Successional Status	Moisture Zone				Environmental Tolerances/Conditions					Vegetation Type
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife		
<i>Sambucus racemose</i> spp. <i>pubens</i>	Red-Berried Elder	Early	*						Part Shade - Shade	Sand, Loam	*	Shrub
<i>Shepherdia canadensis</i>	Buffalo-Berry	Early	*						Full Sun	Sandy Loam, Alkaline		Shrub
<i>Spiraea alba</i>	Meadowsweet	Early		*								Shrub
<i>Staphylea trifolia</i>	Bladdernut		*	*					Partial Shade - Shade	Sand, Loam		
<i>Symphoricarpos albus</i>	Snowberry	Early - Mature	*			High			Full Sun - Part Shade	Limestone, Clay	*	Shrub
<i>Taxus canadensis</i>	American Yew	Mature	*			Low	Low		Full Sun - Part Shade	Clay, Sand, Loam		Shrub
<i>Vaccinium angustifolium</i>	Lowbush Blueberry		*						Full Sun - Part Shade	Sand, Loam	*	Shrub
<i>Vaccinium myrtilloides</i>	Velvet-Leaf Blueberry	Early		*		High			Full Sun - Part Shade	Sandy Loam, Clay	*	Shrub
<i>Vaccinium pallidum</i>	Early Sweet Blueberry		*			High			Full Sun - Part Shade	Sand, Loam	*	Shrub
<i>Viburnum acerifolium</i>	Maple-Leaved Viburnum	Early - Mature	*				Moderate		Shade	Sandy Loam, Clay		Shrub
<i>Viburnum lentago</i>	Nannyberry	Early		*					Sun - Shade	Variable	*	Shrub
<i>Viburnum rafinesquianum</i>	Downy Arrow-Wood	Early	*						Sun - Shade	Sandy Loam, Clay		Shrub
<i>Viburnum trilobum</i>	Highbush Cranberry	Early		*		Low			Sun - Part Shade	Variable	*	Shrub
<i>Zanthoxylum americanum</i>	Prickly Ash	Early	*						Sun - Part Shade	Poor	*	Shrub
Trees												
<i>Abies balsamea</i>	Balsam Fir	Mature		*		Low	High		Shade	Acidic	*	Tree
<i>Acer rubrum</i>	Red Maple	Early - Mature		*		Low			Sun - Part Shade	Slightly Acidic	*	Tree
<i>Acer saccharum</i>	Sugar Maple	Mature	*			Low			Sun - Shade	Sandy Loam, Clay		Tree
<i>Acer saccharinum</i>	Silver Maple	Early		*		Moderate			Shade	Slightly Acidic		Tree
<i>Acer saccharum</i> ssp. <i>nigrum</i>	Black Maple	Mature		*					Part Shade - Shade	Clay, Loam	*	Tree
<i>Acer spicatum</i>	Mountain Maple	Early - Mature	*						Sun	Clay, Sand, Loam	*	Tree
<i>Betula alleghaniensis</i>	Yellow Birch	Mature		*		High			Shade	Slightly Acidic		Tree
<i>Betula papyrifera</i>	Paper Birch	Early	*			Moderate			Sun	Acidic, Sand, Silt, Loam		Tree
<i>Carpinus caroliniana</i>	American Hornbeam	Mature	*			Low			Shade	Slightly Acidic		Tree

Botanical Name	Common Name	Successional Status	Moisture Zone			Environmental Tolerances/Conditions					Vegetation Type
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife	
<i>Carya cordiformis</i>	Bitternut Hickory	Early - Mature		*				Sun - Part Shade	Loam		Tree
<i>Carya ovata</i>	Shagbark Hickory	Early - Mature		*				Full Sun - Part Shade	Loam, Clay		Tree
<i>Fagus grandifolia</i>	American Beech	Mature - Old Growth	*			Low		Full Sun - Part Shade	Acidic	*	Tree
<i>Fraxinus americana</i>	White Ash	Early - Mature	*			High		Full Sun	Loam, Clay		Tree
<i>Fraxinus nigra</i>	Black Ash	Mature		*				Full Sun	Variable		Tree
<i>Fraxinus pennsylvanica</i>	Red Ash	Early - Mature		*		Moderate		Full Sun	Sandy Loam, Clay		Tree
<i>Juglans nigra</i>	Black Walnut	Early - Mature		*				Full Sun - Part Shade	Sand, Loam, Clay	*	Tree
<i>Juniperus virginiana</i>	Eastern Red Cedar	Early	*			Moderate	Moderate	Sun	Moist Loam		Tree
<i>Larix laricina</i>	Tamarack	Early		*				Sun	Clay, Sand, Loam, Humus	*	Tree
<i>Malus coronaria</i>	Wild Crab Apple	Early	*					Part Shade		*	Tree
<i>Ostrya virginiana</i>	Ironwood	Early - Mature	*					Partial Shade - Shade	Sand, Loam, Clay		Tree
<i>Picea glauca</i>	White Spruce	Early	*			High	High	Full Sun	Moist Loam		Tree
<i>Pinus strobus</i>	Eastern White Pine	Early - Mature	*			Low	Low	Full Sun	Fertile, Well Drained		Tree
<i>Populus balsamifera</i>	Balsam Poplar	Early		*		High		Full Sun	Sandy Loam, Clay		Tree
<i>Populus deltoides</i>	Eastern Cottonwood	Early		*	*			Full Sun	Sand, Loam, Clay		Tree
<i>Populus grandidentata</i>	Largetooth Aspen	Early		*		High		Full Sun	Sand, Loam		Tree
<i>Populus tremuloides</i>	Trembling Aspen	Early	*			High	High	Sun	Sand, Loam	*	Tree
<i>Prunus nigra</i>	Black Plum	Early	*					Partial Shade	Clay, Sand, Loam	*	Tree
<i>Prunus serotina</i>	Black Cherry	Early	*			Moderate		Sun - Shade	Moist, Fertile	*	Tree
<i>Quercus alba</i>	White Oak	Early - Mature	*			High		Sun - Shade	Sandy Loam, Loam, Clay, Acidic	*	Tree
<i>Quercus macrocarpa</i>	Bur Oak	Early		*				Full Sun	Sandy Loam, Clay		Tree

Botanical Name	Common Name	Successional Status	Moisture Zone				Environmental Tolerances/Conditions					Vegetation Type
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife		
<i>Quercus muehlenbergii</i>	Chinquapin Oak	Mature	*					Sun, Part Shade	San	*	Tree	
<i>Quercus rubra</i>	Red Oak	Early - Mature	*			High		Full Sun	Sandy Loam, Slightly Acidic		Tree	
<i>Quercus velutina</i>	Black Oak		*					Full Sun	Sand	*		
<i>Salix nigra</i>	Black Willow	Early		*	*	Moderate					Tree	
<i>Sassafras albidum</i>	Sassafras	Early - Mature	*					Full Sun - Part Shade	Sand, Loam	*	Tree	
<i>Thuja occidentalis</i>	Eastern White Cedar	Early - Mature		*		Moderate	Low	Full Sun	Marshy Loam		Tree	
<i>Tilia americana</i>	Basswood	Early - Mature				Low	Low	Full Sun - Part Shade	Moist/Fertile		Tree	
<i>Tsuga canadensis</i>	Eastern Hemlock	Mature - Old Growth	*			Low	Low	Part Shade	Acidic, Rock Bluffs, Sandy Soils		Tree	
<i>Ulmus americana</i>	White Elm	Early - Mature		*		Moderate		Sun - Shade	Sandy Loam, Clay		Tree	
<i>Ulmus rubra</i>	Red Elm	Early - Mature	*	*				Sun - Part Shade	Loam		Tree	
<i>Ulmus thomasii</i>	Rock Elm	Early - Mature	*					Sun - Part Shade	Sandy, Loam, Clay		Tree	
Vines												
<i>Celastrus scandens</i>	Climbing Bittersweet	Early - Mature	*					Sun - Part Shade	Clay, Loam	*	Vine	
<i>Clematis virginiana</i>	Virgin's Bower	Early		*							Vine	
<i>Echinocystis lobata</i>	Wild Cucumber	Early		*							Vine	
<i>Lonicera dioica</i>	Honeysuckle	Early	*	*				Full Sun - Part Shade	Variable	*	Vine	
<i>Menispermum canadense</i>	Canada Moonseed	Early		*				Sun - Shade	Sandy Loam, Clay	*	Vine	
<i>Parthenocissus inserta</i>	Thicket Creeper	Mature		*		High	High	Full Sun - Full Shade		*	Vine	
<i>Smilax herbacea</i>	Carrion-flower		*	*								
<i>Smilax hispida</i>	Bristly Greenbrier	Early		*				Full Sun - Full Shade	Variable		Vine	
<i>Vitis aestivalis</i>	Summer Grape	Early	*					Sun - Shade		*		
<i>Vitis riparia</i>	Riverbank Grape	Early		*				Sun - Shade		*	Vine	

APPENDIX 2
INVASIVE SPECIES LIST

**Appendix 2
Invasive Species List (by vegetation type)**

The objective of the following list is to act as a guide for projects requiring landscaping. Each of the following species (organized by vegetation type) are not native to the Halton Region and have been designated a code for invasiveness (see legend below). Suitable locations for non-native species are dependent on their invasive coding. For some of the species contained within this list a native alternative has been provided. Please review the list of species native to Halton Region for additional alternatives.

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
Aquatic Vegetation							
<i>Cabomba caroliniana</i>	Fanwort	Aquatic	5	Vegetative	> 50M Away From Any Natural Area	Invades Open Waters	<i>Utricularia vulgaris</i>
<i>Egeria densa</i>	Water Weed	Aquatic	5	Vegetative	> 50M Away From Any Natural Area	Invades Open Waters	<i>Utricularia vulgaris</i>
<i>Hydrilla verticillata</i>	Hydrilla	Aquatic	5	Vegetative	> 50M Away From Any Natural Area	Invades Open Waters	<i>Elodea canadensis</i>
<i>Hydrocharis morsus-ranae</i>	European Frog-Bit	Aquatic	1	Vegetative	Not Anywhere	Dominates Open Water	<i>Nymphaea odorata</i>
<i>Isoetes tinctoria</i>	Quillwort	Aquatic	5	Spore	> 50M Away From Any Natural Area		
<i>Myriophyllum spicatum</i>	Eurasian Watermilfoil	Aquatic	1	Seed, Vegetative	Not Anywhere	Dominates Open Water	<i>Myriophyllum sibiricum</i>
<i>Najas minor</i>	Minor Naiad	Aquatic	5	Seed	> 50M Away From Any Natural Area		
<i>Nasturtium microphyllum</i>	Water Cress	Aquatic	5	Seed	> 50M Away From Any Natural Area		
<i>Nymphoides peltatum</i>	Floating Heart	Aquatic	1	Seed	Not Anywhere	Dominates Open Water Habitats	
<i>Potamogeton crispus</i>	Curly Pondweed	Aquatic	1	Seed	Not Anywhere	Dominates Open Water Habitats	
<i>Rorippa amphibia</i>	Marsh Cress	Aquatic	3	Vegetative	> 50M Away From Any Natural Area + Physical Barrier		<i>Rorippa palustris</i>
<i>Typha angustifolia</i>	Narrow-Leaved Cattail	Aquatic	5	Vegetative	> 50M Away From Any Natural Area		<i>Typha latifolia</i>
<i>Typha x glauca</i>	Hybrid Cattail	Aquatic	5	Vegetative	> 50M Away From Any Natural Area		<i>Typha latifolia</i>
Herbaceous Vegetation - Forbs/Herbs							
<i>Acinos arvensis</i>	Spring Savory	Herbaceous	3	Seed	Not Anywhere	Invades Alvars	
<i>Ajuga reptans</i>	Creeping Bugleweed	Herbaceous	4	Vegetative	> 50M Away From Any Natural Area	Persists In Forest Understorey And Edges	<i>Arctostaphylos uva-ursi</i>

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propogation	Suitable Location		
<i>Artemisia absinthium</i>	Absinth	Herbaceous	3	Seed	Not Anywhere	Invades Meadows	
<i>Artemisia vulgaris</i>	Common Mugwort	Herbaceous	5	Vegetative	> 50M Away From Any Natural Area		
<i>Berteroa incana</i>	Hoary Alyssum	Herbaceous	3	Seed	Not Anywhere	Invades Prairies	<i>Epilobium ciliatum</i>
<i>Campanula rapunculoides</i>	Creeping Bellflower	Herbaceous	4	Seed, Vegetative	> 50M Away From Any Natural Area	Invades Forest Edges And Meadows	<i>Campanula rotundifolia</i>
<i>Convallaria majalis</i>	Lily-Of-The-Valley	Herbaceous	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Invades Forest Understorey	<i>Maianthum canadensis</i>
<i>Convolvulus arvensis</i>	Field Bindweed	Herbaceous	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Climbs On Vegetation And Smothers Them	
<i>Euphorbia esula</i>	Leafy Spurge	Herbaceous	4	Vegetative	> 50M Away From Any Natural Area	Can Dominate Prairies	
<i>Glechoma hederacea</i>	Ground-Ivy	Herbaceous	4	Seed	> 50M Away From Any Natural Area	Competes With Meadow And Prairies Species	<i>Physostegia virginiana</i>
<i>Hemerocallis fulva</i>	Orange Day-Lily	Herbaceous	4	Vegetative	> 50M Away From Any Natural Area	Dominates Meadows	<i>Erythronium americanum</i>
<i>Hesperis matronalis</i>	Dame's-Rocket	Herbaceous	1	Seed	Not Anywhere	Dominates Open Forest Understorey And Meadows	<i>Phlox divaricata</i>
<i>Hieracium aurantiacum</i>	Orange Hawkweed	Herbaceous	3	Seed, Vegetative	Not Anywhere	Invades Meadows	<i>Hieracium scabrum</i>
<i>Hieracium caespitosum</i>	Yellow Hawkweed	Herbaceous	3	Seed, Vegetative	Not Anywhere	Invades Meadows	<i>Hieracium scabrum</i>
<i>Hieracium vulgatum</i>	Common Hawkweed	Herbaceous	3	Seed, Vegetative	Not Anywhere	Invades Meadows	<i>Hieracium scabrum</i>
<i>Humulus lupulus</i>	Common Hop	Herbaceous	5	Seed, Vegetative	>50M Away From Any Natural Area		
<i>Hypericum perforatum</i>	Common St. John's-Wort	Herbaceous	4	Seed, Vegetative	>50M Away From Any Natural Area		
<i>Impatiens glandulifera</i>	Himalayan Balsam	Herbaceous	1	Seed	Not Anywhere	Dominates Forests And Wet Meadows	<i>Impatiens capensis</i>
<i>Inula helenium</i>	Elecampane	Herbaceous	4	Seed, Vegetative	>50M Away From Any Natural Area	Invades Meadows	
<i>Iris pseudacorus</i>	Yellow Flag	Herbaceous	4	Vegetative	>50M Away From Any Natural Area	Invades Wetlands	<i>Iris versicolor</i>
<i>Lapsana communis</i>	Nipplewort	Herbaceous	5	Seed	>50M Away From Any Natural Area		
<i>Lythrum salicaria</i>	Purple Loosestrife	Herbaceous	1	Seed	Not Anywhere	Dominates Wetlands	<i>Ludwigia palustris</i>
<i>Malva moschata</i>	Musk Mallow	Herbaceous	4	Seed	>50M Away From Any Natural Area	Invades Meadows	

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
<i>Medicago lupulina</i>	Black Medic	Herbaceous	4	Vegetative	>50M Away From Any Natural Area	Invades Meadows	
<i>Medicago sativa</i>	Alfalfa	Herbaceous	4	Seed	>50M Away From Any Natural Area	Invades Meadows And Prairies	
<i>Mentha piperita</i>	Peppermint	Herbaceous	4	Vegetative	>50M Away From Any Natural Area	Invades Meadows	<i>Mentha arvensis</i>
<i>Myosotis scorpioides</i>	True Forget-Me-Not	Herbaceous	4	Vegetative	>50M Away From Any Natural Area	Dominates Shaded Seepage Areas	<i>Impatiens capensis</i>
<i>Myosotis sylvatica</i>	Forget-Me-Not	Herbaceous	4	Seed	>50M Away From Any Natural Area	Persists in forest edges and understory, meadows	
<i>Nepeta cataria</i>	Catnip	Herbaceous	4	Seed	>50M Away From Any Natural Area	Invades Meadows	
<i>Origanum vulgare</i>	Oregano	Herbaceous	4	Seed	>50M Away From Any Natural Area	Invades Disturbed Meadows	
<i>Pachysandra terminalis</i>	Japanese Spurge	Herbaceous	4	Seed	>50M Away From Any Natural Area	Persists In Forest Understorey And Edges	
<i>Polygonum cuspidatum</i>	Japanese Knotweed	Herbaceous	2	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Wet Meadows And Moist Forests	<i>Apocynum androsaemifolium</i>
<i>Primula veris</i>	European Cowslip	Herbaceous	5	Seed	>50M Away From Any Natural Area		
<i>Ranunculus repens</i>	Creeping Buttercup	Herbaceous	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Invades Meadows	
<i>Rumex acetosella</i>	Sheep Sorrel	Herbaceous	4	Vegetative	>50M Away From Any Natural Area	Invades Meadows	
<i>Saponaria officinalis</i>	Soapwort	Herbaceous	3	Seed	Not Anywhere	Invades Meadows	
<i>Scilla sibirica</i>	Scilla	Herbaceous	2	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Forest Understorey	
<i>Sedum acre</i>	Mossy Stonecrop	Herbaceous	2	Vegetative	Not Anywhere	Invades Alvars	
<i>Tanacetum vulgare</i>	Tansy	Herbaceous	3	Seed, Vegetative	Not Anywhere	Invades Meadows	
<i>Thymus praecox</i>	Creeping Thyme	Herbaceous	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Invades Meadows	
<i>Vinca minor</i>	Periwinkle	Herbaceous	2	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Forest Understorey	<i>Arctostaphylos uva-ursi</i>
<i>Vincetoxicum rossicum</i>	Dog-Strangling Vine	Herbaceous	5	Seed	Not Anywhere	Dominates Forest Understorey	
<i>Viola odorata</i>	Sweet Violet	Herbaceous	5	Seed	>50M Away From Any Natural Area	Difficult To Identify Accurately	<i>Viola fimbriatula</i>
Herbaceous Vegetation - Grasses							
<i>Bromus inermis</i>	Smooth Brome Grass	Grass	4	Seed	>50M Away From Any Natural Area	Resists Conversion To Native Meadow And Prairie	<i>Bromus pubescens</i>

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
<i>Butomus umbellatus</i>	Flowering Rush	Grass	1	Vegetative	Not Anywhere	Dominates Open Marsh	<i>Scirpus cyperinus</i>
<i>Dactylis glomerata</i>	Orchard Grass	Grass	3	Seed	Not Anywhere	Invades Meadows And Prairies	<i>Danthonia spicata</i>
<i>Elymus repens</i>	Quack Grass	Grass	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Meadows And Prairies	<i>Elymus hystrix</i>
<i>Festuca arundinacea</i>	Tall Fescue	Grass	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Moist Meadows And Prairies	<i>Festuca obtusa</i>
<i>Glyceria maxima</i>	Rough Manna Grass	Grass	1	Seed	Not Anywhere	Dominates Wet Meadows	<i>Glyceria striata</i>
<i>Miscanthus sinensis</i>	Silver Grass	Grass	3	Seed	Not Anywhere	Dominates Wet Meadows	
<i>Panicum miliaceum</i>	Common Millet	Grass	5	Seed, Vegetative	>50M Away From Any Natural Area		<i>Panicum xanthophyllum</i>
<i>Phalaris arundinacea</i>	Reed Canary Grass	Grass	5	Seed	>50M Away From Any Natural Area	Dominates Wetlands	<i>Glyceria striata</i>
<i>Phragmites australis</i>	Common Reed	Grass	1	Seed	Not Anywhere	Dominates Wetlands And Wet Meadows	<i>Typha sp.</i>
<i>Phragmites communis</i>	Giant Reed	Grass	1	Seed	Not Anywhere	Dominates Wetlands And Wet Meadows	
<i>Poa pratensis</i>	Kentucky Blue Grass	Grass	2	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Prairies	
<i>Setaria glauca</i>	Yellow Foxtail	Grass	4	Seed	>50M Away From Any Natural Area	Invades Meadows	<i>Elymus canadensis</i>
<i>Setaria viridis</i>	Green Foxtail	Grass	4	Seed	>50M Away From Any Natural Area	Invades Meadows	<i>Elymus canadensis</i>
Woody Vegetation - Shrubs							
<i>Alnus glutinosa</i>	Black Alder	Shrub	1	Seed	>50M Away From Any Natural Area	Invades Riparian Areas	<i>Alnus incana sp. rugosa</i>
<i>Alnus incana incana</i>	European White Alder	Shrub	5	Seed	>50M Away From Any Natural Area	Invades Riparian Areas	<i>Alnus incana sp. rugosa</i>
<i>Ampelopsis brevipedunculata</i>	Porcelain Berry	Shrub	5	Seed, Vegetative	>50M Away From Any Natural Area		
<i>Berberis thunbergii</i>	Japanese Barberry	Shrub	3	Seed	Not Anywhere	Invades Forests	<i>Crataegus punctata</i>
<i>Berberis vulgaris</i>	Common Barberry	Shrub	3	Seed	Not Anywhere	Invades Forests	<i>Crataegus punctata</i>
<i>Crataegus monogyna</i>	English Hawthorn	Shrub	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier		<i>Crataegus punctata</i>
<i>Daphne mezereum</i>	Mezer's Daphne	Shrub	5	Seed	>50M Away From Any Natural Area	Invades Moist Forests	
<i>Elaeagnus angustifolia</i>	Russian Olive	Shrub	3	Seed, Vegetative	Not Anywhere	Dominates Forest And Shrub Communities	<i>Prunus virginiana</i>

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
<i>Elaeagnus umbellata</i>	Autumn Olive	Shrub	1	Seed	Not Anywhere	Dominates Forest Edges	<i>Prunus virginiana</i>
<i>Euonymus alatus</i>	Burning Bush	Shrub	3	Seed, Vegetative	Not Anywhere	Invades Forest Understorey Shrub Layer	<i>Euonymus atropurpurea</i>
<i>Euonymus europaeus</i>	Spindle-Tree	Shrub	3	Seed, Vegetative	Not Anywhere	Invades Forest Understorey And Edges	
<i>Ligustrum vulgare</i>	Privet	Shrub	4	Seed	>50M Away From Any Natural Area	Invades Forest Edges	<i>Lonicera canadensis</i>
<i>Lonicera maackii</i>	Amur Honeysuckle	Shrub	1	Seed	Not Anywhere	Invades Meadows And Forest Edges	<i>Lonicera dioica</i>
<i>Lonicera morrowi</i>	Morrow's Honeysuckle	Shrub	1	Seed	Not Anywhere	Invades Meadows And Forest Edges	<i>Lonicera hirsuta</i>
<i>Lonicera tatarica</i>	Tatarian Honeysuckle	Shrub	1	Seed	Not Anywhere	Invades Meadows And Forest Edges	<i>Lonicera oblongifolia</i>
<i>Lonicera xylosteum</i>	European Fly Honeysuckle	Shrub	1	Seed	Not Anywhere	Invades Meadows And Forest Edges	<i>Lonicera canadensis</i>
<i>Morus alba</i>	White Mulberry	Shrub	1	Seed	Not Anywhere	Hybridizes With Endangered M. Rubra	
<i>Rhamnus cathartica</i>	Common Buckthorn	Shrub	1	Seed, Vegetative	Not Anywhere		
<i>Rhamnus frangula</i>	Glossy Buckthorn	Shrub	1	Seed, Vegetative	Not Anywhere	Dominates Wetlands	
<i>Rosa multiflora</i>	Multiflora Rose	Shrub	1	Seed	Not Anywhere	Dominates Forest Edges	<i>Rosa blanda</i>
<i>Salix alba</i>	White Willow	Shrub	3	Seed	Not Anywhere	Invades Wetlands	<i>Salix discolor</i>
<i>Salix caprea</i>	Goat Willow	Shrub	4	Seed	>50M Away From Any Natural Area		<i>Salix discolor</i>
<i>Salix fragilis</i>	Crack Willow	Shrub	3	Seed	Not Anywhere	Invades Wetlands	<i>Salix nigra</i>
<i>Salix purpurea</i>	Purple Willow	Shrub	4	Seed	>50M Away From Any Natural Area	Invades Wetlands	<i>Salix lucida</i>
<i>Salix X rubens</i>	Hybrid Willow	Shrub	3	Seed	Not Anywhere	Invades Wetlands	<i>Salix lucida</i>
<i>Sambucus racemosa</i>	European Red Elderberry	Shrub	5	Seed	>50M Away From Any Natural Area		<i>Sambucus pubens</i>
<i>Solanum dulcamara</i>	Bittersweet	Shrub	3	Seed, Vegetative	Not Anywhere	Invades Forests And Wetlands	<i>Parthenocissus inserta</i>
<i>Sorbaria sorbifolia</i>	False Spirea	Shrub	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Invades Meadows And Forest Understorey	
<i>Sorbus aucuparia</i>	European Mountain Ash	Shrub	4	Seed	>50M Away From Any Natural Area	Invades Forests	
<i>Symphytum albus var. laeviga</i>	Western Snowberry	Shrub	4	Vegetative	>50M Away From Any Natural Area	Often Substituted For <i>S. albus albus</i>	<i>Symphoricarpos albus var. albus</i>
<i>Syringa vulgaris</i>	Lilac	Shrub	2	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Dominates Shallow Limestone Areas	<i>Rhus aromatica</i> , <i>Prunus virginiana</i>
<i>Viburnum opulus</i>	Guelder-Rose	Shrub	4	Seed	>50M Away From Any Natural Area	Often Substituted For <i>V. trilobum</i>	<i>Viburnum trilobum</i>

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
Woody Vegetation - Trees							
<i>Acer ginnala</i>	Amur Maple	Tree	4	Seed, Vegetative	>50M Away From Any Natural Area	Competes With Early Successional Forest Species	<i>Acer spicatum</i>
<i>Acer negundo</i>	Manitoba Maple	Tree	1	Seed, Vegetative	Not Anywhere	Invades All Habitat Types	<i>Acer spicatum</i>
<i>Acer platanoides</i>	Norway Maple	Tree	2	Seed	Not Anywhere	Dominates Forest Canopy	<i>Acer saccharum</i>
<i>Acer pseudoplatanus</i>	Sycamore Maple	Tree	2	Seed	Not Anywhere	Dominates Forest Canopy	<i>Acer saccharum</i>
<i>Aesculus hippocastanum</i>	Horse Chestnut	Tree	3-4	Seed	>50M Away From Any Natural Area	Invades Forests	
<i>Ailanthus altissima</i>	Tree Of Heaven	Tree	2	Seed, Vegetative	Not Anywhere	Dominates Early Successional Forest	<i>Rhus typhina</i>
<i>Betula pendula</i>	European Birch	Tree	2	Seed	Not Anywhere	Dominates Open Wetlands	<i>Betula papyrifera</i>
<i>Fraxinus excelsior</i>	European Ash	Tree	5	Seed	>50M Away From Any Natural Area	Can Reproduce In Shade	<i>Fraxinus americana</i>
<i>Pinus sylvestris</i>	Scots Pine	Tree	2	Seed	Not Anywhere	Invades Meadows	
<i>Populus alba</i>	White Poplar	Tree	2	Seed	Not Anywhere	Invades Meadows	<i>Populus papyrifera</i>
<i>Populus tremula</i>	European Aspen	Tree	5	Seed	>50M Away From Any Natural Area	Often Substituted For <i>P. tremuloides</i>	<i>Populus tremuloides</i>
<i>Populus x canadensis</i>	Carolina Poplar	Tree	4	Seed	>50M Away From Any Natural Area	Often Substituted For <i>P. deltoides</i>	<i>Populus papyrifera</i>
<i>Prunus avium</i>	Sweet Cherry	Tree	5	Seed	>50M Away From Any Natural Area		<i>Prunus serotina</i>
<i>Prunus mahaleb</i>	Perfumed Cherry	Tree	5	Seed	>50M Away From Any Natural Area		<i>Prunus pennsylvanica</i>
<i>Robinia pseudoacacia</i>	Black Locust	Tree	2	Seed	Not Anywhere	Invades Meadows	<i>Tilia americana</i>
<i>Tilia cordata</i>	European Linden	Tree	5	Seed	>50M Away From Any Natural Area		<i>Tilia americana</i>
<i>Ulmus glabra</i>	Scotch Elm	Tree	4	Seed, Vegetative	>50M Away From Any Natural Area	Invades Forest	<i>Ulmus americana/ Ulmus rubra</i>
<i>Ulmus pumila</i>	Siberian Elm	Tree	2	Seed	Not Anywhere	Invades Prairies	<i>Ulmus americana/ Ulmus rubra</i>

Botanical Name	Common Name	Veg. Type	See invasive location coding legend below			Effect on Habitat	Native Alternative
			Invasiveness	Method of Propagation	Suitable Location		
Vines							
<i>Celastrus orbiculatus</i>	Oriental Bittersweet	Vine	2	Seed	Not Anywhere	Displaces Native <i>C. scandens</i>	
<i>Hedera helix</i>	English Ivy	Vine	3	Vegetative	>50M Away From Any Natural Area + Physical Barrier	Invades Forest Understorey	<i>Arctostaphylos uva-ursi</i> , <i>Parthenocissus inserta</i>
<i>Lonicera japonica</i>	Japanese Honeysuckle	Vine	1	Seed	Not Anywhere	Dominates Forest Understorey	<i>Lonicera canadensis</i>
<i>Pueraria lobata</i>	Kudzu Vine	Vine	1	Seed, Vegetative	Not Anywhere	Dominates Forest Edges, Meadows, Disturbed Areas	

** based on *Sustainable Biodiversity* by D. Havinga and the Ontario Invasive Plants Working Group
 Royer, F and R. Dickinson. 1999. *Weeds of Canada and the Northern United States*. University of Alberta Press. Edmonton.

Invasiveness Legend
1. Excludes all other species and dominates sites indefinitely
2. Highly invasive, dominates niches or does not spread rapidly
3. Moderately invasive, locally dominant
4. Competitive once established
5. Potentially invasive/more information required

Location Coding Legend		
Invasiveness	Propagation Method	Location Code
1	Seed	not anywhere
1	Vegetative	not anywhere
2	Seed	not anywhere
2	Vegetative	>50m away from any natural area + physical barrier
3	Seed	not anywhere
3	Vegetative	>50m away from any natural area + physical barrier
4	Seed	>50m away from any natural area
4	Vegetative	
5	Seed	>50m away from any natural area
5	Vegetative	

APPENDIX 3
SUITABLE NURSE CROP SPECIES

Appendix 3

Suitable Nurse Crop Species

The following list comprises nurse crop species (i.e. short lived exotic species) that are suitable for the stabilization of soil immediately following construction. This list is taken from the "Erosion and Sediment Control Guideline for Urban Construction" (2006), prepared by the Greater Golden Horseshoe Area Conservation Authorities.

Botanical Name	Common Name
<i>Agrostis stolonifera</i> (<i>A. alba</i> var. <i>palustris</i>)	Creeping Bent Grass
<i>Atriplex patula</i> (<i>A. patula</i> var. <i>hastata</i>)	Halberd-Leaved Orache
<i>Avena sativa</i>	Oats
<i>Cyperus esculentus</i>	Yellow Nut-Sedge
<i>Elymus canadensis</i>	Canada Wild-Rye
<i>Fagopyrum esculentum</i> (<i>F. sagittatum</i>)	Buckwheat
<i>Helianthus annuus</i> (incl. <i>ssps. annuus</i> & <i>lenticularis</i>)	Common Sunflower
<i>Hordeum hystrix</i>	Barley
<i>Hordeum jubatum</i> ssp. <i>Jubatum</i>	Squirrel-Tail Barley
<i>Panicum miliaceum</i>	Millet
<i>Portulaca oleracea</i>	Purslane
<i>Secale cereale</i>	Rye

APPENDIX 4
SUITABLE BIOENGINEERING SPECIES

Appendix 4
Suitable Bioengineering Species

The following list is comprised of woody flora locally native to the Halton Region which are suitable for bioengineering purposes. This list is not all inclusive. It is presented to give guidance regarding appropriate species and planting locations. Additional species will be considered on a site by site basis.

Botanical Name	Common Name	Deposition Tolerance	Flooding Tolerance	Drought Tolerance	Salt Tolerance	Root Type	Rooting Ability
<i>Cornus amomum</i>	Silky Dogwood	Low	Medium	Medium	Low	Shallow Fibrous	Very Good
<i>Cornus racemosa</i>	Gray Dogwood	Medium	Medium	High	Low	Shallow	Good
<i>Cornus rugosa</i>	Roundleaf Dogwood	-----	-----	-----	-----	Shallow Fibrous	Fair - Good
<i>Cornus stolonifera</i>	Red-Osier Dogwood	Low	High	Medium	Low	Shallow	Very Good
<i>Populus balsamifera</i>	Balsam Poplar	Medium	Medium	Medium	Medium	Shallow Fibrous	Very Good
<i>Populus deltoides</i>	Eastern Cottonwood	Medium	High	Medium	Low	Shallow Fibrous Suckering	Very Good
<i>Rubus allegheniensis</i>	Common Blackberry	Medium	Medium	Medium	Low	Fibrous	Good
<i>Salix amygdaloides</i>	Peach-Leaved Willow	High	High	Low	High	Shallow To Deep	Very Good
<i>Salix eriocephala</i>	Heart-Leaved Willow	High	High	Medium	Low	Fibrous	Very Good
<i>Salix exigua</i>	Sandbar Willow	High	High	Medium	Low	Shallow Suckering	Good
<i>Salix discolor</i>	Pussy Willow	High	High	High	Medium	Shallow Fibrous Spreading	Very Good
<i>Salix lucida</i>	Shining Willow	Medium	Medium	Medium	Low	Fibrous Spreading	Very Good
<i>Salix nigra</i>	Black Willow	High	High	Medium	Medium	Shallow To Deep	Excellent
<i>Sambucus canadensis</i>	Common Elder	High	Medium	Medium	Low	Fibrous	Good
<i>Symphoricarpos albus</i>	Snowberry	Low	Low	High	High	Shallow Fibrous Suckering	Good
<i>Viburnum lentago</i>	Nannyberry	Medium	Low	Medium	Low	Shallow	Fair - Good

**APPENDIX 5
SHORELINE SPECIES**

Appendix 5

Shoreline Species

The following list comprises of woody flora native to the Halton Region suitable for planting along the shoreline. The species include locally native species and species which have a minimum rooting ability of “fair-good”. This list is not all inclusive. It is presented to give guidance regarding appropriate species and planting locations. Additional species will be considered on a site by site basis and should be representative of the existing site conditions.

Botanical Name	Common Name	Successional Status	Moisture Zone			Environmental Tolerances/Conditions				
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife
Shrubs										
<i>Alnus incana ssp. rugosa</i>	Speckled Alder	Early	*	*				Full Sun	Moist	
<i>Amelanchier arborea</i>	Juneberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*
<i>Amelanchier sanguinea</i>	Round-Leaved Serviceberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*
<i>Amelanchier spicata</i>	Shadbush Serviceberry	Early - Mature	*			Moderate	High	Full Sun - Part Shade	Acidic	*
<i>Corylus cornuta</i>	Beaked Hazelnut	Early	*				High	Full Sun - Part Shade	Loam	*
<i>Cornus stolonifera</i>	Red-Osier Dogwood	Early		*	*	Low		Full Sun	Moist	*
<i>Crataegus spp.</i>	Hawthorn	Early	*			Low			Loam, Clay	*
<i>Diervilla lonicera</i>	Bush Honeysuckle	Early	*				High	Full Sun - Shade	Sandy Loam	
<i>Hamamelis virginiana</i>	Witch Hazel		*			High	High	Full Sun - Part Shade	Moist	
<i>Prunus pensylvanica</i>	Pin Cherry	Early	*				High	Full Sun	Sandy Loam	*

Botanical Name	Common Name	Successional Status	Moisture Zone			Environmental Tolerances/Conditions				
			Upland	Floodline Fringe/Wet Riparian	Shoreline Fringe/Shallow Water	Salt	Wind	Shade	Soil	Attracts Wildlife
<i>Prunus virginiana</i>	Choke Cherry	Early	*	*		Low		Full Sun - Part Shade	Sandy Loam, Clay	*
<i>Rhus typhina</i>	Staghorn Sumac	Early	*			High		Full Sun	Sandy Loam, Clay	
<i>Salix amygdaloides</i>	Peach-Leaved Willow	Early		*		High		Full Sun	Variable	*
<i>Salix bebbiana</i>	Beaked Willow	Early		*		High		Full Sun	Variable	*
<i>Salix discolor</i>	Pussy Willow	Early		*		High		Full Sun	Variable	*
<i>Salix eriocephala</i>	Woolly Headed Willow	Early		*		High		Full Sun	Variable	*
<i>Salix exigua</i>	Sandbar Willow	Early		*	*	High		Full Sun	Variable	*
<i>Salix lucida</i>	Shining Willow	Early		*		High		Full Sun	Variable	*
<i>Salix petiolaris</i>	Slender Willow	Early		*		High		Full Sun	Variable	*
Trees										
<i>Abies balsamea</i>	Balsam Fir	Mature		*		Low	High	Shade	Acidic	*
<i>Acer saccharum</i>	Sugar Maple	Mature	*			Low		Sun - Shade	Sandy Loam, Clay	
<i>Acer saccharinum</i>	Silver Maple	Early		*		Moderate		Shade	Slightly Acidic	
<i>Fraxinus pennsylvanica</i>	Red Ash	Early - Mature		*		Moderate		Full Sun	Sandy Loam, Clay	
<i>Picea glauca</i>	White Spruce	Early	*			High	High	Full Sun	Moist Loam	
<i>Populus tremuloides</i>	Trembling Aspen	Early	*			High	High	Sun	Sand, Loam	*
<i>Salix nigra</i>	Black Willow			*	*	Moderate				
<i>Thuja occidentalis</i>	Eastern White Cedar	Early - Mature		*		Moderate	Low	Full Sun	Marshy Loam	

**APPENDIX 6
LANDSCAPING PLAN
CHECKLIST FOR CONSULTANTS**

Landscaping Plan Checklist for Consultants

This checklist should be used to ensure that Conservation Halton's requirements are met as set out in the "*Landscaping and Tree Preservation Guidelines*." These guidelines are available on line at <http://www.conservationhalton.ca>. This checklist must be signed and completed by the landscape architect for all submissions. Submissions without this checklist will be considered incomplete. Please check all applicable requirements.

Requirements for Plans

Complete	Requirement	Guidelines Section
<input type="checkbox"/>	Locally native, non-invasive species proposed (no cultivars) and botanical names included.	General 1(a)
<input type="checkbox"/>	No rare species (provincially rare and locally rare) included.	General 1(d)
<input type="checkbox"/>	Species chosen with consideration given to the existing environmental characteristics (e.g. moisture regime, shade, soil type, exposure to wind, salt, sun, etc.) of the site.	General 2 and Appendix 2
<input type="checkbox"/>	Planting densities meet minimum standards as per CH Guidelines. <ul style="list-style-type: none"> ▪ 5 trees per 100m² (storm water management facilities) ▪ 10 trees per 100m² (creek realignments, reforestation) 	General 3
<input type="checkbox"/>	Sizes of species varied, interspersed and blended with surrounding natural areas, mimicking nature to the greatest extent possible.	General 1(a)
<input type="checkbox"/>	Aquatic species include at least one submergent or floating leaved plant and one emergent, containing no less than four aquatic species.	SWM Facilities
<input type="checkbox"/>	Species used by wildlife included where appropriate.	Natural Areas Bioengineering
<input type="checkbox"/>	No single species accounts for more than 20% of the total tree or shrub quantity.	General 1(a)
<input type="checkbox"/>	Plantings include no fewer than four to six tree species and four to six shrub species depending on the size of the area to be planted.	General 1(a)
<input type="checkbox"/>	Stabilization methods and timeframes indicated.	General 5(a) Bioengineering
<input type="checkbox"/>	Bioengineering measures used where appropriate.	Bioengineering
<input type="checkbox"/>	Shoreline protection measures included where appropriate.	Shoreline Restoration
<input type="checkbox"/>	Vegetation provides shade on 60-80% of the surface of coldwater streams.	Watercourse
<input type="checkbox"/>	Nurse crop, if necessary, is indicated.	General 1(b)
<input type="checkbox"/>	Topsoil requirements indicated.	General 4(a)/4(b)/4(c)
<input type="checkbox"/>	Habitat created where applicable.	General 7
<input type="checkbox"/>	Key plan included indicating location of project, project name, address and applicant and owner's name(s), landscape architect's name and contact information.	General 9
<input type="checkbox"/>	Total plantable area and density calculations included.	General 9
<input type="checkbox"/>	Rodent protection included.	General 9
<input type="checkbox"/>	Staking details included.	General 9
<input type="checkbox"/>	Tree wrap details included for deciduous trees.	General 9
<input type="checkbox"/>	Mulching details included.	General 9
<input type="checkbox"/>	Tree protection fencing details indicated.	General 9
<input type="checkbox"/>	Existing vegetation is clearly indicated on drawings.	General 9
<input type="checkbox"/>	Extent of disturbance is clearly indicated on drawings.	General 9
<input type="checkbox"/>	Existing conditions (such as creeks, wetlands and woodlands) are clearly marked on drawings.	General 9
<input type="checkbox"/>	Monitoring plan detailed in notes.	General 9
<input type="checkbox"/>	Removal of wire baskets and burlap is indicated.	General 9
<input type="checkbox"/>	List of Project Goals/Special Considerations (redside dace habitat enhancement, increase shading along creek, creation of forest edge, reforestation etc.) included.	General 9

Complete

Requirement

**Guidelines
Section**

- Drawings folded to standard letter size (8 1/2" x11").

General 9

Tree Preservation Plans

Complete

Requirement

**Guidelines
Section**

- Maximum tree preservation potential achieved. Trees to be removed or preserved accurately and clearly indicated and labelled on the plans. TPP
- Tree protection fencing details provided. TPP
- Vegetation inventory completed including species, size, location, biological condition (noting potential stresses), presence of rare or significant species, etc. TPP
- Mitigation and compensation measures discussed. TPP
- Monitoring plans are detailed. TPP
- The dripline of existing individual trees and/or woodlots shown to scale. TPP
- Plans include the proposed site plan/subdivision layout and limits of all grading. TPP
- Edge management details provided. TPP

Additional Notes:

Name

Signature

Date
