



Conservation Halton Guidelines for Landscaping and Rehabilitation Plans

October 2022
Version 3.1



CONSERVATION HALTON GUIDELINES

Conservation Halton (CH) strives to protect life and property from natural hazards such as flooding and erosion and to prevent environmental degradation, loss of natural features and their ecological and hydrological functions, and to prevent pollution near or within natural features. To do this, CH undertakes a wide range of programs and services. In the planning and development process, CH exercises its roles and responsibilities in accordance with the Province's Policies and Procedures for Conservation Authority Plan Review and Permitting Activities (2010), including:

- A regulatory agency under Section 28 of the *Conservation Authorities Act*;
- A body with delegated authority under Section 3 of the Provincial Policy Statement, to represent the 'Provincial Interest' regarding natural hazards in the review of municipal policy documents and planning applications under the *Planning Act*;
- A public commenting body under the *Planning Act*, *Clean Water Act* and other Acts and Provincial Plans;
- A service provider for environmental advice and technical clearance to municipalities in accordance with signed Memoranda of Agreement;
- A resource management agency operating on a local watershed basis; and
- A landowner in the watershed.

CH's Planning and Regulations staff (i.e., environmental planners, regulations officers, ecologists, water resource engineers, technologists, and hydrogeologists) work together on interdisciplinary teams to deliver timely and comprehensive reviews and advice to provincial agencies, municipalities and landowners across CH's jurisdiction.

Section 28 (1) of the Conservation Authorities Act allows conservation authorities to make regulations to protect life and property from natural hazards. CH's regulation is Ontario Regulation 162/06. Under Ontario Regulation 162/06, CH regulates:

- All development in or adjacent to river or stream valleys, wetlands, and surrounding lands where development could interfere with the hydrologic function of the wetland, Lake Ontario shorelines, and hazardous lands such as karst, and any prescribed allowances;
- Alterations to a river, creek, stream, or watercourse; and
- Interference with wetlands.

Permission is required from CH for undertaking any works within regulated areas. Any development, which in the opinion of the CA, does not affect the control of flooding, erosion, pollution, conservation of land, or dynamic beaches may be approved or approved with conditions. Interference to watercourses and wetlands may be approved, approved with conditions, or refused. CH's Board-approved Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document outlines the policies and technical requirements which must be met before permission may be granted. As part of a CH permit application, an applicant must demonstrate that CH's Board-approved policies and technical standards can be met.

CH also provides technical advice to its municipal partners on a range of environmental matters, including stormwater management (SWM) and natural heritage, through service agreements or Memoranda of Understanding/Agreement (MOU/MOA). Technical advice is also provided to municipal partners in CH's capacity as a public commenting body and a resources management agency.

These Guidelines provide clear expectations regarding the criteria and approaches that are acceptable to CH and are used by staff to assess the technical merits of a landscaping and rehabilitation plans for works proposed in CH regulated areas. Applicants proposing landscaping and rehabilitation works should follow these Guidelines when preparing plans to be submitted as part of a CH permit application. By doing so, more efficient, and consistent reviews, fewer resubmissions, and faster approvals are anticipated.

These Guidelines are specific to CH and do not replace or supersede any other federal, provincial, or municipal requirement.

OBJECTIVE	<p>The purpose of the Guidelines for Landscaping and Rehabilitation Plans is to:</p> <ul style="list-style-type: none"> • Identify CH's regulatory and technical requirements for a landscaping and rehabilitation plan submission • Outline CH's key expectations for landscaping and rehabilitation design
APPLICATION & USE	<p>Applies to all landscaping and rehabilitation plan submissions associated with Ontario Regulation 162/06 permit applications. These Guidelines have been developed for:</p> <ul style="list-style-type: none"> • Qualified professionals such as landscape architects and ecologists tasked with preparing landscaping and rehabilitation plans • CH staff to assess the technical merits of a landscaping and rehabilitation plan and to facilitate quicker and more consistent reviews
ADDITIONAL REFERENCE MATERIALS (to be read in conjunction with this document)	<ul style="list-style-type: none"> • Ontario Regulation 162/06 Halton Region Conservation Authority: Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, 2006 • Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning, November 6, 2020 (amended) • Conservation Halton Guidelines for Ecological Studies, 2017 • Conservation Halton Seed Mixes, October 2020 • Conservation Halton Native Species List, August 2018 • Conservation Halton Guidelines for Stormwater Management Engineering Submissions, 2021 (forthcoming)
VERSION	<p>Version 3.1</p> <p>This version of the Guidelines for Landscaping and Rehabilitation Plans was presented to and endorsed by the CH Board of Directors in June, 2021.</p> <p>Version 3.1 was edited in October 2022.</p> <p>The Guidelines may be updated from time to time. For more information, visit https://www.conservationhalton.ca/policies-and-guidelines or call 905-336-1158.</p>

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Abbreviations

The following table lists the various abbreviations used within this document:

TABLE 0-1: LIST OF ABBREVIATIONS

ARL	Approximate Regulation Limit	CA	Conservation Authority
CH	Conservation Halton	DBH	Diameter at Breast Height
ELC	Ecological Land Classification	MECP	Ministry of Environment, Conservation and Parks
NAI	Natural Areas Inventory	O. Reg 162/06	Ontario Regulation 162/06
SWM	Stormwater Management		

Section 1 Introduction

The purpose of the Guidelines for Landscaping and Rehabilitation Plans is to:

- Identify CH's regulatory and technical requirements for a landscaping and rehabilitation plan submission for a permit within CH's regulated areas
- Outline CH's key expectations for landscaping and rehabilitation design

This document focuses primarily on CH's expectations related to the ecological aspects of landscaping and rehabilitation plans. Other disciplines may also provide relevant direction such as water resource engineering, hydrogeology and geotechnical engineering.

Complex permit applications for larger scale works may require a landscaping and rehabilitation plan completed by a qualified professional. Single landowner residential development will be encouraged to adopt the principles in these guidelines, where possible, for simple permit applications for smaller scale works. Consultation with CH is advised to ensure the appropriate sections of the guidelines are used.

1.1 Guideline Outline

This document is divided into five sections and a supporting appendix. For all projects requiring CH's permission, the General Standards must be followed. In addition to the General Standards, the Project Specific Standards also apply to those identified in Section 3.

- **Section 1 – Introduction** – Outlines the purpose of CH's Guidelines for Landscaping and Rehabilitation Plans.
- **Section 2 – General Standards** – Outlines the general requirements for landscaping and rehabilitation plans proposed in CH's regulated areas.
- **Section 3 – Project Specific Standards** – Outlines CH's standards for planting and provides direction for specific landscaping or rehabilitation works, such as:
 - Rehabilitation in floodplains and/or along watercourses;
 - Stabilizing temporary channels;
 - Planting plans for stormwater management facilities; and,
 - Planting plans in the setback adjacent to regulated natural areas (e.g. wooded features, wetlands and shoreline).
- **Section 4 – Wildlife Habitat Features** – Summarizes various techniques that can be applied to creating and enhancing wildlife habitat features within CH's regulated area.
- **Section 5 – Submission and Drawings** – Summarizes the key requirements and standards outlined in the guideline and provides a checklist with all information to be included in a submission to CH.
- **Appendix 1 – Best Practices, Helpful Tips and Other Considerations** – Provides tips and considerations that are not required as part of a submission but are encouraged.

These Guidelines are specific to CH and do not replace or supersede any other federal, provincial or municipal requirements.

1.2 Conservation Halton's Role in Reviewing Landscaping and Rehabilitation Plans

CH protects, manages, and enhances the area within its jurisdiction (see Figure 1-1) through a wide variety of programs and services, including the administration of regulations and the provision of planning services.

FIGURE 1-1: CONSERVATION HALTON WATERSHED



Watersheds

- | | |
|--|--|
| Bronte Creek | Expressway/Highway |
| Grindstone Creek | Creeks & Waterbodies |
| Sixteen Mile Creek | Municipal Boundaries |
| Urban Creeks | |

0 1 2 4 6 8 10 Kilometres

Under Ontario Regulation 162/06 (O. Reg. 162/06), CH regulates:

- All development in or adjacent to river or stream valleys, wetlands and surrounding lands where development could interfere with the hydrologic function of the wetland, Lake Ontario shorelines, or hazardous lands such as karst and any associated allowances;
- Alterations to a river, creek, stream, or watercourse; and
- Interference with wetlands.

Permission is required from CH for undertaking any development within regulated areas. “Development” means,

- a) the construction, reconstruction, erection or placing of a building or structure of any kind,
- b) any change to a building or structure that would have the effect of altering the use or potential use of the building or structure, increasing the size of the building or structure or increasing the number of dwelling units in the building or structure,
- c) site grading, or
- d) the temporary or permanent placing, dumping or removal of any material, originating on the site or elsewhere.

CH’s Board-approved *Policies and Guidelines for the Administration of Ontario Regulation 162/06 and Land Use Planning Policy Document* (2020) outlines the policies and technical requirements which must be met before permission may be granted. As part of a CH permit application, an applicant must demonstrate that CH’s Board-approved policies and technical requirements can be met to the satisfaction of CH.

In addition, CH provides plan review services to municipalities for environmental advice and technical clearance.

CH’s review of proposed landscaping and rehabilitation plans provides for a streamlined and integrated assessment of the merits of the proposal that is linked to CH’s roles and responsibilities.

Section 2 General Standards

This section outlines landscaping and rehabilitation requirements for works proposed in CH's regulated areas, such as floodplains, watercourses, valleys, wetlands and lands adjacent to wetlands. Additional project specific guidance is provided in Section 3.

Landscaping and rehabilitation are required when alteration or rehabilitation works are proposed within a regulated area. Landscaping and rehabilitation plans may be a component of an overall CH permit. Applicants are encouraged to consult with CH staff prior to submitting a plan.

Drawing or Submission Requirements

When preparing a landscaping or rehabilitation plan, each plan must include and/or show the following:

- ☐ Written and graphic scale on all drawings (e.g., 1:200)
- ☐ North arrow
- ☐ Property boundary
- ☐ Full area of disturbance, including all grading works, (i.e., digital submission, and/or 8.5 x 11 hardcopy)
- ☐ Air photo(s) with proposed works overlaid (digital submission only)
- ☐ Vegetation protection measures and erosion control measures (if not provided on other drawings)
- ☐ Stamp of a qualified professional (if applicable) and drawing date
- ☐ CH's Approximate Regulated Limit (ARL) or confirmed regulated area by CH staff (e.g., CH staff staking)
- ☐ Plantable area in square metres (m²)
- ☐ Description of the proposed approaches for topsoil, timing of work, species selection, tree and shrub plantings, groundcover and stabilization of soils

Before drawings are drafted, all higher-level plans and policies (e.g. site-specific environmental impact assessments/studies, subwatershed studies, subwatershed impact studies, etc.) that pertain to the proposed development should be reviewed. These high-level policies and plans may identify goals that should be achieved through landscaping or rehabilitation works. They may also provide direction on the expected outcome of landscaping and rehabilitation works.

Understanding existing site context and conditions is a critical consideration for plan preparation. Professionals preparing the plan are encouraged to visit the site early in the planning stage to familiarize themselves with the site. The existing or adjacent natural environment can be used as a reference to identify appropriate species selection and composition for planting.

A suite of factors will influence the survival of the proposed plantings. Species suited to the environmental conditions, the current and anticipated stresses due to development, and the anticipated uses of the site should be selected. Depending on these factors, additional measures may be recommended by staff as part of the landscaping works.

2.1 Site Preparation

There are several steps that can be completed to minimize materials needs and reduce the footprint of disturbance on a given site. Simple notes on plans can provide clear direction on how to clear the site of vegetation and protect features identified for preservation.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Demarcate the limits of construction with erosion and sediment fencing and/or tree protection fencing to avoid encroachment into the natural area. This will minimize disturbance to preserve the quality of the topsoil.
- ☐ Undertake any required tree removals without grubbing the soil, to the extent feasible to minimize disturbance to the soil and subsequent erosion risks.

2.2 Topsoil

Healthy soils are essential for effective vegetation establishment, increasing success rates of restoration projects while minimizing management costs, maintenance and replanting. Outlined below are CH's requirements related to topsoil application and the stockpiling of materials. These requirements are based on industry best practices and CH's experience with successful landscaping and rehabilitation projects.

When preparing a landscaping or rehabilitation plan, each plan must:

Topsoil

- ☐ Indicate if the existing topsoil is viable and if there is enough depth for anticipated plantings and seeding.
- ☐ Specify aeration and/or adding compost, compost tea, leaf mulch and/or locally sourced mycorrhizal inoculant if the existing soil is compacted or degraded.
- ☐ Ensure a minimum depth of 20 cm of clean topsoil is specified unless the area has been compacted or soil is sterile and a minimum of 45 cm of clean topsoil where soil has been compacted. Confirm the proposed topsoil depths are supported by engineering studies.
- ☐ Specify mixing imported soil with native soil to ensure soil microorganisms are adapted to the site.
- ☐ Specify that clean topsoil is proposed in a consistent depth throughout the area.
- ☐ Phase works during construction to the extent possible to minimize disturbance. Care should be taken so as not to place fill within regulated areas or unnecessarily use heavy equipment.
- ☐ Show how compaction will be minimized and mitigated in instances where encroachment into the natural area cannot be prevented. Consider application of a medium such as woodchips in locations where vehicle movement is proposed in natural areas.

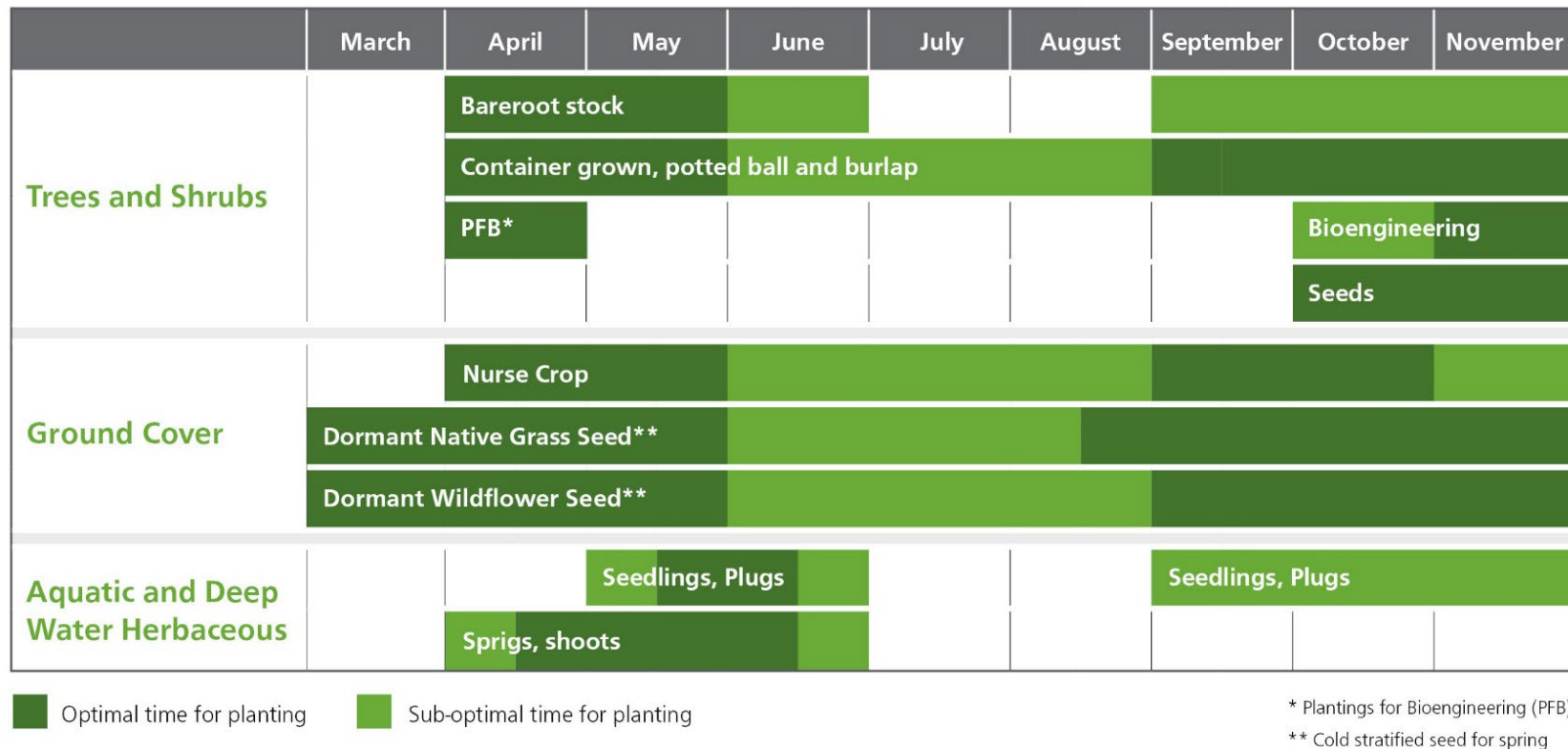
Stockpile

- ☐ Show all topsoil stockpile locations on site, outside of CH's regulated limits, to a recommended maximum specified height limit of 130 cm. Stockpiling to greater heights and remaining for periods longer than six months will generally sterilize the topsoil. Where this cannot be avoided, the addition of compost is recommended at the end of the stockpiling period.
- ☐ Seed stockpiles with nurse crop or alternative winter cover to help retain the quality of the topsoil and minimize erosion.

- ☐ Install appropriate erosion and sediment control measures around the topsoil pile and other exposed areas to prevent sediment-laden runoff from reaching watercourses and other sensitive areas.
- ☐ Keep stockpiled topsoil separate from subsoil.

2.3 Timing

For landscaping and rehabilitation projects to be successful and avoid sensitive timing windows for wildlife, consideration must be given to the best and most appropriate time of year to undertake the proposed works. The timing of works should be included on submitted plans, as this will determine if additional maintenance measures are required. Figure 2-1 below outlines the appropriate time to plant various vegetation types based on best practices.

FIGURE 2-1: WHEN TO PLANT NEW STOCK

When planting trees and shrubs, deciduous plants should be transplanted in the fall after leaves drop or in the spring before the leaves emerge, while conifers should be planted in the spring. Some species such as oaks can only be transplanted in the spring. Bioengineering plantings must be installed when dormant. Caution should be exercised when proposing landscaping during periods when risk of freezing is high.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Indicate a contingency plan for seeding if works cannot be completed immediately after construction.
- ☐ Include notes on maintenance should landscaping be completed during sub-optimal periods.
- ☐ Provide an advisory note indicating that planting of herbaceous material is to be completed outside of frost period with sufficient time for plants to take root.

2.4 Species Selection

A well-designed landscape incorporating native species will function well ecologically and hydrologically with the existing surroundings. CH endeavours to protect and enhance natural features, and hydrologic and ecological functions within the watershed by promoting the use of native *self-sustaining vegetation*.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Illustrate transplanting, planting or salvaging of only native species.
- ☐ Include locally common and/or uncommon species as per CH's Native Plant List.
- ☐ Ensure that no invasive species or plant associations that support the lifecycle of pests are proposed (e.g., do not plant the hosts of blister rust together: *Ribes* and *Pinus* species).
- ☐ Include a diversity of species with different flowering times.
- ☐ Include a minimum of five species per targeted plant type (e.g., tree, shrub, forbs, graminoid, aquatic, etc.).
- ☐ Avoid species with allelopathic effects to ensure the optimal growth of other species (or ensure tolerance of species planted in association).
- ☐ Incorporate bioengineering measures where appropriate.
- ☐ Include locally native species representative of existing vegetation or edge habitat communities when planting adjacent to vegetation communities or in natural areas.
- ☐ Integrate early successional species.
- ☐ Incorporate companion plantings for shading, where appropriate.
- ☐ Include at least one submergent or floating-leaved plant and one emergent species, in aquatic planting plans.
- ☐ Use CH's Native Species List for a list of suitable species.

2.4.1 Species at Risk, Provincially or Regionally Rare Species

CH does not support the planting of any species at risk, provincially rare or regionally rare species unless undertaken specifically under the direction of a recovery initiative. 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. Confirm current species status with federal, provincial and regional lists prior to submission. Regional rarity can be found in the Halton and Hamilton Natural Areas Inventories (NAI).

2.4.2 Trees and Shrubs

Trees and shrubs provide important services and critical ecological and hydrological functions in the landscape. Trees and shrubs can reduce the rate of erosion by protecting the soil from rain impacts and holding soil in place with their roots. Trees and shrubs also reduce flooding by increasing infiltration.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Propose no fewer than five tree species and five shrub species in areas currently or intended to be forested.
- ☐ Include a variety of tree sizes and successional species to accelerate establishment of a natural vegetation structure. Specific size variations are provided in the project specific standards subsections.
- ☐ Select species representative of natural plant associations and appropriate successional stage.

- ☐ Use adjacent vegetation communities, where applicable, as examples of vegetation associations.
- ☐ Mimic a naturalistic, rather than geometric layout to the greatest extent possible in the planting plan.
- ☐ Design cover structure and layering (e.g., groundcover, understory canopy, heterogeneous canopy height, etc.) to maximize structural complexity.
- ☐ Install plant species not susceptible to ice/storm damage as well as spreading, suckering vegetation away from structures.
- ☐ Transplant/salvage only non-invasive woody vegetation that is under 20 cm diameter at breast height (DBH).
- ☐ Include larger stock and/or fast growing shrubs and trees near or adjacent to streams and ponds to provide immediate shading (i.e. *Acer saccharinum*, *Salix spp.*, *Sambucus canadensis*, *Populus spp.*).
- ☐ Consider contingency measures for animal damage during species selection and post-planting care.
- ☐ Provide a tree planting detail on the drawings showing the stakes, wrap, mulch, soil amendments and size of hole.

Due to factors such as area of disturbance, stock availability, and survivability, CH may support planting of younger and smaller stock on a case-by-case basis. Consultation with staff is recommended.

Whips can be substituted for caliper stock at a 10 to 1 ratio, where appropriate.

- 1 deciduous caliper stock is >4 cm DBH
- 1 conifer is >150 cm in height

2.4.3 Ground Cover/Stabilization

Ground cover and stabilization measures are key in preventing immediate erosion and sedimentation, improving the ecological function and significantly contribute to the restoration efforts. When preparing plans, it is key to consider the application, composition and timing of the ground cover/stabilization proposed.

When preparing a landscaping or rehabilitation plan, each plan must:

Application

- ☐ Specify application of ground cover in a nutrient rich medium using Terraseeding, hydroseeding or similar techniques that incorporates both seed mix and growth media during the application process or with weed-free "sod blocks."
- ☐ Limit mulch to a depth of 5 cm and only in planting nodes.
- ☐ Avoid broadcasting the entire watercourse corridor or natural area with mulch.
- ☐ Select plastic-free mulch.

Composition

- ☐ Include plugs or potted stock for immediate results, and plants grown from seed for target community composition, where possible.
- ☐ Plant both native graminoids and wildflowers for structural diversity and blooming periods to capture a larger suite of biological services. Include deep rooting, native perennial grass species for soil stabilization.
- ☐ Provide the seed mix species composition and application rate on plans. CH recommends a seeding rate of 25-30 kg/ha. Verify species-appropriate quantities with a qualified professional.
- ☐ Salvage seed depending on site conditions and existing vegetation. Areas with invasive species or dominated by non-native species are not suitable salvage sites.
- ☐ Use more than one nurse crop to prolong coverage over multiple seasons.
- ☐ Do not use conventional sod in naturalized regulated areas.

Timing

- ☐ Optimize timing of works and germination of nurse crops.
- ☐ Apply a combination of nurse crops to establish quick vegetative cover over various seasons.
- ☐ Avoid seeding during the drought-prone periods, unless additional maintenance measures can be completed (i.e. frequent watering).
- ☐ Stabilize topsoil with approved nurse crop seed mixes for groundcover.
- ☐ Add additional stabilization measures (e.g., hydroseeding in combination with engineered methods such as erosion matting and nurse crops) if required due to seasonal conditions and depending on timing of work. Re-evaluate the depth of the topsoil prior to planting if not stabilized immediately.
- ☐ Delay spreading of topsoil until following spring, if topsoil cannot be stabilized within the current year's growing season.

Additional Considerations

- ☐ Indicate scheduled weeding plan to ensure intended vegetation grows.
- ☐ Use biodegradable erosion matting such as plant fibre blankets for short-term stabilization.
- ☐ Consider pit and mound construction as a topographic approach when used with an appropriate planting regime. To minimize erosion and runoff, each pit should not be surrounded on four sides by a mound, and vice versa.
- ☐ Ensure the nurse crop is certified and does not contain any invasive species.

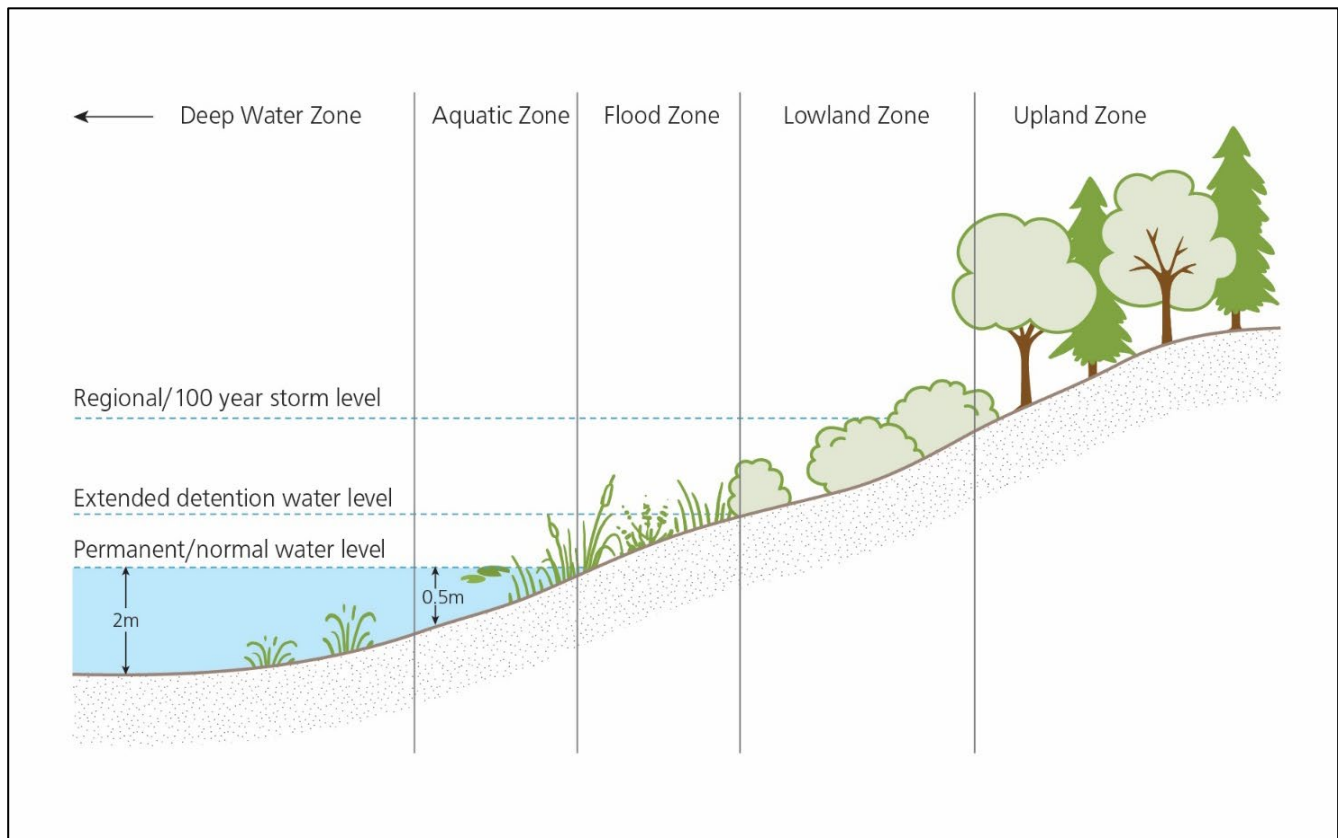
2.5 Planting According to Moisture Regime

To achieve a successful outcome, it is necessary to consider the site's moisture regime when determining what to plant in which location. Many plants have specific needs as it relates to moisture level and will not thrive if these needs are not met. The five zones describe typical conditions encountered. The hydrologic/moisture zones represent the tolerance of plants to differing degrees of water inundation (Figure 2-2: Moisture Zones).

- **Deep Water Zone:** water depth 0.5 m to 2 m below surface.
- **Aquatic Zone:** depth from 0.5 m to the permanent pool level/normal water level.
- **Flood/Shoreline Zone:** permanent pool to extended detention elevation or 5-year storm.
- **Lowland Zone:** extended detention elevation to the regional storm or based on vegetation community present.
- **Upland Zone:** above the regional storm elevation.

Consider and include moisture zones when developing plans.

FIGURE 2-2: MOISTURE ZONES



The Figure 2-2 is provided for schematic purposes only. Plantings in each zone are subject to the type of rehabilitation project.

CH's Native Species List provides a list of native species suitable for each hydrologic/moisture zone based on the coefficient of wetness is available online at www.conservationhalton.ca.

2.6 Post Planting Care

Post-planting care refers to the maintenance and monitoring required to achieve self-sustaining vegetation. It can ensure survivability of the newly installed material and soil stabilization to prevent sedimentation and erosion. Specifications for frequency and duration of maintenance and monitoring will vary based on the nature of the project. Certain projects may warrant pre-installation meetings between the designer and contractor or ongoing supervision by the qualified professional to address issues as they arise. Prior to installation, a qualified professional must verify that the proper species have been sourced. Drawings must include all details regarding monitoring and maintenance for clear communication between the designer, review agencies and contractors.

Post-planting site visits should be carried out throughout the warranty period to ensure vegetation has reached a free-to-grow state. These visits may involve watering, removal of invasive and non-native species, adding mulch, removing stakes, removing litter and resolving any problems. Sites should be visited after inclement weather, especially during the period of establishment, to confirm that the proposed plantings have not been uprooted, to address erosion or ponding of water, and to determine if the approach is working satisfactorily. CH should be contacted if changes to the approved plan are necessary.

When preparing a landscaping or rehabilitation plan, each plan should:

- ☐ Outline the vegetation monitoring plans in the General Notes. The plan should include how the performance and effectiveness of interim measures (e.g., nurse crops) will be monitored, the duration and frequency of the program, and how plant health will be protected during droughts and other extreme weather (e.g., high rainfall or wind events) until plantings have reached a free-to-grow state
- ☐ Include coir disks around the base of trees and shrubs to retain water.
- ☐ Ensure mulch extends beyond the root ball and does not touch the base of the tree and shrubs.
- ☐ Indicate the removal of plant tags.
- ☐ Include tree protection measures such as rodent guards and stakes.
- ☐ Indicate all temporary stabilization measures such as rodent guards and stakes will be removed at the appropriate time after planting, generally within 2 years.
- ☐ Indicate that pruning of all dead or damaged tree and shrub branches will be done by a qualified professional.
- ☐ Include replacement of dead or dying plantings prior to the end of two years or the end of the warranty period from the nursery/contractor.

Section 3 Project Specific Standards

This section outlines project specific requirements for landscaping and restoration associated with works within regulated areas such as floodplains and watercourses, temporary channels, stormwater management facilities and areas adjacent to natural hazards or features. These requirements are in addition to the general requirements outlined in Section 2.

3.1 Floodplains and Watercourses

Plantings associated with floodplains and watercourse alterations must:

- stabilize the side slopes and floodplain of the creek block;
- prevent erosion on meander bends;
- mitigate pollution (e.g., thermal impacts, sediment and other deleterious materials, etc.);
- enhance fish and wildlife habitat; and,
- protect and enhance the natural heritage system.

3.1.1 Planting Requirements

Floodplain and watercourse alteration requirements apply to the entire width of the creek block, including floodplain and, side slopes (excluding trails). Appropriate species selection is essential to ensure long term viability and success of the plantings.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Provide both general and species-specific habitat features.
- ☐ Include a variety of pioneer, successional and late successional species for rehabilitation works. Pioneer flood tolerant species ensure rapid rehabilitation, while mid-successional species provide longer-term structural diversity based on growth rates and shade tolerance.
- ☐ Ensure plantings consist of 5% caliper, balled and burlap and/or wire basket material and 95% whips and/or saplings.
- ☐ Include trees at a density of 10 trees per 100m² and a shrub to tree ratio of 5:1, in communities dominated by trees and shrubs.
- ☐ Provide tree and shrub plantings within the first metre adjacent to the creek to maximize the benefit of shading, bank stability and instream habitat. Vegetation should provide shade on 60-80% of the surface of streams.
- ☐ Use bioengineering along banks where possible.
- ☐ Include ground cover throughout the entire area of disturbance within the floodplain and where enhancement will improve the riparian/creek corridor.
- ☐ Vegetate the entire cross-section of intermittent channels and to the approximate bankfull limits of permanent channels.
- ☐ Illustrate the topsoil tapering to a thin layer near the bottom of the bank or low flow limits.

3.1.2 Bioengineering

Bioengineering is the rehabilitation technique of using dormant cuttings of hardy native plant material. It is an encouraged approach for watercourse and valley rehabilitation works as a method to stabilize or protect

erodible soils. It can provide immediate mechanical stability while a vigorous root matrix establishes within the soil. As the stabilization is provided by living vegetation, the reinforcement provided grows stronger and more effective over time. Types of Bioengineering can include installing live fascines, brush layering, live crib walls, live staking and brush mattresses. The plant material used for bioengineering is installed in a dormant state.

Two factors should be considered when determining whether bioengineering is an option:

- **Shear Stress:** determine the shear stress that is anticipated to be enacted on the bioengineering material via precipitation, meltwater or creek flow to confirm if the approach will work.
- **Timing:** install bioengineering structures during the required planting timing window to ensure the survival of the planting material and the success of the bioengineering project. The collection of material and installation should occur between October 31 and March 31.

3.2 Temporary Channels

Temporary channels are used to divert flows during construction of stormwater infrastructure or permanent/ultimate watercourse realignments. It is important to quickly stabilize these channels to prevent sediment from entering downstream, or from impairing aquatic species passage.

The following approaches for temporary channels in regulated areas should be considered:

- ☐ Using erosion control blankets depending on construction timing and duration.
- ☐ Lining bed with rocks and/or vegetation.
- ☐ Planting native vegetation to ensure full coverage, especially in cases where works will be completed over a longer timeframe (i.e., greater than one year).
- ☐ Using sod mats for stabilization where appropriate.



Temporary channel lined with rocks



Temporary channel bed lined with vegetation

3.3 Stormwater Management Ponds

Plantings contribute significantly to the proper functioning of Stormwater Management (SWM) Ponds. SWM vegetation benefits and functions include:

- improving water quality by preventing the release of sediment into local creeks and tributaries;
- stabilizing the side slopes of the pond;
- mitigating pollution and nutrient loading of waterways;
- reducing the exchange of sediments and toxins into watercourses;
- minimizing establishment and growth of invasive species;
- reducing water temperatures through shading;

- providing aesthetic benefits; and,
- carbon capturing and cycling.

Municipalities may have additional requirements for stormwater ponds and should be consulted throughout the design process.

3.3.1 Planting Requirements

Appropriate species selection for these areas is critical for long-term survivability of the vegetation and function of the facility to achieve the abovementioned benefits and functions.

When preparing a landscaping or rehabilitation plan, each plan must:

- ☐ Provide shade on the southern exposure of pond, inflow and outflow channels whenever possible to reduce warming. Plant a portion of the required caliper species on the south side of the pond and close to the permanent pool level.
- ☐ Select flood tolerant species adapted to anticipated water flow velocities.
- ☐ Protect planting nodes from waterfowl if required. Dense shrubby vegetation placed close to the permanent waterline will help to discourage loafing and nesting geese.
- ☐ Include nodes of 5 - 30m², spaced out no more than 6 m.
- ☐ Show species in randomized patterns to mimic a natural layout. Avoid a grid layout.
- ☐ Locate woody plants in a manner that does not impede the flow of water in or out of SWM pond facilities.
- ☐ Provide the total plantable area per moisture zone.
- ☐ Provide no-maintenance, non-invasive species with a mix of locally native forb and grass species.

It is best practice to increase planting densities, as vegetation will have to be removed during sediment dredging operations.

The planting details provided above are also presented in Table 3-1.

TABLE 3-1: PLANTING CRITERIA PER MOISTURE ZONE

Zone	Water Depth	Planting Criteria
Deep Water Zone	0.5 m to 2 m below surface	<ul style="list-style-type: none"> <input type="checkbox"/> Group aquatic plants and space them 0.5m to 1m apart. <input type="checkbox"/> Aim for 40% cover (at full growth) of the area as defined by the normal water level to 0.75m depth. <input type="checkbox"/> Include a minimum of four aquatic plant species.
Aquatic Zone	depth of 0.5 m to the permanent pool level/normal water level	<ul style="list-style-type: none"> <input type="checkbox"/> Aquatic species should include at least one species of submergent and floating-leaved plant, and at least one species of robust, broadleaved and narrow-leaved emergent. <input type="checkbox"/> Provide cattails (<i>Typha latifolia</i>) and pioneer rush and bulrush species (e.g., <i>Juncus effusus</i>, <i>Juncus torreyi</i> and <i>Scirpus cyperinus</i>) as interim vegetation in sediment forebay to aid in sediment trapping. Limit the plantings of cattails to areas away from maintenance access areas.
Flood/Shoreline Zone	permanent pool/normal water level to extended detention elevation	<ul style="list-style-type: none"> <input type="checkbox"/> Include a minimum of four aquatic forbs and graminoid plant species should be included as plugs and seeds. <input type="checkbox"/> Provide at least five species of shrubs should be planted <input type="checkbox"/> Provide at least 25 shrubs per 100 m²
Lowland Zone	extended detention elevation to the regional storm	<ul style="list-style-type: none"> <input type="checkbox"/> Indicate a density of no less than 5 trees per 100 m² and 25 shrubs per 100 m² in the dry land area of the lowland and upland zone. <input type="checkbox"/> Include a variety of tree planting stock sizes and successional species to accelerate establishment of a natural vegetation structure. Use the following percentages to determine the amount of each size to plant: <ul style="list-style-type: none"> ○ 5% caliper, balled and burlap and/or wire basket material (4 cm caliper for deciduous trees; min. 150 cm for conifers), ○ 95% whips and/or saplings Provide larger caliper sized trees to shade SWM ponds. Place plantings 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.
Upland Zone	above the regional storm elevation	<ul style="list-style-type: none"> <input type="checkbox"/> Include a variety of shrub sizes between 0.4 – 1 m in height. At least five species of shrubs and trees should be planted. <ul style="list-style-type: none"> ○ 5 trees per 100 m² ○ 25 shrubs per 100 m² <input type="checkbox"/> Include groundcover

3.3.2 Calculation of Plant Material for Aquatic Species

The total aquatic plantable area is defined by the normal water line/permanent pool level down to 0.75 m depth. To achieve 40% cover, the quantity of aquatic plants is calculated based on 6 plants per 1 m².

Below is a formula to determine aquatic plant numbers to achieve at least 6 plants per 1 m² for the Deep Water and Aquatic Fringe Zone:

$$\text{Plantable area (m}^2\text{)} \times 40\% \text{ (cover)} \times 6 \text{ plugs per m}^2 \text{ (plants/m}^2\text{)} = \text{proposed planting number}$$

Sample calculation for 10,000 m² for area between normal water line down to 0.75 m deep:

$$10,000 \text{ m}^2 \times 40\% \times 6 \text{ plants/m}^2 = 24,000 \text{ plants/plugs for the area.}$$

Provided below in Table 3-2 is an example of SWM calculations to be included in the submission.

TABLE 3-2: SWM POND PLANTING CALCULATIONS

Zone	Area	Required Densities	Required Quantity of Plantings
Deep Water Zone	1200 m ²	<ul style="list-style-type: none"> Aquatic plants should be planted in groupings, spaced 0.5m to 1m apart and cover 40% (at full growth) of the area defined by the normal water level to 0.75m depth 	<ul style="list-style-type: none"> 2880 plugs
Aquatic Zone		<ul style="list-style-type: none"> (plantable area (m²) x 40% x 6 plugs per m²) 	
Flood/Shoreline Zone	1100 m ²	<ul style="list-style-type: none"> 25 shrubs per 100 m² Groundcover 	<ul style="list-style-type: none"> 275 shrubs groundcover
Lowland Zone	2000 m ²	<ul style="list-style-type: none"> 5 trees per 100 m² 25 shrubs per 100 m² 	<ul style="list-style-type: none"> 100 trees 500 shrubs
Upland Zone		<ul style="list-style-type: none"> Groundcover 	<ul style="list-style-type: none"> groundcover

*Quantity of required plants/m² is subject to change based on municipal requirements or ecological requirements of receiving watercourse.

3.3.3 Topsoil in SWM Ponds

The first 2 m below the permanent water level along the edge of the pond receives 0.30 m of clean topsoil in keeping with the MECP SWM Guidelines. All areas above the permanent water level receive 0.45 m to 1.0 m of clean topsoil. The subsoil is to be de-compacted/scarified to ensure proper integration between subsoil and topsoil.

The engineer should confirm the suitability of subsoil and topsoil material, and de-compaction options with the landscape architect.

3.3.4 SWM Pond Outlet Structures

SWM pond outlets may be designed as: swales/channels, flow spreaders, infiltration trenches, stonecore wetlands, etc. Regardless of the design, the area around the outlet should be well-vegetated to achieve water quality objectives as well as ecological targets in the receiving watercourse. Establish a continuous band (minimum 3 m in width) of woody riparian vegetation around or along the outlet structure to facilitate shading and stabilization. Plant a combination of fast-growing riparian pioneer species (e.g., poplars, dogwoods, alders and willows) as well as longer lived, large canopy species (e.g., silver maples). Plant the larger planting material adjacent to the outlet feature to provide a more immediate shading effect.

3.3.5 Temporary SWM Pond Stabilization

Temporary SWM ponds may be installed as an interim facility. It is important to quickly stabilize these temporary SWM ponds to prevent sediment from entering downstream.

The following approaches for temporary SWM ponds that outlet to regulated areas should be considered:

- ☐ Use erosion control blankets depending on construction timing and duration.
- ☐ Plant native riparian groundcover vegetation to ensure full coverage, especially in cases where works will be completed over a longer timeframe (i.e., greater than one year).
- ☐ Use sod mats where appropriate.

3.4 Areas Adjacent to Natural Hazards and Wetlands

Plantings in the regulated allowance of natural hazards and wetlands are important for preserving the health of the natural area and improving the ecological function of the watershed. While regulation and policy determine the allowance width, the width of the planting area and composition of the plantings can be determined by an ecological impact study, equivalent ecological study or as determined by CH. The planting area in the regulated allowance is intended to be established and maintained as natural, self-sustaining vegetation. CH promotes rehabilitating sites using planting densities appropriate to the desired Ecological Land Classification (ELC) vegetation community. Appropriate planting densities should be established through consultation with CH.

It is important to consider any existing naturally occurring vegetation adjacent to a natural area when planting. The density and size requirements for planting may be reduced based on existing vegetation provided the existing areas that are not disturbed during any phase of construction. Requirements will be determined on a site-by-site basis. The planting guidelines in the following subsections are based on the most common vegetated treatments.

When preparing a landscaping or rehabilitation plan, each plan must:

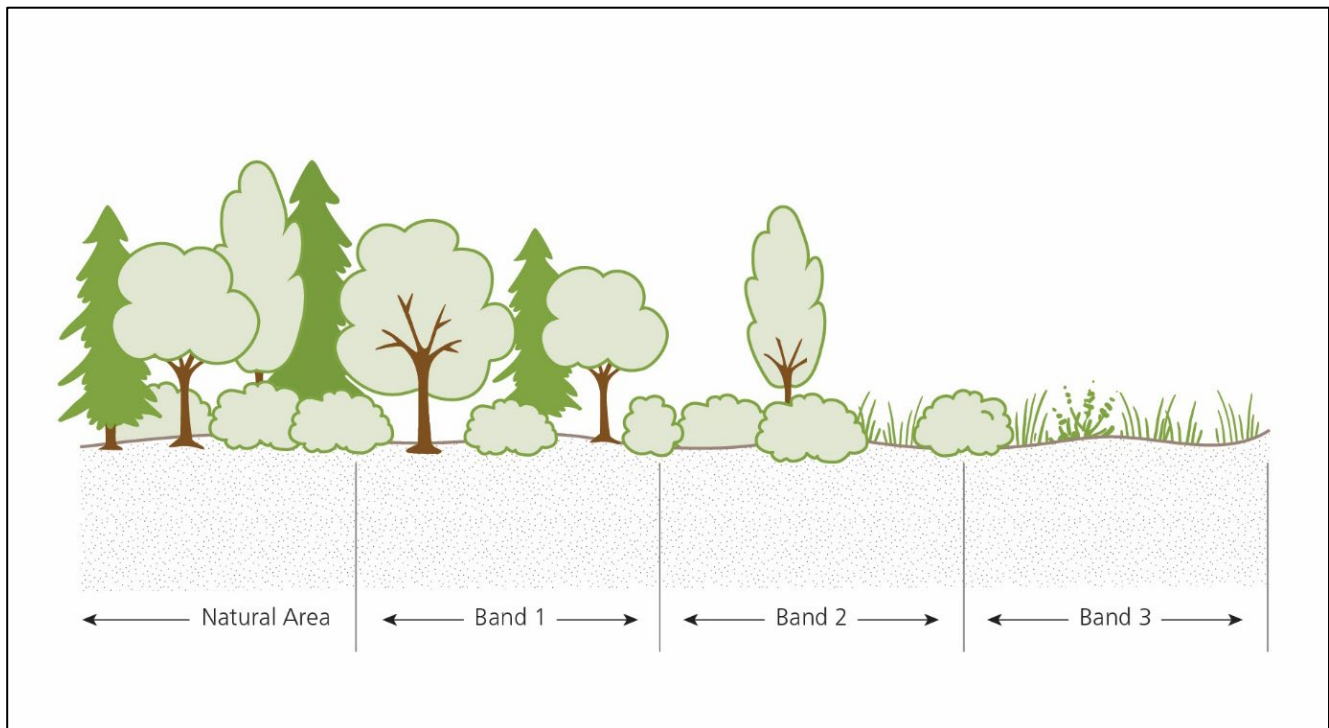
- ☐ Identify if a fence is necessary to deter encroachment into the planting area.
- ☐ Include thorny species, such as raspberries, blackberries and hawthorns, in the perimeter vegetation screen of natural area plantings to help deter encroachment and trampling by people and certain types of wildlife.

- ☐ Plant shrubs which are equal to or larger than 1-gallon pots or equivalent.
- ☐ Include wildlife habitat features, where appropriate.
- ☐ Provide winter cover for wildlife and wind and snow breaks by clumping conifers and using small shade tolerant conifers as understorey among deciduous trees.

Since each site is unique, landscaping plans will be reviewed on a site-by-site basis to determine the most appropriate planting approach.

Regardless of the natural hazard or wetland present, the planting area is made up of three distinct vegetated bands. The purpose of these bands is to create transitions between the natural hazard or wetland, and the proposed development. Band 1 is located closest to the natural feature and tends to be the most densely planted. The width of Band 1 should be a minimum of 5 m for all allowances 15 m wide or less. For all allowances greater than 15 m, the width of Band 1 is half of the total allowance width. Band 2 is made up of sparser woody plantings interplanted with groundcover plantings while Band 3 blends into the surrounding developable envelope consisting only of native herbaceous and graminoid species. The width of Band 2 and 3 will be determined on a site-by-site basis. As illustrated in Figure 3-1, the minimum planting densities are broken down into three bands to create a gradual transition between the natural area and the proposed development.

FIGURE 3-1: VEGETATION BANDS ADJACENT TO NATURAL HAZARD AND WETLANDS



There are a variety of ecological community types that might be classified as natural hazards. This section pertains to wetlands, valleys (typically woodlands) and shorelines, as these comprise most natural areas that require adjacent landscaping. Plantings adjacent to all other ecological community types are dealt with on a site-by-site basis. Table 3-3 outlines the planting criteria by vegetation community.

TABLE 3-3 BANDS CRITERIA BY HABITAT

Habitat	Band 1	Band 2	Band 3	Considerations
Woodlands and swamps	<div><input type="checkbox"/> Indicate tree density of 5 trees per 100 m²</div> <div><input type="checkbox"/> Indicate shrubs density of 5 trees/25 shrubs (for every tree planted, 5 shrubs should be planted) per 100 m².</div> <div><input type="checkbox"/> Locate proposed trails, if any, in other bands and/or away from the natural feature.</div>	<div><input type="checkbox"/> Indicate tree density of 3 trees per 100m².</div> <div><input type="checkbox"/> Indicate shrubs in this band at a shrub to tree ratio of 5:1.</div>	<div><input type="checkbox"/> Indicate a ground cover mix as prescribed in the General Standards section of this document.</div>	
Thickets and thicket swamps	<div><input type="checkbox"/> Plant at a density of 25 shrubs per 100 m².</div> <div><input type="checkbox"/> Plant appropriate groundcover/seed mix around and between shrubs.</div>	<div><input type="checkbox"/> Plant Bands 2 and 3 as a gradient to transition from woody vegetation to ground cover species dominated adjacent to the development.</div>		
Shallow marshes, meadow marshes, along wetland pond edges, wet meadows/prairies, or similar shallow aquatic habitats	<div><input type="checkbox"/> Plant at a density of 15 shrubs per 100 m² in a gradient with most shrubs located adjacent to the remaining natural area.</div> <div><input type="checkbox"/> Plant appropriate groundcover/seed mix around and between shrubs.</div>	<div><input type="checkbox"/> Plant a secondary band of herbaceous cover adjacent to the proposed development.</div>		<div><input type="checkbox"/> The width of bands 2 and 3 will be determined on a site-by-site basis and will vary depending on the quality of the natural area.</div> <div><input type="checkbox"/> Shrub plantings are recommended closest to herbaceous wetlands as a mitigation measure. In certain instances, planting a reverse vegetation band around an herbaceous wetland (e.g. shrubs in Band 3) may be recommended to prevent encroachment into the critical function zone of the wetland.</div>
Vegetated Shoreline along Lake Ontario and Hamilton Harbour	<div><input type="checkbox"/> Plant 5 trees per 100 m² and 5 shrubs per 100 m² within the band immediately adjacent to the shoreline.</div> <div><input type="checkbox"/> Plant coniferous trees as they provide ideal habitat and foraging areas for birds throughout the year as well a wind and snow break.</div> <div><input type="checkbox"/> Cluster plantings to preserve views to the lake.</div>	<div><input type="checkbox"/> Plant native herbaceous species in Band 2 and 3</div>		<p>Shoreline plantings are exposed to extreme conditions along the Lake Ontario and Hamilton Harbour shoreline. Due to this harsh environment, a qualified coastal and geotechnical engineer may need to be consulted. Not all plants are suitable for use in bioengineering and stabilization works along the shoreline and specified species need to be resistant to wind, tolerant to sun and fluctuating water levels.</p> <p>It is essential to consider ground cover 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. A dense tree/shrub zone is beneficial along shorelines as it:</p> <ul style="list-style-type: none">protects against erosion in a harsh environment;deters geese;provides habitat for migrating wildlife; and,provides mutual support against the elements when planted near existing trees and shrubs. <p>It is important to design landscaping that requires minimal to no fertilizer to prevent the runoff from entering the lake and leading to algae blooms.</p>

Provided below in Table 3-4 is an example of band plantings to be included in the submission.

TABLE 3-4: EXAMPLE BAND PLANTINGS

<i>Band</i>	<i>Area</i>	<i>Requirement Densities</i>	<i>Required Quantity of Plantings</i>
Band 1	4000 m ²	<i>Total Tree (5 Trees/ 100 m²)</i>	200
		<i>5% Caliper</i>	10
		<i>50% whip and/or sapling</i>	100
		<i>45% seedling and/or plug</i>	90
		<i>Total Shrubs (5 Shrubs per Tree)</i>	1000
		<i>Groundcover</i>	<i>Refer to section or provide seed mix, percentage and application</i>
Band 2	2000 m ²	<i>Total Tree (3 Trees/ 100 m²)</i>	60
		<i>5% Caliper</i>	3
		<i>50% whip and/or sapling</i>	30
		<i>45% seedling and/or plug</i>	27
		<i>Total Shrubs (5 Shrubs per Tree)</i>	300
		<i>Groundcover</i>	<i>Refer to section or provide seed mix, percentage and application</i>
Band 3	2000 m ²	<i>Groundcover</i>	<i>Refer to section or provide seed mix, percentage and application</i>

Section 4 Wildlife Habitat Features

Landscaping and rehabilitation works can help improve the ecological function of the watershed by including the creation or enhancement of a variety of wildlife habitat features. Wildlife habitat features can foster biodiversity by supporting wildlife populations in the local ecosystem, from invertebrates like bees, butterflies and other pollinators, to amphibians, birds and many other animals. Among other benefits, a diverse ecosystem with a variety of plants and wildlife habitats can reduce the risks of pest outbreaks, provide natural balance and improve the resiliency of the ecosystem. A fundamental characteristic of ecosystems is that biological complexity and diversity requires habitat with structural complexity.

When preparing a landscaping or rehabilitation plan, each plan should:

- ☐ Include wildlife habitat features.
- ☐ Demonstrate how structure and diversity are achieved.
- ☐ List maintenance requirements, if any, of the structure (e.g., cleaning of bird and bat boxes, weed turtle nesting sites, etc.).

4.1 Types of Wildlife Habitat Features

The following subsections provide examples of various wildlife habitat feature types which can contribute to the structural complexity. While these are not requirements for all projects, incorporating them is encouraged to provide diversity and a benefit to the overall system.

4.1.1 Topographic Diversity

Topographic diversity creates habitat heterogeneity by creating micro-climates with varying levels of shade and moisture. To support topographic diversity:

- ☐ Incorporate small pockets of wet meadow/wetlands/shallow seasonal pools within the newly graded areas to provide greater variety in terrestrial habitat, short term water retention and in some locations, a more natural floodplain form.
- ☐ Design wetland habitat to mimic hummocky features or varied microtopography, including basking mounds, oxbows and pit-and-mound features.



Seeding during construction of pit-and-mound features



Vegetation growth post construction of pit-and-mound features

4.1.2 Rock Piles

Rock piles offer structures for loafing, perching basking and refuge to various wildlife. To support habitat diversity:

- ☐ Add rock piles into vegetated areas. Rock piles may vary considerably in size, shape and composition, depending on factors such as the intended purpose, target species, topography and vegetation. Materials may vary, but typically consist of flat rocks, riverstone, cobble and/or small boulders. Riprap is not appropriate for creating wildlife habitat purposes.

4.1.3 Brush Piles

Brush piles on the ground are important components of wildlife habitat as they provide cover and protection during various life stages. To support habitat diversity:

- ☐ Stack small piles of brush (1 to 2 m in height, 3 to 5 m in width and 5 to 10 m in length) to create hiding cover and denning sites for small mammals and nest sites and shelter for birds.
- ☐ Seed/plant native groundcover and vines under and around the brush pile to encourage vegetation to grow over and around the structure, enhancing cover for wildlife.
- ☐ Include large wood structures like logs and limbs to provide habitat for small wildlife, such as birds, salamanders, toads, frogs and invertebrates.
- ☐ Reuse native, non-invasive woody material removed on or near the site.



Example of a rock pile in a newly realigned creek corridor



Example of a brush pile

4.1.4 Hibernacula

Hibernacula is another important component of creating wildlife habitat. Since the creation or enhancement of hibernacula is a relatively complex project, consultation with CH staff is recommended.

4.1.5 Nesting Sites

Several specific criteria must be met when creating a nesting site, depending on the target species. Installing bird boxes is relatively straightforward. Fine woody debris and mulch piles can be used as basking and nesting sites for reptiles when positioned in partially shaded locations. However, for many species such as reptiles, nest site design details are critical. Consultation with CH staff is recommended.



Example of a nesting site made of mulch



Example of a snake hibernacula made of an assortment of rocks and branches built into the ground

4.1.6 Snags and Perching Trees

Snags and perching trees for raptor habitat ensures that habitat is available for large avian predators and similar wildlife. These in turn provide important ecosystem services and functions, including small animal control. To support raptor habitat:

- ☐ Retain tall trees for owl and raptor perches. De-limb trees and leave standing as snags for other wildlife habitat features as well (e.g. woodpeckers, owls, warblers, tree frogs).
- ☐ Install snags on tablelands away from floodplain.
- ☐ Maintain a minimum of 10 m separation distance between installed snags from prey habitat (i.e., hibernacula, brush piles and turtle nesting sites).
- ☐ To improve the snag's longevity, include a layer of gravel 15 cm deep in the post-hole, below the post as a drainage layer, reducing decay at the base of the post/tree, and mound the earth slightly around the installed snag at grade to encourage runoff to flow away from the post to reduce moisture retention against the post.
- ☐ Include boulders at grade to provide extra ballast, or support for the snag where appropriate.
- ☐ Locate snags and perching trees away from trails to be consistent with municipal hazard tree guidelines.



Example of a raptor pole made of an ash damaged by Emerald Ash Borer

4.1.7 Instream Habitat

Works in or near water should consider opportunities for creating habitat heterogeneity for fish and other aquatic wildlife consistent with what is present in the referenced reach. To support fish and aquatic habitat:

- ☐ Provide cover, lunkers, vegetative overhangs such as large woody objects (e.g. logs, root wads, etc.) or boulders. Streambank vegetation plantings contribute to habitat for aquatic organisms and provide allochthonous materials to the stream.
- ☐ Coordinate design with the fluvial geomorphologist to ensure the features do not negatively affect the form and function of the stream.



Example of instream habitat built into the creek bank



Example of instream habitat anchored into an offline wetland

Section 5 Submission and Drawings

Once the landscaping and rehabilitation plan is complete and ready for submission, a copy of the Landscaping Checklist must be completed and signed by the qualified professional to be considered a complete submission. A copy of this checklist can also be found at www.conservationhalton.ca or available at the Administration Office. While not all the information below is applicable to all projects, applications must include the information in the General Section to ensure a timely review and reduce the number of resubmissions.

TABLE 5-1: DRAWING REQUIREMENTS

1st Submission	
<input type="checkbox"/>	All planting plans are completed, stamped and signed by a qualified professional if applicable.
<input type="checkbox"/>	Key map, written and graphic scale, north arrow, project name and location, name and contact information for applicant/owner and qualified professional are shown on the plan.
<input type="checkbox"/>	Property boundary and CH regulated areas are shown clearly on all drawings.
<input type="checkbox"/>	A reference to project goals and site condition/context on drawings is included.
<input type="checkbox"/>	All features shown on landscaping drawings are consistent with other works (e.g. location of ESC, tree protection fencing, location of proposed structures, etc.).
<input type="checkbox"/>	All sensitive timing windows are noted where appropriate on drawings.
<input type="checkbox"/>	Areas of retention and/or species to be protected are shown on all drawings (e.g. vegetation protection and/or erosion and sediment control measures)
<input type="checkbox"/>	Extent of disturbance is shown on drawings.
<input type="checkbox"/>	Location of infrastructure (above and underground) that may affect the proposed landscaping plans (e.g., utility lines, snow storage, etc.) is shown on drawings.
<input type="checkbox"/>	Summary table providing the calculations in square metres for the total plantable area for the areas to be vegetated (excluding any infrastructure such as trails), and total number of trees and shrubs and seed mix in each submission.
<input type="checkbox"/>	Details as outlined in the General and Project Specific standards are included.
<input type="checkbox"/>	Digital and if necessary, hardcopy drawings folded to a standard letter size (8 1/2" x11").
Additional Submissions	
<input type="checkbox"/>	A cover letter outlining the changes to the revised landscaping plan and highlighting the changes on the plans directly.
Upon Completion of Works	
<input type="checkbox"/>	A certified letter from the qualified professional confirming that plans have been implemented as per the approved plans.
<input type="checkbox"/>	Discrepancies between the proposed and as-built plans and the rationale for these are included in the certified letter. Remediation may be required where the difference is substantial.
Submission Prepared by:	
Date (day/month/year)	

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Trees Ontario, 2012. **Discussion Paper: Alternative Approaches to Afforestation in Ontario.** Toronto, Ontario.

Toronto and Region Conservation Authority. 2012. **Preserving and Restoring Healthy Soil: Best Practices in Urban Construction.** Toronto, Version 1.0.

Glossary of Terms

Terms	Definitions
Allelopathic	A chemical emitted from certain plants that reduces some plant's ability to grow optimally. Example of allelopathic plants are: Black Walnut, <i>Juglans nigra</i> , Sumac, <i>Rhus Typhina</i> and goldenrods <i>Solidago spp.</i>
Allochthonous	An input into a system of an organic nature such as woody materials or aquatic invertebrates.
Ball and Burlap	The intact ball of earth containing the roots of nursery stock that has been hand dug, balled and wrapped in burlap.
Bareroot	The root system of nursery stock without a ball of earth.
Bioengineering	Soil bioengineering is an established method of stabilizing or protecting erodible soils using dormant cuttings of hardy, native plant material. Structures provide immediate mechanical stability while 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.
Caliper	The above ground diameter of a distinct part of a nursery stock stem, measures in accordance with the Canadian Standards for Nursery Stock. CH considers deciduous trees with a diameter of 4 cm or greater and a conifer with a height of 150 cm or greater as caliper stock. Generally supplied in 7 gallon or larger containers.
Coefficient of wetness	<p>A measure of the tolerance of a plant species to soil moisture conditions. It is a value on a scale from -5 to +5 that represents the soil moisture regime for the plant species:</p> <p>These categories are defined as follows:</p> <p>OBL (-5) Obligate Wetland - Occurs almost always in wetlands under natural conditions (estimated > 99% probability).</p> <p>FACW (-2 to -4) Facultative Wetland - Usually occurs in wetlands, but occasionally found in non-wetlands (estimated 67-99% probability).</p> <p>FAC (-1 to +1) Facultative - Equally likely to occur in wetlands or non-wetlands (estimated 34- 66% probability).</p> <p>FACU (+2 to +4) Facultative Upland - Occasionally occurs in wetlands, but usually occurs in non-wetlands (estimated 1-33 % probability).</p> <p>UPL (+5) Obligate Upland - Occurs almost never in wetlands under natural conditions (estimated < 1 % probability).</p>

Terms	Definitions
Companion planting	A nodal planting made up of an assortment of species that mutually benefits each other. The shade intolerant species are located on the outside of the node to maximize on sunlight and provide a barrier to shade intolerant located in the middle of the node.
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.
Diameter at Breast Height (DBH)	Standard measurement to establish the diameter of a tree. The diameter at breast height (DBH) is measured at 137 cm above the ground.
Dripline	The edge of the tree canopy.
Ecological Land Classification	The Ontario Ministry of Natural Resources and Forestry (MNRF) system that classifies ecological units based on bedrock, climate (temperature, precipitation), physiography (soils, slope, aspect) and corresponding vegetation.
Fascine	A long bundle of overlapping live shrub cuttings held together by twine.
Free-to-Grow	A self-sustaining state of a plant that no longer requires maintenance and is generally free of vegetative competition. To achieve a free-to-grow state, the landscape plans should indicate growth measures such as the target size of caliper, root collar measurement, height of the plant, crown or other targets for determining when maintenance is no longer required.
Forb	A non-woody flowering plant. Also referred to as an herbaceous plant.
Graminoid	A grass like plant often referring to the <i>Poaceae</i> (grasses), <i>Cyperaceae</i> (sedges) and <i>Juncaceae</i> (rushes) families.
Herbaceous	An adjective representing herb like plants. More generally, herbaceous plants are non-woody flowering plants. Also referred to as a forb.
Landscaping and Rehabilitation Plan	Proposed planting plan. Throughout this document, the term landscaping and rehabilitation plans refers to all restoration, reforestation and enhancement planting plans.
Live Stake	Cuttings from live, rootable woody species.
Locally Common Species	A plant species observed in over 15 natural areas in the respective NAIs.
Locally Native	A species identified in the Natural Area Inventory as naturally occurring within a specified jurisdiction (e.g. Halton Region).

Terms	Definitions
Locally Rare Species	A species considered rare at a local (e.g. local or regional municipality) level.
Locally Uncommon Species	A plant species observed in 6 - 15 natural areas in the respective NAIs
Native	Indigenous to a region, having evolved there as part of an ecosystem over a long period.
Natural Feature	Features and areas, including wetlands, coastal wetlands, watercourses, valleys, which are important for their biodiversity/biological/ecological, 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 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). Sometimes described as 'Introduced'.
Nurse Crops	Fast growing annual groundcover species that establish within one growing season and provide stabilization. Typically, short lived.
Plant Type	Refers to trees, shrubs, forbs, vines, ferns and graminoids.
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.
Regionally Rare	A species known in five or fewer sites in Halton Region/City of Hamilton as identified during the Halton/Hamilton Natural Areas Inventory (NAI).
Provincially Rare Species	A species with a subnational (provincial) rank of S1 to S3.
Qualified Professional	A person with specific qualifications, training, and experience authorized to undertake work in accordance with the policies in accepted arboriculture, forestry, landscape architecture, ecology or scientific principles, provincial standards, criteria and guidelines, and/or to the satisfaction of the Conservation Halton.
Sapling	A young tree without branches; in some species and grades spurs may be present. Also referred to as a whip.
Seedling	A cylinder of soil in which a plant is grown. Also referred to a plug.
Self-Sustaining Vegetation	Vegetation dominated by plants that can grow and persist without direct human management, protection or tending.

Terms	Definitions
Shear Stress	The force applied to the stream bank from the flowing water, which can cause the movement of soil particles.
Shoot	A bud, young leaf, or other new growth on a plant.
Sod Block/Mat	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 (COSEWIC) or the Committee on the Status of Species at Risk in Ontario (COSSARO) and the Ontario Ministry of Natural Resources and Forestry 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, the outlet and accessory areas.
Stormwater Management Pond	<p>Dry pond - 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 pond - 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 provides quality control.</p>
Submergent	Rooted hydrophytes with leaves entirely under the water surface.
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. Also referred to as a sapling.
Woodland	Forested, treed, and woodlot areas, including cultural Vegetation Types as defined by the Ecological Land Classification system or the <i>Forestry Act</i> .

Appendix 1: Best Practices, Helpful Tips and Other Considerations

Appendix 1: Best Practices, Helpful Tips and Other Considerations

This appendix provides more direction on approaches that can be taken to ensure a project's success and reduce submissions. This advice represents best management practices and evidence-based successful approaches adopted in CH's watershed. The sections are organized by the subsections of the General Standards.

Before drawings are drafted, review all higher-level policies, studies and plans that pertain to the proposed development. These high-level policies, studies and plans may identify goals that should be achieved through landscaping or rehabilitation works. They may also provide direction on the expected outcome of landscaping and rehabilitation works.

When an ecological and/or hydrological study has not been completed, identify and account for the form and function of natural features in the landscaping plans. In all cases, ensure consistency between the landscaping plans and other drawings (e.g., erosion and sediment control, site plan, etc.).

Guideline Outline

This document is divided into five sections:

- A. Design Considerations** – Lists factors to consider when preparing a Landscaping and Rehabilitation Plan.
- B. Edge Management Plan** – Describes a specific landscaping or rehabilitation plan for works along the edge of a regulated area.
- C. Topsoil** – Outlines additional tips for ensuring the quality of topsoil.
- D. Planting Considerations** – Lists several considerations for plant selection and planting approaches.
- E. Wildlife** – Considerations for wildlife in Landscaping and Rehabilitation Plans.

A. Design Considerations

Several factors could affect the landscaping and rehabilitation plans. While these factors do not all need to be provided on a plan, except for the ARL, the list below outlines most factors to be considered during the preparation of plans such as the site context, existing site condition, the timing of the proposed plantings and the planting plan's coordination with the development application. This list is not comprehensive but provides a starting point for typical considerations in plan preparation.

Site Context

- CH's Approximate Regulated Limit and Natural Heritage System - where applicable and as defined by the regional or municipal official plan or higher planning document.
- Existing Challenges - light, noise, particulates, road salt, etc.

Site Condition

- Vegetation - existing and surrounding vegetation, species tolerances, invasive species and plants that host pests, potential for plant salvage and/or seed harvest.
- Wildlife - sensitive timing windows, colonization potential, wildlife exclusion measures, wildlife encounter protocols, etc.

- Soils and Physiography - soil composition, depth, quality, drainage, slope and aspect, wetness/dryness of site, existing erosion.
- Hydrology - fluvial geomorphology, floodplain, meander belt, low water and high-water mark, potential groundwater interactions.
- Elements - prevalent wind patterns, shade/part-shade from adjacent trees or buildings, landforms or structures, micro-climate.
- Structures - existing infrastructure and utilities located above and below ground, historic land uses that may be in or adjacent to proposed works.

Timing

- Season, duration, and phasing of proposed works.
- Native species stock availability.

Design Conditions

- Extent of proposed development and how it may impact site conditions (e.g., soil compaction, stockpiling, road salt, wind tunnels, etc.).
- Stabilization requirements.
- Grading.
- Altered hydrology, potential wetness/dryness of site.
- Post-construction or post-development use.
- Adjacent sites.
- Suitability of project for low impact development (LID).

B. Edge Management Plan

An Edge Management Plan may be recommended as part of a site-specific environmental impact study/assessment where tree, shrub or vegetation clearing/disturbance involves the existing edge of a regulated natural feature (e.g., wetland, valley). This Plan typically consists of plantings to restore functions and protect the feature from adjacent disturbances. Impacts from such disturbance can include changes to light penetration, increased air movement and associated drying effects, loss of trees/shrubs and groundcover, introduction of exotic or invasive species, decreased biodiversity, alterations of habitat form and function, overall loss of resilience, etc.

C. Topsoil

Proper topsoil application and management is key to pollution prevention, sedimentation and reducing the ecological footprint. In many instances, the quality and quantity of topsoil at the site pre and post development is unknown and consequently will affect the survivability of the plants. Determining the appropriate amount and types of amendments by completing a soil test and sourcing amendments from renewable resources are two examples of topsoil best management practices.

Soil Tests

Excessive application of soil amendments may negatively result in nutrient loading and potentially leaching into nearby waterways. Prior to completing any works, determine if the existing topsoil is salvageable and/or requires amendments by completing a soil test. Should soil amendments be deemed necessary, CH recommends sourcing soil amendments from sustainable practices such as incorporating leaf mulch, or

compost from municipal compost systems that meet Category AA or A of the MECP Ontario Compost Standard Quality.

Peat Moss

Avoid using peat moss as it is a non-renewable resource. Its harvest damages the wetlands it is removed from, making its use unsustainable. Where organic content of soil needs to be amended, alternatives can include coir mulch, compost, fine-textured wood mulch or leaf mulch, which may be available from municipal leaf-collection programs.

D. Planting Considerations

Listed below are various considerations for ensuring appropriate naturalization techniques are adopted.

Conservation Halton's Seed Mix and Native Species List

CH developed a variety of seed mixes that are appropriate for use within our watershed and are suitable for rehabilitation purposes and naturalization projects as well as for stormwater management facilities. They are designed for use in a variety of soil and moisture conditions and are available online on CH's Policies and Guidelines webpage (www.conservationhalton.ca).

The Native Species List provides a list of acceptable species for planting plans in regulated areas. The identified species are not exhaustive as other species may be appropriate for the site, and any locally native non-invasive could be added to the seed mixture (www.conservationhalton.ca).

Establishing Long-term Native Cover

When creating a seed mix, consider including seeds that will germinate immediately the following growing season (nurse crop) and in three to five years. Keep in mind that some native seeds are hard to grow and may not bloom within the two-year warranty and monitoring period. For example, *Impatiens* sp. seeds undergo a double dormancy and may not grow until two to three years after seeding.

Ground Cover Seed Distribution

Consider the distribution method for seed application. Some native seeds may get caught or not germinate in the hydroseeding slurry. Pair the size of seed and medium (tackifier and mulch) appropriately or use an alternative method (e.g., drill seeding, Terraseeding, or broadcast spreading). Specify on the plans:

- Equipment will be seed free prior to starting a new project.
- Seeds to be hand-broadcast on the surface and ensure seed to soil contact for a small site.
- Fluffy seeds are sowed separately.
- Seed grasses with complete awns as it increases germination and buries itself.

Naturalization with Local Species

CH promotes naturalization of regulated areas by using locally native and representative vegetation.

Seed and stock collected from within CH's seed zone (Zone 34 and 37) are ideal for use, as they contain genetic traits that have evolved through long-term adaptation by the species to local micro-climates and other conditions.

Pests

Consideration should be given to the increasing threat of pests on our native flora. CH recommends planting a diversity of species when developing a landscaping plan to ensure the site is more resilient to future pests. For more information consult the Canadian Food Inspection Agency and the Tree, Insects and Diseases of Canada from Natural Resources Canada to determine native alternatives that are not host species to various pests.

Seed/Sod Mat/Soil Salvage

Prior to construction, collect any suitable native seeds, sod mats or soil present. When development projects will take several years to complete, harvest and store local seed for post-construction rehabilitation. Depending on the extent of disturbance, the seeds harvested from these areas will likely be suitable for the conditions of the area once works are complete. Exercise care when stratifying the seeds to maintain viability during the storage period.

Timing

Summer plantings are inevitable. Caution should be used when planting during the typical high temperature summer months due to drought conditions. Survivability during non-optimal planting periods include:

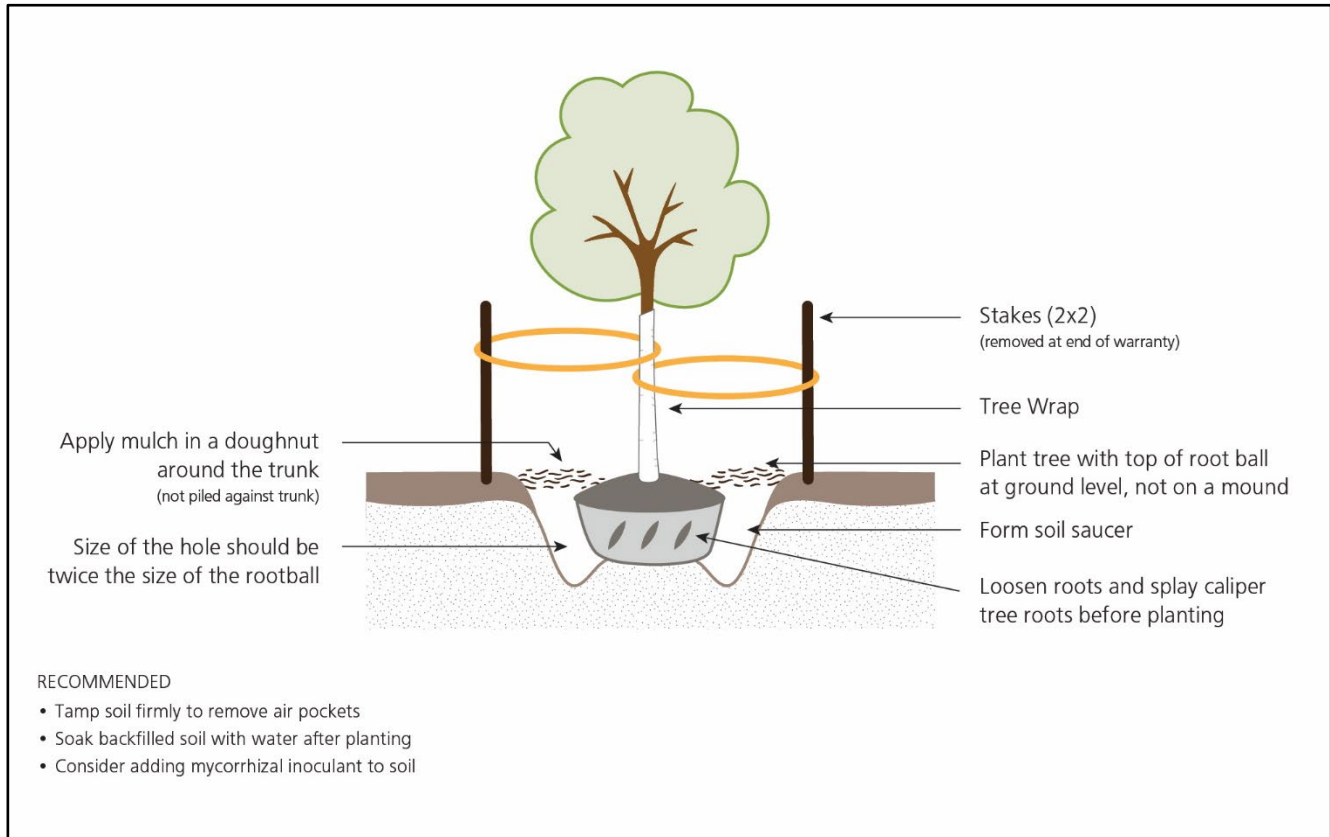
- Keeping planting stock out of the sun,
- Planting during prior to or after peak sun periods, and
- Increasing the frequency of watering

The appropriate time of sowing nurse crop depends on the species and its hardiness to frost. Confirmation of the appropriate nurse crops should be provided once the timing of works has been determined.

Trees and Shrubs Planting Notes

Additional direction in the planting notes or detail as shown on Figure A can help ensure that the plantings get installed correctly and survive. Consider the following advice when composing the landscaping notes:

- Loosen the roots of rootbound individuals and splay immediately before planting for caliper and potted stock. Rootbound plants may need their roots to be pruned. If roots need to be pruned, use only sharp tools to ensure a clean cut. Pruned ends should face obliquely downwards.
- Scarify the sides of the planting hole, when planting in clay or compacted soils, to loosen soil and allow for ease of root growth.
- Plant on firm subsoil, no deeper than the depth of the rootball.
- Plant trees at ground level, not mounded or depressed. Plant shrubs slightly above grade by no more than 2.5 cm.
- Loosen soil within the planting hole to encourage ease of root growth. Remove substantial rocks and large stones. No air pockets should be present during backfill.
- Stake and tie all caliper trees 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. 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.
- Specify staking and tie installation and removal.
- Apply mulch in a donut formation around tree trunk at 7.5 -10 cm in depth approximately at the dripline of the tree. Allow soil to be exposed at the base of tree, to prevent moisture from being trapped against the trunk.

FIGURE A: CALIPER TREE PLANTING DETAIL

Tree and Shrub Planting Approaches

The planting density of woody vegetation is determined based on the project goals. Outlined below and in Figure B are two effective methods of approaching landscaping: nodal planting or scatter planting.

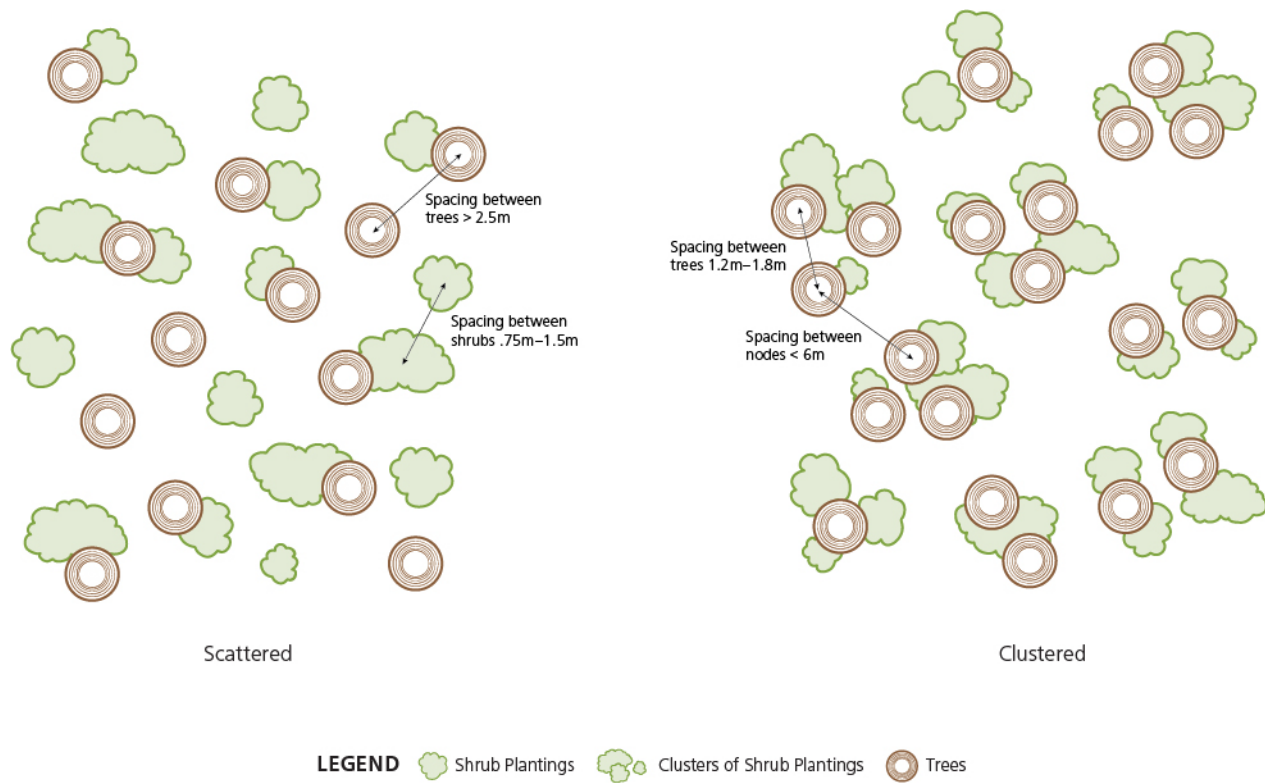
Clustered/Nodal Plantings: Cluster plantings of trees and shrubs.

- Select node size based on site and rehabilitation goals, typically 5-30 m²
- Space out nodes, typically no more than 6 m apart
- Provide 1.2 - 1.8 m spacing between trees (closer than 2.5 m) to promote early crown closure, shading of competing ground cover and promote vertical growth
- Cluster trees with similar growth rate together to encourage long-term survival
- Surround late successional species with adjacent early successional species
- Sow native ground cover around node plantings
- Mulch the entire bed to prevent weeds from establishing
- Locate nodes based on moisture regime zones

Scatter Plantings: Trees and shrubs are spread out in a random fashion throughout the site

- Plant trees no closer than 2.5 m on-centre
- Plant shrubs between 0.75 – 1.5 m on-centre
- Plant a diversity of ages
- Individually mulch the tree and shrub pits
- Seed and stabilize the area between the woody plantings with native groundcover

FIGURE B: PLANTING APPROACHES



E. Wildlife

Important Bird Areas

CH's Lake Ontario and Hamilton Harbour shorelines are designated as Important Bird Areas by BirdLife International, which is supported by Bird Studies Canada and Nature Canada. It is also a migratory pathway for wildlife every spring and fall. Planting trees and shrubs along the shoreline provides perching, resting, foraging and nesting locations. Woody vegetation also buffers noise and sound pollution from the lake and the associated wildlife.

Canada Geese

Canada Geese are typically found grazing near shorelines, beaches, lawns and other open grassed areas near water. The best way to reduce the number of Canada Geese entering a landscaping area is to make the site undesirable to them.

Canada Geese use water as an escape route from predators. To create a visual barrier between geese and their escape route:

- Plant a dense swath of vegetation along the waters edge, such as a dense shrub layer and trees.
- Include a screen of cattails or similar robust shoreline vegetation.
- Install a low fence (30 – 60 cm high) located within the shrub plantings to restrict geese access to and from the water.
- Avoid extensive areas of lawn or sod.
- Plant areas of mixed native wildflowers and other ground cover instead, as geese are more likely to move elsewhere to graze on grassy lawns.

The *Migratory Birds Convention Act*, 1994 protects Canada Geese. For more information on controlling Canada Geese, contact Canadian Wildlife Service, Ontario Region (ec.enviroinfo.ec@canada.ca).