

**Natural Environment and Landscape
Policy and Guidelines**

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Landscaping Consultant's Signature _____

Landscaping Consultant's Name _____

C: Compliant
NC: Non-Compliant
NA: Not Applicable

1.0 Introduction

The natural environment is featured as a key area of action in a number of University plans including the Campus Master Plan, Climate Change Plan, and Sustainability Plan. These landscape design guidelines reflect content of these plans by providing specific guidance on how to meet plan goals.

Plan goals specific to the natural environment include:

- Meet all regulatory requirements such as municipal storm water and pesticide bylaws;
- Employ best management practices for exterior and hardscape management to preserve health and ecological integrity;
- Employ universal design and landscape standards to enhance public spaces and the aesthetic quality of the outdoor environment;
- Meet LEED standards for erosion control and construction activity;
- Conserve and restore damaged areas to provide habitat and biodiversity;
- Eliminate the need for potable water consumption for ongoing irrigation;
- Reduce pollution and run off to storm water systems by reducing impervious cover; and
- Reduce heat island effect to minimize microclimate effects.

Dalhousie University's *Natural Environment and Landscape Policy and Guidelines* outline campus design standards to enhance and protect the natural environment during the planning and construction of future developments and maintenance on all University campuses. Design quality, character, landscape materials, and plant communities contribute significant social, economic, and environmental value to the University and the larger community.

Throughout the document, additional references and sources may follow the description of a principle, policy, or guideline. For example, a policy could be followed by “*See LEED Canada EBOM SS Credit 3 and STARS OP Tier Two Credit 20*”. These references refer to two programs: *Leadership in Energy and Environmental Design* (LEED) and *Sustainability Tracking, Assessment & Rating System* (STARS). LEED is a ‘Green Building Rating System’ that promotes sustainable development and building practices through a number of standardized and internationally recognized tools and criteria. STARS is a volunteer self-reporting framework that measures the sustainable activities of universities and colleges in Canada and the United States. In both systems, credits are accumulated to achieve varying levels of sustainability certification. For more information on LEED and STARS see section 2.11 in the *Natural Environment Plan*.

2.0 Universal Design Principles to be followed in landscape design.

2.1 Equitable use

- Provide the same means of use for all users: identical whenever possible; equivalent when not;
- Avoid segregating or stigmatizing any users;
- Provisions for privacy, security, and safety should be equally available to all users; and
- Make design appealing to all users.

2.2 Flexibility in Use

- Provide choice in methods of use;
- Accommodate right- or left-handed access and use;
- Facilitate the user's accuracy and precision; and
- Provide adaptability to the user's pace.

2.3 Simple and Intuitive Use

- Eliminate unnecessary complexity;
- Be consistent with user expectations and intuition;
- Accommodate a wide range of literacy and language skills;
- Arrange information consistent with its importance; and
- Provide effective prompting and feedback during and after task completion.

2.4 Perceptible Information

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information;
- Provide adequate contrast between essential information and its surroundings;
- Maximize "legibility" of essential information;
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions); and
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

2.5 Tolerance for Error

- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded;
- Provide warnings of hazards and errors;
- Provide fail-safe features; and
- Discourage unconscious action in tasks that require vigilance.

2.6 Efficient and comfortable design

- Allow user to maintain a neutral body position;
- Use reasonable operating forces;
- Use reasonable operating forces;
- Minimize repetitive actions; and
- Minimize sustained physical effort.

2.7 Size and Space for Approach and Use

- Provide a clear line of sight to important elements for any seated or standing user;
- Make reach to all components comfortable for any seated or standing user;
- Accommodate variations in hand and grip size; and
- Provide adequate space for the use of assistive devices or personal assistance.

3.0 Landscape Principles

3.1 Branding and Way-finding

- Follow theme (branding) for the campuses to strengthen and communicate a University identity;
- Coordinated an easy to read system of direction and information graphics that reflects the character and branding;
- Consistently use high quality paving materials and signature furniture pieces;
- Provide free-standing consistent graphic signage near main entrances to all campus buildings; and
- Maintain up-to-date campus maps that are easily readable and support pedestrian orientation and way-finding; provide free-standing copies of this map at various pedestrian intersections and campus gateways.

3.2 Planting

- Use plant species that are native and adapted to the local climate;
- Consider substituting low maintenance salt and drought-tolerant groundcovers instead of high maintenance turf. This will reduce maintenance and irrigation costs;
- Consolidate soft landscape areas to enhance tree and plant growing conditions;
- Use plants to define spaces and make them climatically comfortable for people;
- Expand rooting zones of landscaped areas under adjacent hard paving surfaces. Techniques may include the use of structural soils or cells, continuous planting trenches and/or permeable paving;
- Consider combining stormwater management and planting where appropriate; and
- Planting programs should consider principles of Crime Prevention Through Environmental Design (CPTED), which can reduce the incidence and fear of crime on the campus.

3.3 Trees

- Consider a three metre planting interval to maximize the value of campus trees;
- Select tree species that are native or adapted to Halifax and Truro/Bible Hill. Salt and drought tolerance help to ensure survivability (please consult list in Appendix G);
- At gateway locations, special plantings and landscape features should be encouraged;
- Where proposed development may impact on significant mature tree species, they should be assessed by a certified arborist or landscape architect and reported to the Grounds Supervisor;
- Wherever possible, provide a continuous soil trench for street trees to give tree roots more room to spread and access water thus improving growth.

3.4 Street Corners

- Street curb radii should not exceed municipal standards and should be reduced wherever possible in order to reduce the distance at crosswalk locations; provide more pedestrian area at intersections; and require vehicles to slow down as they turn corners;
- Street corners should be designed to accommodate multiple functions including pedestrian crossings, wheel chair movement, location of utility and traffic signal poles, traffic movements, and pedestrian waiting areas;
- The size of curb radii should consider the geometry of the intersection, the street classification, and whether there is on-street parking and/or a bike lane within the road right-of-way (consult Dalhousie Active Transportation guidelines for details on cycling infrastructure);
- Define edges and transitions with paving materials and textures; and
- Street corners should be free of obstacles and easily identifiable for people with a range of disabilities.

3.5 Amenities

- Where possible, pedestrian amenities such as pedestrian scaled lighting, public message centres, seating, four-bin waste/ recycling/organics/ paper receptacles, and shelters should be provided where the pedestrians gather. Locations include primary pedestrian circulation routes, street intersections, courtyards and building entrances; and
- The pedestrian amenities should be coordinated in style, colour and scale to contribute to the overall identity of the campus.

3.6 Lighting

- Provide a comprehensive energy efficient lighting plan and consistent lighting system for the entire length of the corridor;
- Promote safety and enhance the pedestrian and cyclist environment through good lighting design;
- Provide a line of aesthetic, coordinated, functional, technologically flexible, and durable light standards that contributes to the identity of the campus with consideration of use;
- Solar powered lighting and LED lighting should be implemented throughout the campus to minimize energy consumption;
- Implement full cut-off lanterns to minimize light pollution, glare and light trespass and ensure protection of the night sky; and
- Provide lighting that is appropriate to its location, i.e. pedestrian-scaled lighting along pedestrian routes.

3.7 Site Furniture

- Implement a family of aesthetic, coordinated, functional, technologically flexible, and durable site elements for the campus;
- Coordinate the colour, graphics, materials and finishes of all site elements to promote identity and support the branding theme;
- Design, details, materials and colours should be simple, elegant and timeless;
- Promote ease of pedestrian movement and accessibility through the placement of site and furniture elements;
- Should be accessible to all users and follow the principles of universal design as defined by

- Locate bicycle parking in highly visible, well-lit, accessible and weather protected locations (when possible). Consult the Active Transportation Design Guidelines for further municipal and LEED requirements for indoor and outdoor bicycle parking.
- Incorporate way-finding signage as appropriate; and
- Site structures such as lighting, benches, recycling receptacles, and bicycle parking should incorporate recycled and local materials and technologies where possible.

3.8 Public Art

- Create opportunities for the implementation of public art pieces; and
- Locate art in proximity to the active transportation network, other areas of high pedestrian activity, transit stops, public open spaces, and areas of special heritage or community significance.

3.9 Parking

- Short term parking facilities i.e. drop-off and pick-up areas should be limited to a single row with drive and should be screened from view of the street;
- Appropriate lighting levels should be provided in parking areas to assist pedestrian and vehicular safety while respecting adjacent land uses;
- Designated handicapped spaces to municipal standards should be located as close to the building entrance as possible;
- Integrate underground parking ramps into the architectural design of the building where desired and when possible; and
- If large surface parking lots are unavoidable next to public realm, creatively screen with architectural walls and /or landscaping.

3.10 Utilities

- Utilities should be buried underground where possible; and
- All above grade utilities i.e. transformers within view of public realm the road right-of-way should be screened from view of the street through the use of landscaping and/or architectural screen walls.

3.11 Sustainability

- A direct convenient active transportation corridor with improved pedestrian comfort and circulation increases the appeal of walking and may reduce reliance on the automobile;
- Minimize the extent of impermeable surfaces by utilizing permeable pavers and soft landscaped areas. This will reduce the amount of storm water run-off and subsequent pressure on municipal systems;
- Reduce the urban heat island effect by minimizing the extent of paved surfaces;
- Manage rainwater and snowmelt on-site with designs that encourage infiltration, evapotranspiration and water re-use such as bio-retention areas and bioswales for example.
- Green roofs should be incorporated where feasible to improve building insulation, reduce surface runoff and minimize discharge into the storm drainage system;
- Existing mature non-invasive trees should be preserved and integrated in to the design where possible pending review by a certified landscape architect or arborist;
- Incorporate deciduous trees into the design to provide shade the summer and help reduce

internal building temperatures. In the winter months, deciduous trees shed their leaves and allow sunlight to penetrate windows and warm internal temperatures;

- For soft landscaping, consider an Integrated Pest Management (IPM) strategy, which is a sustainable ecological approach with a main goal of significantly reducing or eliminating the use of harmful pesticides while at the same time managing pest populations at an acceptable level.

4.0 Landscape Replacement Policy

- 4.1 During construction, the removal of vegetation is sometimes unavoidable. New construction projects must demonstrate that alternatives have been considered prior to removing vegetation. Where alternatives are not feasible, to the maximum extent practical, materials shall be transplanted.
- 4.2 Encroachment or removal requests for trees in the HRM right-of-way shall be coordinated with the HRM's Urban Forester. Trees that are owned by the HRM are subject to all regulations outlined in *HRM Bylaw T-600*.
- 4.3 Prior to removal of trees and shrubs from a project site, trunk diameter at breast height (DBH) shall be measured for each affected tree and shrub. The sum of all such diameters is the replacement diameter. The number of replacement trees and shrubs is to be calculated from an equivalent total diameter of new stock as measured at the root collar. Thus, the sum of all root-collar diameters of replacement vegetation shall be no less than the sum of all breast-height diameters of removed vegetation.
- 4.4 Replacement vegetation shall be sited so as to provide roughly similar and equal social, economic, and environment value. Planting locations shall be on the same location as trees or shrubs were removed if possible. If not possible, funding for the replacement vegetation will be given from the relate project budget to the Grounds Supervisor who will use this funding for adding replacement vegetation elsewhere on campus and/or surrounding community. The Dalhousie Grounds Supervisor will approve all planting plans.
- 4.5 Funding for new plantings will be allocated annually as part of the Grounds budget. Additional funding sources include carbon offset funding negotiated through the Office of Sustainability, grants, and individual and group donations. Any person or group providing resources for vegetation on campus must select species from the approved list in Appendix G.
- 4.6 During construction, all costs associated with vegetation protection, mitigation, replacement or transplanting are to be fully funded by the budget of the proposed project.
- 4.7 Where tree protection and relocation is not possible, any tree that is felled on campus property shall be cut to a length of 2.44 m to facilitate transportation for re-use if not milled onsite. The project manager should meet with the planning unit at Dalhousie University to determine the best architectural uses of campus wood. In the case of spruce trees, due diligence must be carried out to reduce the spread of the brown spruce long horn beetle by contacting the local Canadian Food Inspection Agency office for guidelines.

- 4.8 All trees planted, moved, and existing trees in the HRM right-of-way must survive in good condition for two (2) years after project completion. Tree failure or tree deterioration is subject to compensation at time of HRM's Urban Forester's assessment within the two (2) year time span.
- 4.9 Compensation will be made to the University for physical damage to tree foliage, branches, trunks, roots, and soil during construction by a third-party. Damages will be evaluated by the Grounds Supervisor or a third-party arborist if appropriate.

5.0 Appendix A: Landscape Guidelines

5.1 Tree Protection

5.1.1 In undertaking new construction and renovations the designer must preserve existing mature trees. Any project that will impact University owned or maintained trees must include a report completed by a certified arborist. The report will:

- i. Assess the condition of the tree(s) before the project begins.
- ii. Identify the species, condition and physical dimensions of the tree(s).
- iii. Include a plan for the protection of the tree(s) during the project.

The report must be submitted and the plan approved by the Grounds Supervisor before any work can begin. The plan will be used to assess any damage to the trees caused by the project.

5.1.2 The Tree protection zone (TPZ) shall be outlined prior to commencement of the project. The arborist (or Grounds Supervisor) shall define the area. In the case of construction concerns and required grading, this area may be decreased or increased at the discretion of the arborist (or Grounds Supervisor).

5.1.3 Where trees are to be retained on a site, protection barriers must be installed. Trees inside the TPZ shall be cared for throughout the construction process. A fence shall be erected around the perimeter of the TPZ prior to the commencement of any demolition, grading work or construction. This fence shall not be removed until the completion of the project.

5.1.4 Barriers may consist of plastic, wood, or metal fencing of suitable height and strength to prevent encroachment.

5.1.5 The TPZ area is determined by one of three commonly accepted measurements:

- i. Drip-line method: Protect the area under the drip-line for broad canopied trees or 50% further than the drip-line for narrow canopied trees (conifers, etc.).
- ii. Tree height method: Protect a circular area with the radius equal to the height of the tree.
- iii. Trunk diameter method: For every cm of DBH, allow 15cm of space from trunk.

5.1.6 Signs shall be erected at the perimeter of the TPZ and shall not be removed until the completion of the project. The sign should read as follows:

“Tree Protection Zone

No grade change, storage of materials, or equipment permitted. Tree protection barrier must not be removed without written permission of the Grounds Supervisor.”

5.1.7 TPZs shall not be breached in any way. Within the TPZ the following restrictions apply:

No grade change

- i. No storage of material or debris.
- ii. No dumping of wash water or concrete effluent
- iii. No dumping of de-watering effluent, unless approved by the arborist (or Grounds Supervisor)
- iv. No rigging cables shall be wrapped around or tied to the trees

5.1.8 Mulching and irrigation of the TPZ prior, during and following construction can reduce negative construction impacts, improve soil conditions, and increase the likelihood of tree survival. Standard chemical fertilization may provide some benefit. However, ensuring good soil health typically reduces the need for chemical fertilization.

5.2 Plant Materials and Ground Cover

5.2.1 All plant installations shall be carried out in the presence of a certified Horticultural Technician

5.2.2 Plant species shall be selected from the list in Appendix G to improve species diversity, age and size-class distribution, and overall long-term functioning of campus trees. Please refer to the planting priority map in the *Natural Environment Plan*.

5.2.3 The campus design should incorporate the design elements of texture, line, colour, form, and mass to enhance high quality campus landscapes.

5.2.4 Plant material and landscapes at the perimeter of the campus should connect to surrounding neighbourhoods.

5.2.5 No new trees or vegetation shall be planted closer than 6 feet to a building, at the edge of their expected mature dripline. This is to avoid future tree removal if future construction work requires building staging.

5.2.6 Primary plantings should be established within all the major open spaces and campus entrances to define and accentuate the space, provide an appropriate sense of scale, and bring a high scenic character to the campus. Major open spaces should be landscapes of landmark stature, distinct from plantings around buildings.

5.2.7 The predominantly deciduous campus will be enhanced with the addition of both deciduous and evergreen species and other plants with seasonal interest.

5.2.8 The location, layout and massing of the plants must have a regard for public and personal safety. Hedges should be avoided, or if they are to be provided, they should be low. Cedar hedges, Cotoneaster and any invasive plants must be avoided. Refer to *Crime Prevention Through Environmental Design (CPTED)* design standards.

5.2.9 The landscape designer should consider using mass plantings of hardy and prolific

blooming perennials as bold accent plantings rather than annuals.

- 5.2.10 All new trees will be native and adapted species, as per the species list in Appendix G, unless special approval is granted by the Grounds Supervisor. Vegetation that is native to the Acadian forest is a valued University asset that will be promoted (*See LEED Canada EBOM SS Credit 3 and Credit 5 and STARS OP Tier Two Credit 19*).
- 5.2.11 The landscape designer shall consider the incorporation of mass-plantings of drought-tolerant, salt-tolerant, and accent perennials to increase overall site-specific landscape interest and to reduce maintenance requirements.
- 5.2.12 Consideration should be given to landscapes that provide habitat for native birds and animals (*See LEED Canada EBOM SS Credit 3 and STARS OP Tier Two Credit 20*).
- 5.2.13 Design and construction activity occurring near the public and private right-of-way should be coordinated with both Dalhousie University and the HRM to ensure planting, design, material, and infrastructure guidelines are met.
- 5.2.14 Parking structures and blank walls should be creatively screened with green walls, trees, or other greening alternatives.
- 5.2.15 Integrated Pest Management (IPM) should be central in a proposed maintenance strategy for campus vegetation (*See LEED Canada EBOM SS Credit 3 and STARS OP Credit 9*).

5.3 Trees and Shrubs

- 5.3.1 Trees and shrubs must be of good nursery stock that is not root-bound or stunted (held too long in nursery containers).
- 5.3.2 Trees and shrubs must have a strong fibrous root system free of disease, insects, defects, and injuries. The trees must have solid stems and a well-branched structure characteristic of the species. Plants must have been transplanted or root pruned regularly but not later than nine months prior to arrival on site.
- 5.3.3 Trees and shrubs must have been grown in containers for an optimal amount of time to produce a root system that is able to hold soil when removed from container. Plants that have become root bound are not acceptable.
- 5.3.4 In 'balled and burlapped' trees, the size of the ball shall be proportional to the caliper of deciduous tree and to the height of the conifer. The caliper shall be measured at 150mm (6") above ground level. A tree with 75mm (3") caliper required root ball of 1m (40") diameter. Increase diameter of root ball by 250mm (10") with each increase of 25mm (1") in caliper. Root balls of proper size must include 75% of fibrous and feeder root system. This excludes use of native trees grown in light sandy or rocky soil. Secure root balls with burlap, heavy twine and rope. Use hessian burlap. Frozen root balls will be permitted provided the root balls are sufficiently protected to prevent breakage. Protect root balls from sudden changes in temperature and exposure to heavy rainfall.

- 5.3.5 Refer to the Canadian Nursery Trades Association standards for size and quality of plant stock.
- 5.3.6 Imported plant material must be accompanied by the necessary permits and import licenses. They must conform to federal and provincial phytosanitary regulations. Consider local plant producers as an alternative.
- 5.3.7 Plant material should be specifically suited to the planting location, in terms of toxicity (children's centre) and thorns (near walkways and entrances). Consideration should also be given to flowering and fruiting trees or shrubs that will drop fruit or residues on walkways/people or cars. Plants with pungent fragrances or heavy pollen loads should not be planted near air conditioning intake ducting to buildings.

5.4 Planting Time

- 5.4.1 Planting locations must be approved prior to excavation of planting pits.
- 5.4.2 Deciduous plants must be planted during a dormant period before buds have broken or at the end of the growing season prior to ground freeze. Plant material imported from a region with warmer climatic conditions may only be planted in early spring.

5.5 Excavation and Stakeouts

- 5.5.1 The locations of all below grade utilities must be verified prior to excavating. The locations of utilities must be staked out in areas where excavation will occur.
- 5.5.2 Where tree excavation is required around valued campus trees, excavation should be done by hand or by air/water jet excavation systems.
- 5.5.2 No root pruning is permitted within 1.5m of the tree trunk. For every 15 cm of tree diameter (DBH) add 30cm to distance from trunk. No more than 25% of tree roots shall be pruned on one side of the tree and no more than 33% of the entire root system.
- 5.5.3 All new tree planning and planting projects shall consider the amount of continuous soil volume required to maximize tree growth. In difficult planting environments, volume targets can be achieved with soil trenches, structural soil, and growth-cells. See Appendix C for the soil volume and tree-size relationship chart. See the *Natural Environment Plan* for greening opportunities that maximize tree volume in difficult urban sites.
- 5.5.4 For large trees and conifers, the depth of the excavation must be at least 20 cm deeper than height of root ball. The planting pit must be excavated 3-5 times the size of the root ball. A wider pit is required for poor quality soils. Excavated soil is to be amended with good quality (texture, structure and AFP) planting substrate. See Appendix D for tree planting details.
- 5.5.5 The bottom of the excavations must be properly drained to prevent freezing and water-logging. The subgrades of the planting beds and tree pits must be scarified to 20 cm.

5.6 Planting Procedures

5.6.1 Soil in planting beds and tree pits is to be amended with a “triple-mix” planting mixture. Refer to the Landscape Nova Scotia Guidelines for soil amendments and fertilizers. Tree planting and soil amending should be done under favourable weather conditions.

5.6.2 Orient trees and shrubs with the best side facing outward based on the individual location in relation to buildings, pedestrian spaces, and other plantings.

5.6.3 All plant material shall be planted to allow for settling of the soil. The final depth will be equal to the depth originally grown in the nursery. No excessive mounding above root crown and stem collar.

5.6.4 Ensure that tree root balls rest on a minimum of 20 cm (8”) of planting mix.

5.6.5 Topsoil must be tamped around the root system in layers of 15 cm (6”) to eliminate air pockets. Frozen or saturated topsoil is unacceptable. When 2/3 of topsoil mixture has been placed, the hole is to be filled with water. After the water has completely drained through the soil, completely backfill. Form a saucer around the top of the root ball.

5.7 Irrigation

5.7.1 The university as a policy does not irrigate on an ongoing basis, just in the plant establishment phase. For this phase, the proposed irrigation design must be reviewed and approved by the Grounds Supervisor.

5.7.2 The proponent shall explore slow-drip tree bags or other low-water-use irrigation alternatives for vegetation establishment.

5.7.3 Grey water and stormwater should be used whenever possible for irrigation purposes.

5.7.4 All irrigation components shall be either Rainbird or Toro brand of irrigation systems.

5.8 Stormwater Management

5.8.1 New development shall not increase the flow of stormwater from project sites and retrofit projects shall decrease the amount of stormwater run-off by the methods listed below (i, ii, iii). Stormwater can no longer be discharged into a sanitary sewer. (*See LEED Canada EBOM SS Credit 6, STARS OP Credit 23, Halifax Regional Municipality Charter, Item 348, and HRM Stormwater Management Guidelines*). Vegetative solutions for stormwater management on the Dalhousie campus include:

- i. Vegetated swales to direct and channel water, allow for water infiltration, and provide site aesthetics.
- ii. Rain gardens for on-site stormwater retention, infiltration, evaporation, and the addition of amenity value to the landscape (Appendix F).
- iii. Green roofs to intercept rainwater that would otherwise be channeled into the municipal stormwater system. See section 18.

5.8.2 Stormwater management systems shall be planted with vegetation that is proven to perform well in wet, low oxygen environments, which will take-up and transpire water, stabilize soil, filter water and soil pollutants, and encourage on-site water infiltration. Green roof systems shall be planted with vegetation that is from certified plant

producers. Vegetation should be selected to perform in a myriad of temperature and precipitation extremes.

5.8.3 Contractors should explore non-vegetated storm water solutions:

- i. Permeable paving encourages a slow infiltration and release of surface water from the paved site. See Appendix F for a permeable paving detail.
- ii. Rainwater storage and re-use will divert stormwater for internal grey- water use or for landscape irrigation.

5.9 Sod

5.9.1 Sod shall be weed-free number one Kentucky bluegrass-Fescue, nursery grown in compliance with the specifications outlined by the Nursery Sod Growers Association of Canada.

5.9.2 The sod is to be laid during the growing season. Sodding at freezing temperatures or on frozen ground is unacceptable. Sodding during dry weather should be avoided. However, if there is no alternative it will be acceptable only if sufficient and continuous watering is assured.

5.9.3 The sod is to be laid with joints butted even with adjoining areas and the rows shall have staggered joints. The sections are to be butted closely without over- lapping or leaving gaps between sections. Irregular or thin sections are to be cut out with a sharp tool.

5.9.4 The sod is to be rolled with a light roller to ensure close contact between sod and soil. The sod is to be thoroughly watered.

5.9.5 Grassed areas should be used strategically; it is not encouraged as a dominant landscape feature.

5.10 Soil and Additives

5.10.1 The soil used for landscaping must be purchased from a reputable supplier and be screened; triple mix; weed-free; friable natural loam; free of stones, roots, lumps, and other solid material.

5.10.2 Peat moss used for landscaping shall be decomposed plant material, fairly elastic and homogenous, free of decomposed colloidal residue, wood, sulphur and iron and of brown color containing minimum 6% organic matter by weight and moisture content not exceeding 15%. Minimum pH value of peat 4.5, maximum 6.0.

5.10.3 Bone meal shall be raw commercial, finely ground, and with a content of minimum 4% nitrogen and 20% phosphoric acid.

5.10.4 Manure shall be well-rotted, un-leached cattle manure, free from harmful chemicals and other injurious substances. Manure must be composted for at least eight months, but not more than two years and with no more than 25% straw, leaves or other unacceptable materials for planting use (*See LEED Canada EBO&M SS Credit 3 for all fertilizer use*).

5.10.5 Lime is to be used in all cases where the pH of the soil is less than 6.0. The lime

shall contain not less than 8% of calcium and magnesium carbonates combined, finely-ground to pass a 10 mesh sieve with at least one half passing a 100 mesh sieve. Rate of application shall be determined after determining the pH of the topsoil.

5.10.6 When planting in hot, dry conditions, anti-desiccant emulsion can be used to form a permeable film over plant surfaces. Mix emulsions according to manufacturer's directions.

5.11 Plant Accessories

5.11.1 The tree wrappings for trunks shall be first quality burlap.

5.11.2 The anchors for the support of large shrubs and trees up to 65mm (2.5") in caliper shall be new metal "T" bars 38mm x 5mm (1.5" x 1.5" x 3/16") painted black.

5.11.3 Eye Bolts and Turnbuckles shall be zinc coated. Turnbuckles shall be 10mm (3/8") diameter bolts for trees for 75mm (3") caliper and 76mm (0.25") diameter bolts for less than 75mm.

5.11.4 Anchoring hoses shall be two-ply reinforced, new black rubber hose 12.7mm (0.5") in diameter.

5.11.5 The Mulch shall be shredded bark mulch.

5.11.6 The tie back wires should be zinc coated pliable steel wire, #9 gauge.

5.11.7 The stakes shall be T-rail iron stakes 37mm x 1.5 x 3/16") primed with on brush coat of black zinc rich paint to CGSB 1-GP-181.

5.11.8 Wound Dressing shall be horticultural grade accepted non-toxic, non-hardening emulsion.

5.11.9 Rodent Protection shall be round, metal or plastic extending 60 cm above grade.

5.12 Paving

5.12.1 In the design and future reconstruction of streets within the campus, the designer should work with the University and the HRM to establish a palette of materials.

5.12.2 In the landscape design of central open spaces and in special areas of the campus, natural stone paving in combination with poured in place concrete, should be used. The chosen natural material should be available in suitable quantities, over an extended period of time, and sourced locally.

5.12.3 Asphalt should only be used for temporary repairs and should not be considered as a permanent material for pedestrian walkway systems.

5.12.4 Paving stones and porous paving should be considered as part of a stormwater management program. When properly graded and laid, porous paving encourages the recharge of groundwater. See Appendix F for a permeable paving detail.

- 5.12.5 All pedestrians, regardless of abilities, should be able to safely and easily use outdoor spaces. Street corners and routes should be free of obstacles, easily identifiable, and separate from vehicular routes. Please refer to Dalhousie University's *Principles and Guidelines of Universal Design*.
- 5.12.6 The paving material should have sufficient surface texture that will help prevent slipping and will assist in reducing the need for winter salting.
- 5.12.7 Foundations should be 20 cm of properly compacted screening. The sand or stone must be clean and free of deleterious materials. A steel edge should be used around the perimeter of the paving stones. The steel edge should be 0.6 cm and pre-punched to accept a mechanical fastener.
- 5.12.8 Walkways should be a minimum of 1.8 m width to accommodate snow-clearing machinery (See *LEED Canada EBOM SS Credit 2 and STARS OP Tier Two Credit 22*) and ideally be drained on either side to avoid waterlogged margins and ice build-up along the walkway due to compaction.
- 5.12.9 Consider paved surface cover for stormwater control and to reduce heat absorption (See *LEED Canada EBOM SS Credit 7.1*).

5.13 Seating and Furniture

- 5.13.1 Outdoor seating and street furniture should be selected based on both the long-term availability of the product and the longest life cycle available within the budget parameters. Seating should consider the pedestrian movement system.
- 5.13.2 Seating and street furniture should make use of local and recycled materials where possible.
- 5.13.3 Seating and street furniture should be designed for the comfort of the users.
- 5.13.4 Appropriate and easy to service waste collection and recycling containers should be provided. (See *Custodial Design Guidelines*)
- 5.13.5 See the *Dalhousie University Active Transportation Design Guidelines* for planning activities related to bicycle parking and transportation planning.
- 5.13.6 All of the above should be properly fixed in situ to avoid unauthorized removal.

5.14 Walls and Fences

- 5.14.1 New walls and edges should be attractive and of durable materials, preferably natural stone and should specifically exclude timbers, logs, and dry set pre-cast blocks. Wherever possible walls should include integral seating to animate the spaces.
- 5.14.2 Free standing walls should be designed to define spaces. Walls should not obstruct visibility or create secluded corners that may compromise personal safety.
- 5.14.3 Fences should not be installed as features in the redesign of major open spaces

and a program to remove existing non- historic fences should be undertaken.

5.15 Signage

- 5.15.1 Signage should be a component of the landscape design and integrated into walls, structures, and planting plans where possible.
- 5.15.2 Free standing markers must conform to the University design standards on signage. The markers should be illuminated if possible and be placed away from traffic so that they are not damaged or obscured by snow removal operations.
- 5.15.3 Signs to be situated within planting beds should have their concrete footings set deeper than normal to allow sufficient growing medium to accommodate planting of groundcover around the base of the sign.

5.16 Outdoor Lighting

- 5.16.1 In the design of the exterior lighting the same pedestrian scale lighting fixtures should be used in both the street system and in the major open landscape spaces. The illumination levels should be consistent. The lighting levels should be maintained along the pathway for security and safety reasons.
- 5.16.2 Indirect lighting of important building facades and landscape features should be used to enhance the general night-time illumination level required for safety, security and visual amenity of the campus.
- 5.16.3 Ease of maintenance should be a consideration when selecting the type of lighting to be used in any landscaped areas.

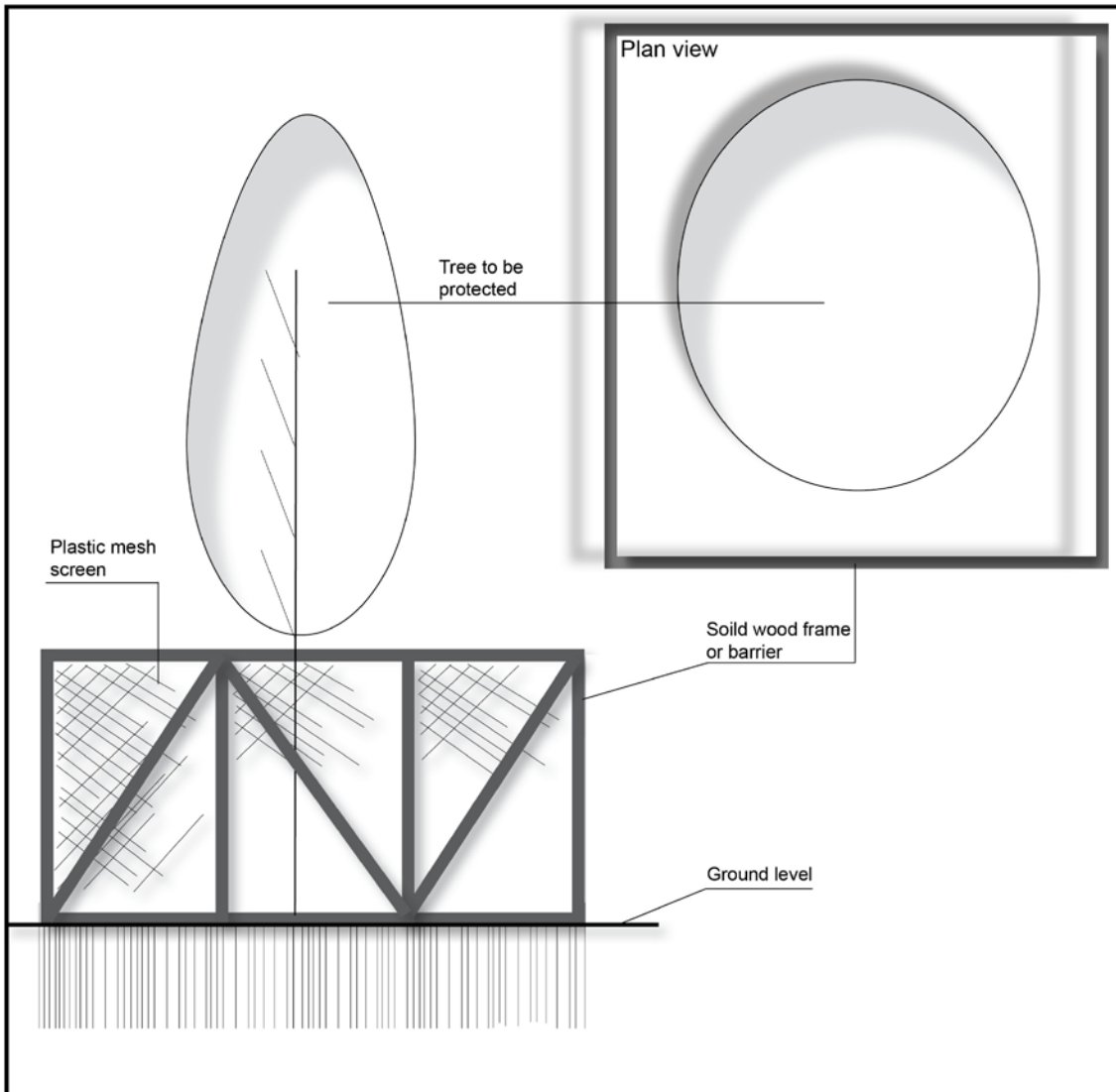
5.17 Green Roof

- 5.17.1 All applied roofing and green roof components shall be provided by one manufacturer.
- 5.17.2 The various components comprising the green roof assembly shall be under the jurisdiction of, and be the responsibility of, the roofing membrane manufacturer.
- 5.17.3 The product and material manufacturers and suppliers shall review and oversee the labor for the installation and placement of the green roof assembly.
- 5.17.4 Design and provide a light-weight growing medium that will retain water and sustain plant growth.

(See LEED Canada EBO&M SS Credit 5, Credit 7.2).

End of Section

6.0 Appendix B: Construction protection details



Notes:

- At minimum- barrier to be established outside of tree dripline.
- There shall be no storage of building materials or equipment within the protection zone.
- There shall be no grade change in protection zone.
- Signage must accompany tree protection.

Tree protection detail

Dalhousie University Natural Environment Plan Standards

Adapted from:

City of Toronto (2010). *Tree protection and policy and specifications for construction near trees*. Retrieved from <http://www.toronto.ca/trees/pdfs/TreeProtSpecs.pdf>

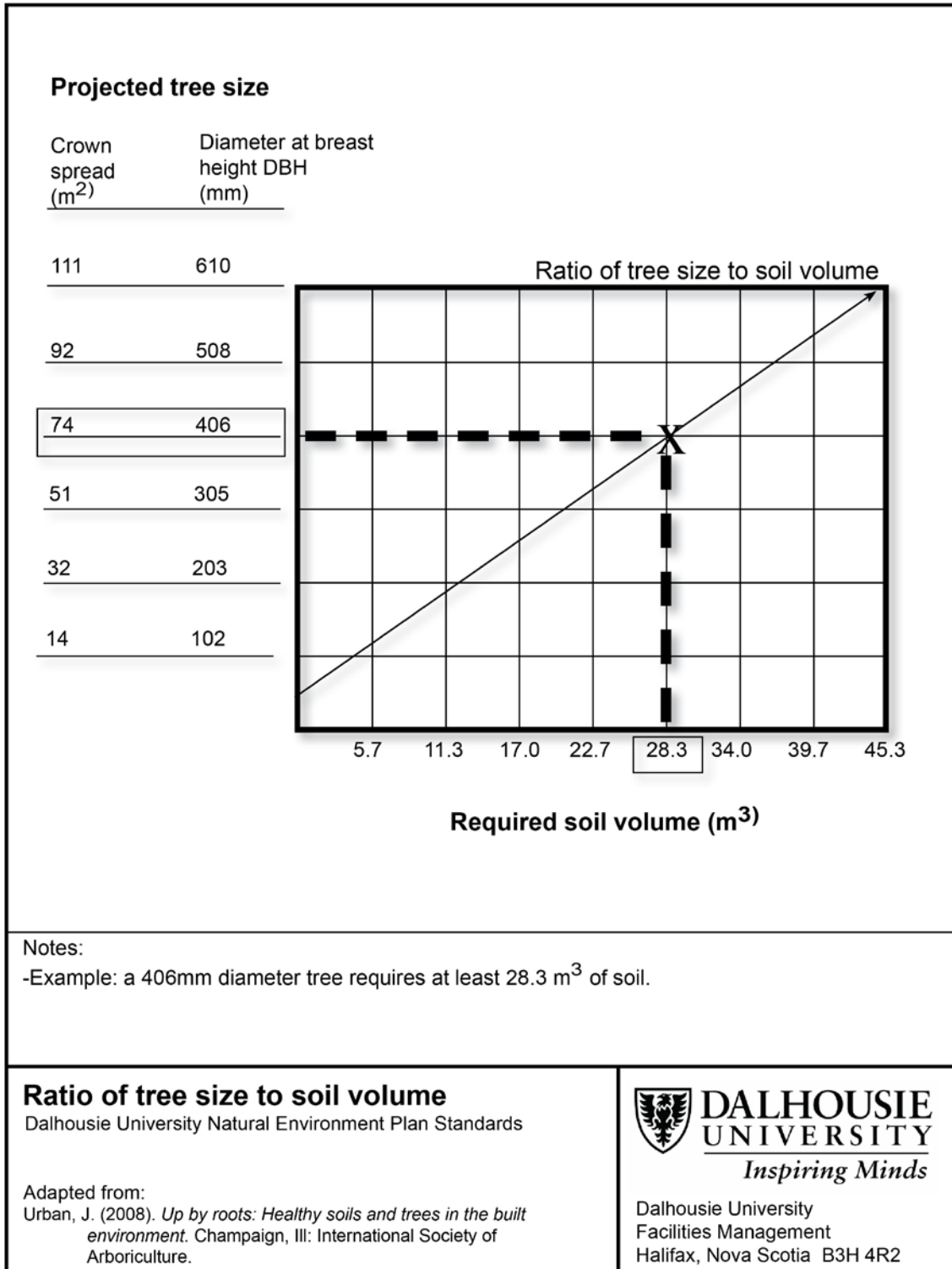


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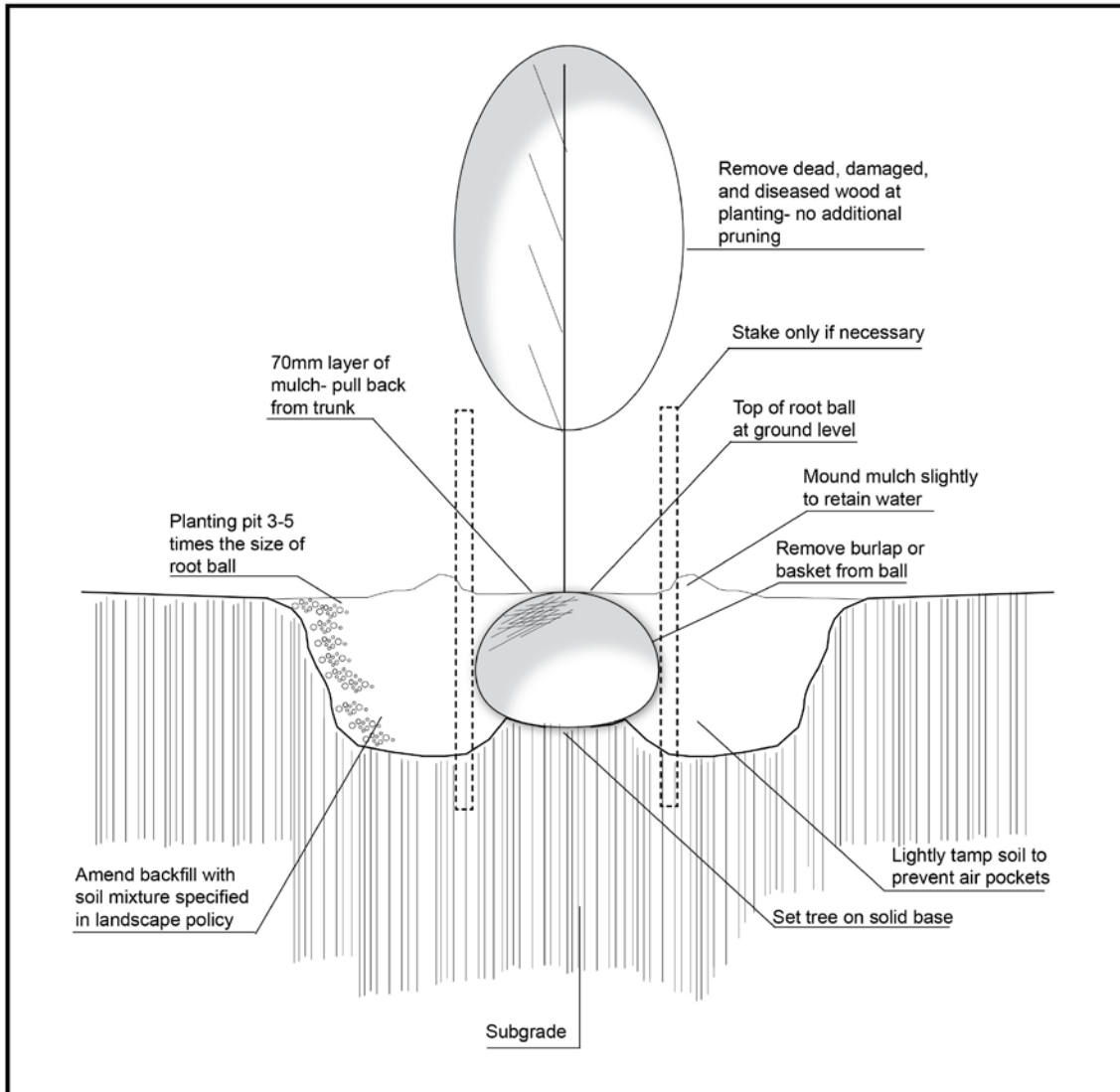
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7.0 Appendix C: Soil volume targets for tree planting



8.0 Appendix D: Tree planting detail



Notes:
 -The same detail applies for evergreen plantings.

Tree planting detail

Dalhousie University Natural Environment Plan Standards

Adapted from:
 City of Toronto (2002). *Planting detail for balled and burlapped trees in turf*. Retrieved from http://www.toronto.ca/trees/pdfs/Detail_PD101bbinturf.pdf

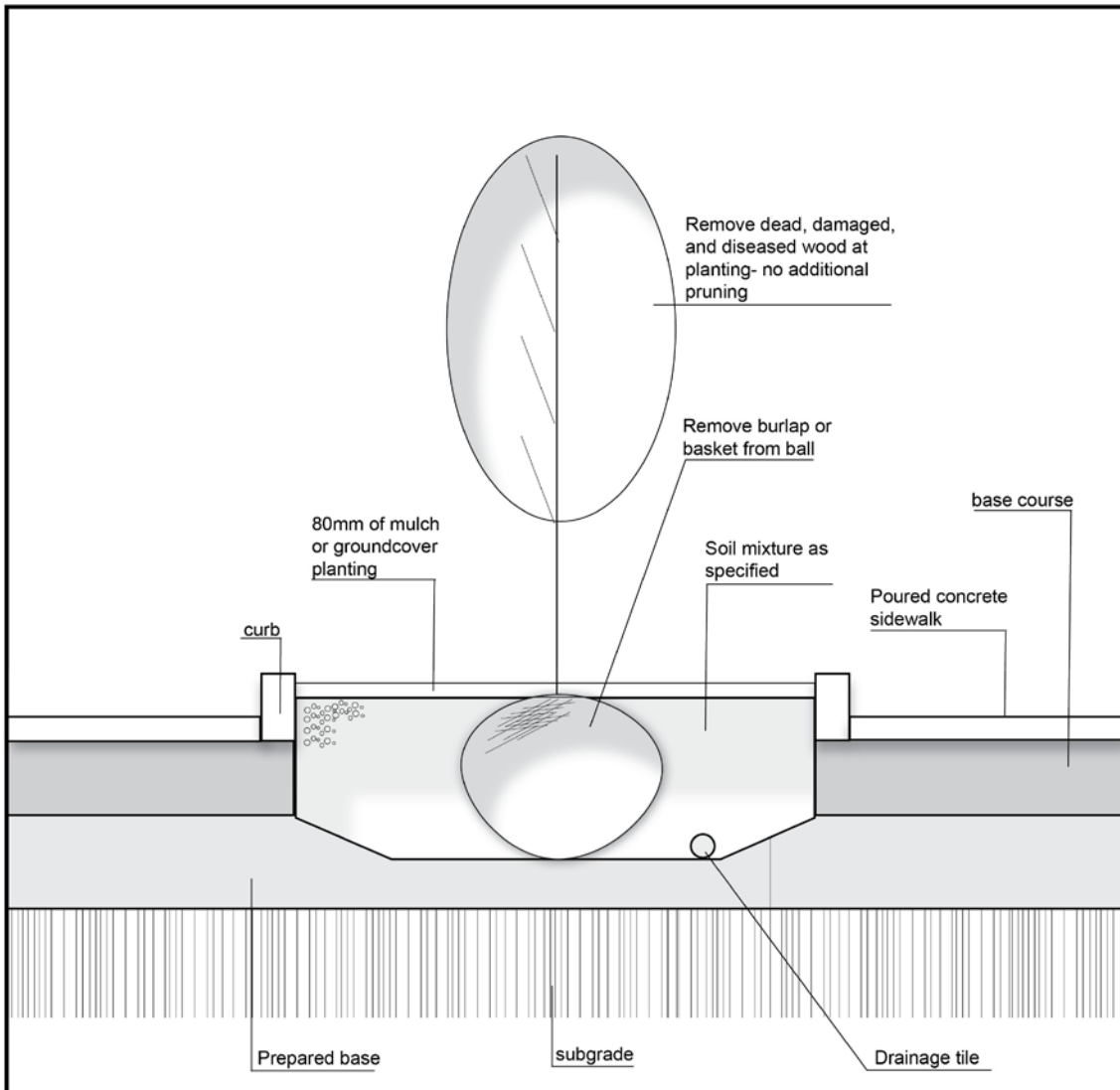


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9.0 Appendix E: Planting details for paved environments



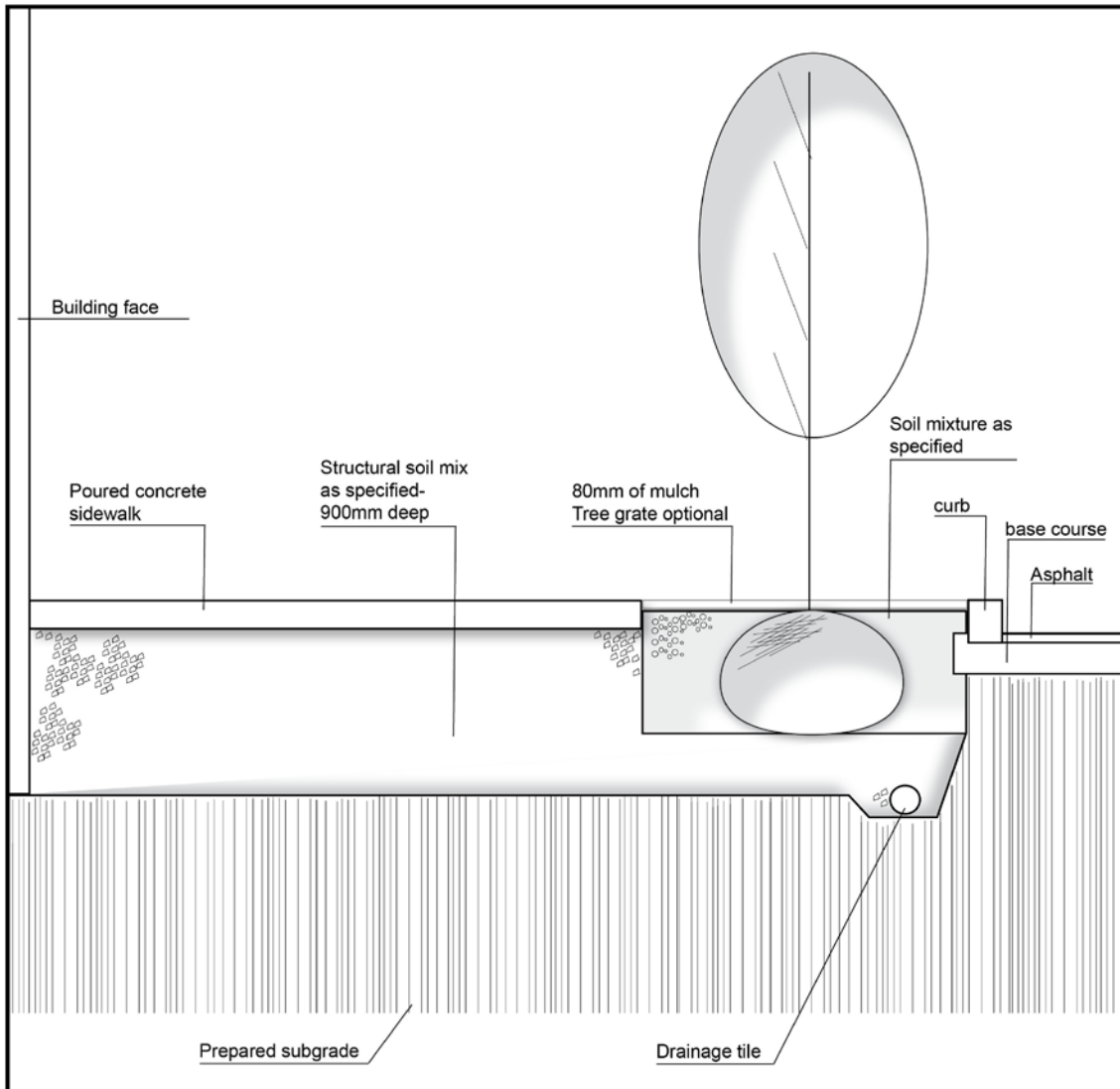
Notes:
 -Soil trench is suitable when there is suitable soil volume to support tree growth. Where adequate soil volume is not available - see structural soil or growth-cell standards.
 -Curbed soil trench will protect against some salt loading.

Sidewalk tree planting detail- soil trench
 Dalhousie University Natural Environment Plan Standards

Adapted from:
 City of Toronto (2013). *Tree details and drawings*. Retrieved from http://www.toronto.ca/trees/tree_details_drawings.htm



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Notes:
 -Systems allows for 30m³ of soil per tree.

Sidewalk tree planting detail- structural soil

Dalhousie University Natural Environment Plan Standards

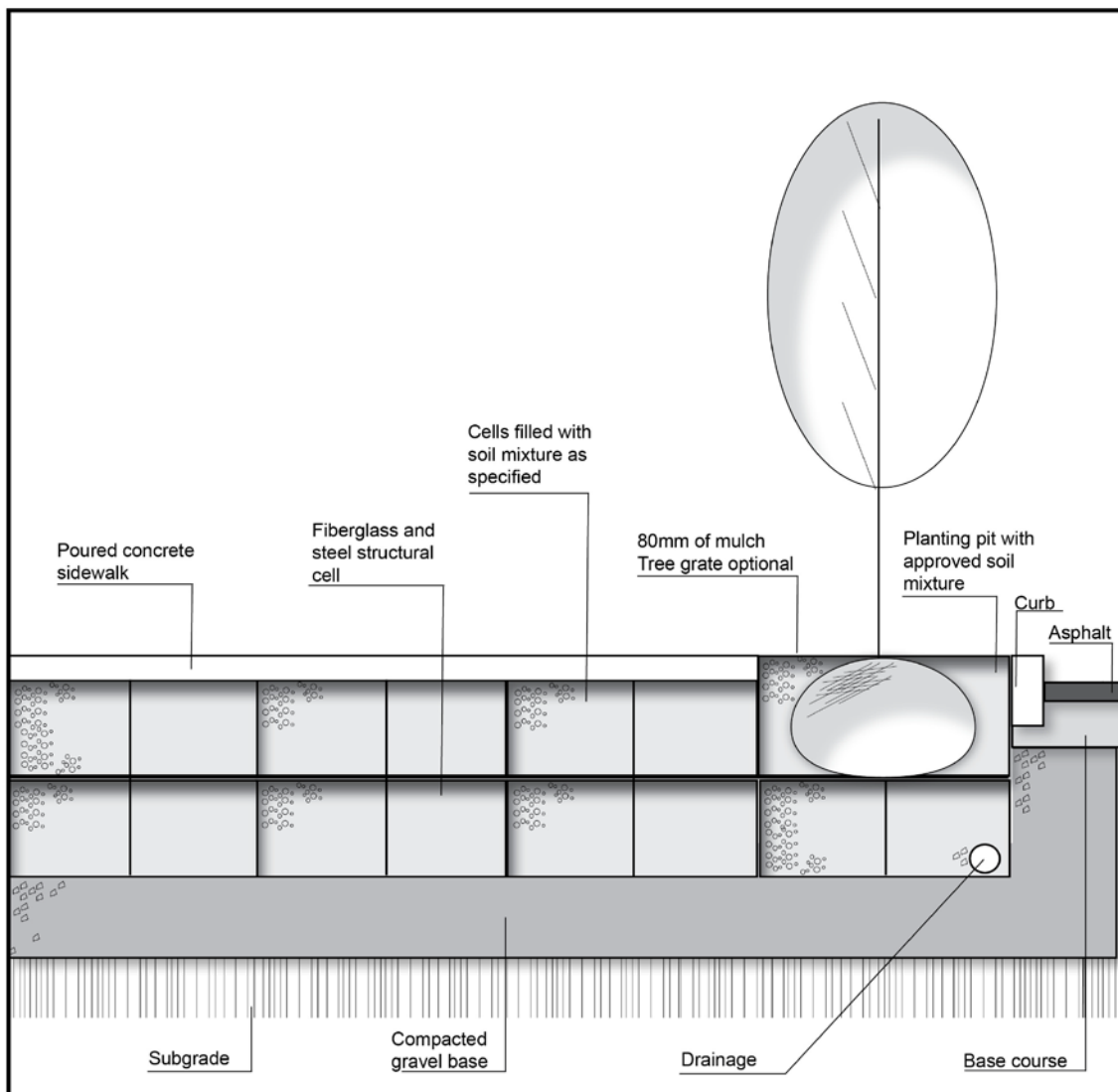
Adapted from:
 Cornell University (2007). *CU-Structural Soil™ Graphics and Plan Views*. Retrieved from <http://www.hort.cornell.edu/uhi/outreach/csc/graphics.html>



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- Notes:**
- Rooting volume extended underneath sidewalk.
 - Structural cells double as a stormwater management system.
 - Cell arrangement is site specific.
 - Systems allows for 30m³ of soil per tree.

Soil cell planting detail

Dalhousie University Natural Environment Plan Standards

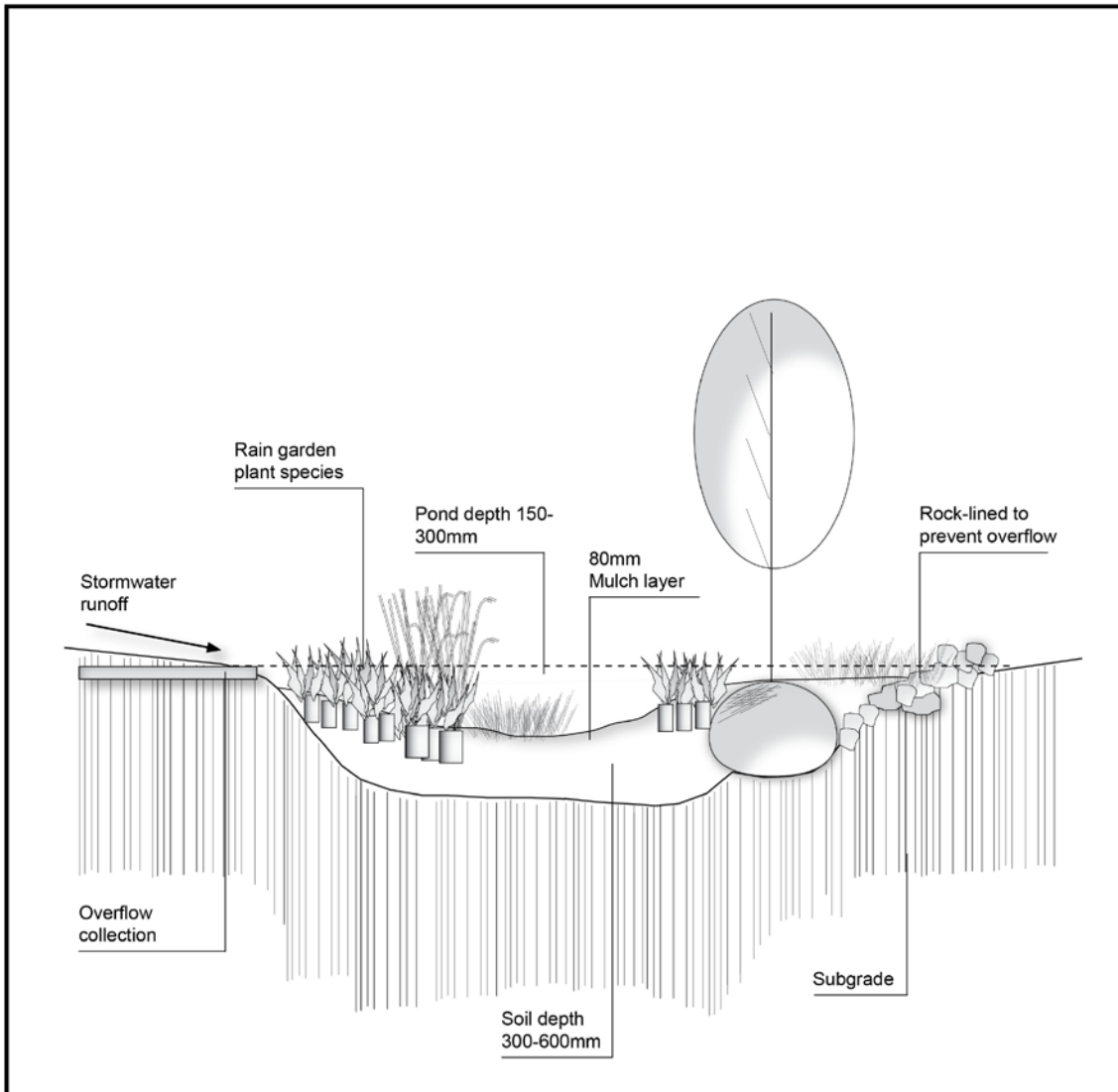
Adapted from:
 Greemax (2013). *Silva Cell - Tree And Stormwater Management System*. Retrieved from <http://www.greenmax.eu/en/silvacell/>



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10.0 Appendix F: Stormwater management details



Notes:

- Design and layout of rain garden is flexible.
- Depending on subgrade, additional drainage may be required.
- Plants must be adapted to wet soil and low oxygen conditions.
- A soil mixture of 1/3 compost, 2/3 soil is recommended.

Rain garden detail

Dalhousie University Natural Environment Plan Standards

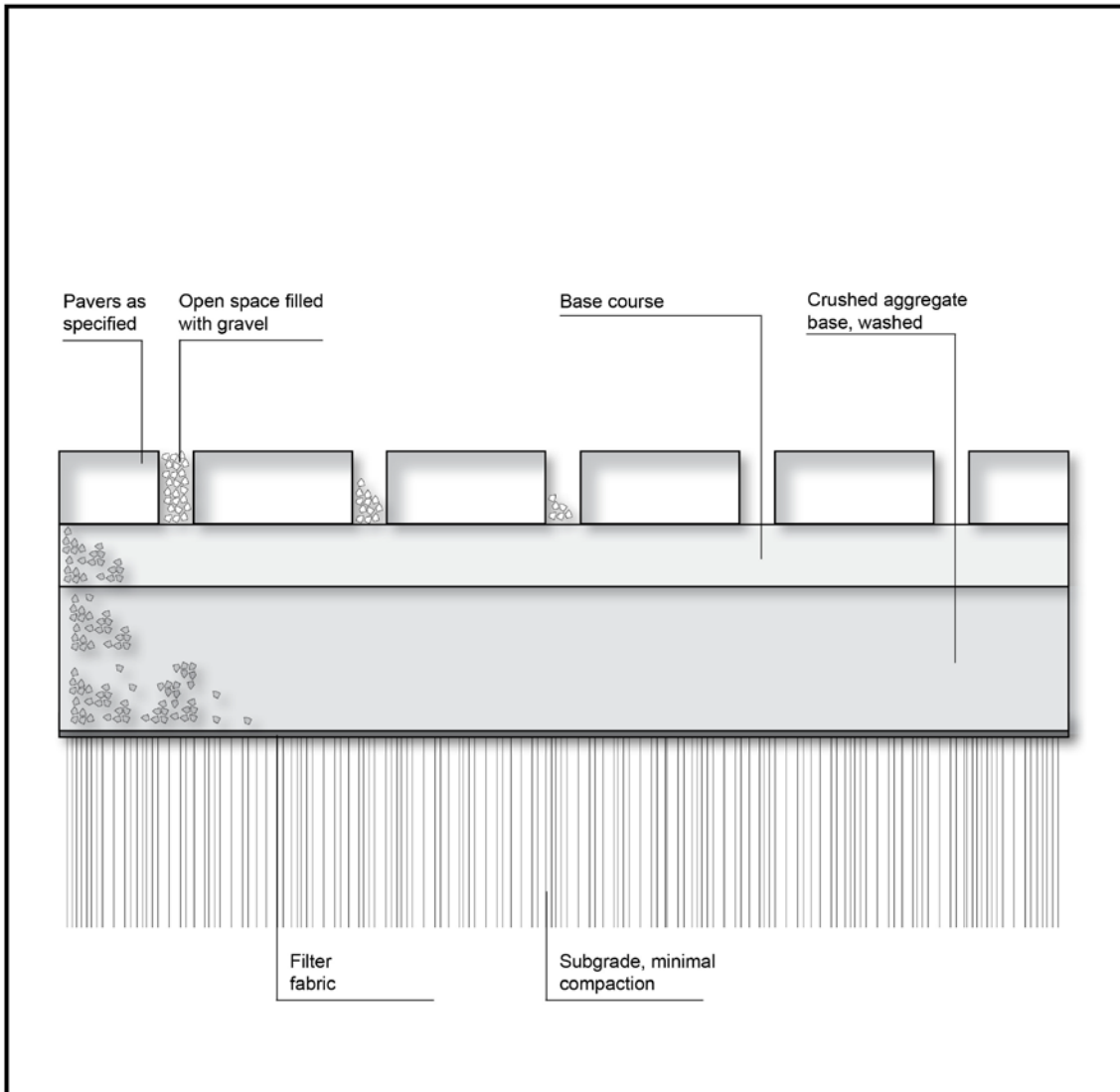
Adapted from:
 Seattle Public Utilities (2013). *Building a rain garden*. Retrieved from
http://www.seattle.gov/util/groups/public/@spu/@usm/documents/webcontent/spu01_006287.pdf



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Notes:
-See reference below for pervious asphalt and concrete.

Pervious paving detail

Dalhousie University Natural Environment Plan Standards

Adapted from:
City of Portland (2004). *Supplemental Drawings and Example Landscaping Plans*. Retrieved from <http://www.portland.oregon.gov/bes/article/55836>



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11.0 Appendix G: Tree, shrub, and perennial species

Natural Environment Plan- Approved species

Tree species list

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Abies balsamea</i>	12	6	5a	conical	p		✓		✓	✓	sun	moderate/low	no serious pests
<i>Acer x freemanii</i>	16	14	4a	oval	s, p, w		✓	✓	✓	✓	sun/part shade	moderate	urban tolerant, intense fall colour
<i>Acer ginnala</i>	5	5	4a	rounded	s, p		✓	✓	✓	✓	sun/shade	moderate/low	performs well in planters
<i>Acer nigrum</i>	14	9	5b	rounded	p	✓	✓		✓	✓	sun/shade	moderate	heat tolerance
<i>Acer pseudoplatanus</i>	15	10	5b	rounded	s, p		✓	✓	✓	✓	sun/part shade	moderate	few serious pests
<i>Acer rubrum</i>	15	13	4a	rounded	s, p, w	✓	✓		✓		sun/part shade	moderate	best to grow from local seed source
<i>Acer saccharinum</i>	20	14	4a	upright	p, w	✓	✓	✓	✓	✓	sun/part shade	moderate/high	urban tolerant, weak branching
<i>Acer saccharum</i>	20	24	4b	rounded	p, w	✓					sun/shade	moderate	shade tree, not stress tolerant
<i>Amelanchier alnifolia</i>	4	3	5a	rounded	s, p, w		✓		✓	✓	sun/part shade	moderate	white blooms, showy fruit, wildlife
<i>Betula alleghaniensis</i>	20	15	4a	upright	p, w	✓					shade	high	attractive peeling bark
<i>Betula papyrifera</i>	15	10	3a	pyramidal	p, w	✓	✓		✓		sun	low	stress susceptible, best planted B&B
<i>Carpinus caroliniana</i>	8	8	4b	irregular	s, p, w	✓	✓		✓		sun/shade	moderate	naturalizing, slow to establish
<i>Carya cordiformis</i>	25	20	5a	cylindrical	p, w	✓					sun	moderate	edible nut, attractive bark, slow to establish
<i>Carya ovata</i>	25	20	5a	oblong	p, w	✓	✓		✓		sun/part shade	moderate	edible nut, attractive bark, slow to establish
<i>Fagus sylvatica</i>	20	10	5a	pyramidal	p, s						sun/part shade	moderate	specimen
<i>Fraxinus nigra</i>	25	20	5b	rounded	p, w	✓			✓	✓	sun	moderate/high	separate male and female trees
<i>Fraxinus pennsylvanica</i>	20	15	2	rounded	s, p, w	✓	✓		✓		sun	moderate/low	great campus tree, monitor for EAB
<i>Gleditsia triacanthos</i>	15	15	4	spreading	s, p, w			✓	✓	✓	sun	moderate/high	casts dappled shade
<i>Juglans cinerea</i>	25	15	4a	spreading	p, w	✓	✓		✓		sun	moderate/high	intolerant of shade
<i>Juglans nigra</i>	20	15	4	rounded	p, w						sun	moderate/high	difficult to transplant
<i>Larix laricina</i>	25	5	2a	pyramidal	p, w	✓					sun	moderate/high	intolerant of shade
<i>Liriodendron tulipifera</i>	25	20	5	pyramidal	s, p, w						sun	moderate/high	avoid dry, hot sites
<i>Magnolia acuminata</i>	25	25	4	pyramidal	s, p, w				✓		sun/part shade	moderate/high	difficult to transplant
<i>Malus spp.</i>	7	7	4a	upright	s, p		✓	✓	✓	✓	sun	moderate/low	very showy, many pests
<i>Nyssa sylvatica</i>	20	8	4	pyramidal	s, p, w						sun	moderate/high	taproot, difficult to transplant

tree selection

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Ostrya virginiana</i>	8	5	4b	rounded	s, p, w	✓	✓	✓			sun/part shade	moderate	fairly tolerant, leggy in drought, slow to establish
<i>Picea glauca</i>	25	5	1a	conical	s, p, w	✓	✓	✓	✓	✓	sun	moderate/high	wind tolerant, short-lived
<i>Picea rubens</i>	25	5	2a	conical	p, w	✓					sun	moderate/low	pollution intolerant
<i>Picea mariana</i>	25	5	2a	irregular	p, w	✓						moderate/high	shallow rooting
<i>Pinus resinosa</i>	25	15	3a	irregular	p, w	✓	✓		✓		sun	low	wind tolerant, shade intolerant
<i>Pinus strobus</i>	30	10	4a	irregular	p, w	✓			✓		sun	moderate/low	susceptible to wind
<i>Platanus occidentalis</i>	25	20	4	rounded	s, p, w		✓	✓	✓	✓	sun	moderate	tolerant of city conditions
<i>Populus grandidentata</i>	20	10	4a	oval	w	✓	✓		✓		sun/part shade	moderate	naturalized plantings
<i>Populus tremuloides</i>	25	10	2	rounded	w	✓	✓		✓	✓	sun	moderate/low	short lived, naturalized plantings
<i>Prunus serotina</i>	22	15	4a	oval	p, w	✓	✓		✓		sun	moderate	naturalized plantings
<i>Prunus virginiana</i>	8	3	2a	rounded	p, w	✓	✓	✓	✓	✓	sun/part shade	moderate/low	fruit edible, susceptible to 'black knot'
<i>Quercus alba</i>	20	20	4	pyramidal	p, w						sun	moderate	difficult to move and establish
<i>Quercus macrocarpa</i>	15	15	3b	spreading	s, p, w	✓	✓	✓	✓	✓	sun	moderate	no serious pests, difficult to transplant
<i>Quercus rubra</i>	25	25	4a	rounded	s, p, w	✓	✓	✓	✓	✓	sun	moderate/low	few pests, good urban performer, slow to establish from bare root
<i>Quercus velutina</i>	18	15	3	irregular	p, w						sun	moderate	intolerant of disturbance
<i>Robinia pseudoacacia</i>	20	25	5a	narrow	s, p		✓	✓	✓	✓	sun	low	tolerant, brittle branches
<i>Sassafras albidum</i>	15	10	5	pyramidal	p, w						sun	moderate/low	use in naturalization
<i>Sorbus americana</i>	11	7	2a	rounded	p, w	✓			✓	✓	sun/part shade	moderate/high	intolerant of maritime exposure
<i>Sorbus decora</i>	10	6	2a	rounded	p, w	✓		✓			part shade/ shade sun	moderate/high	berries attractive to wildlife
<i>Thuja occidentalis</i>	15	5	4a	pyramidal	p, w	✓	✓		✓		sun	moderate/high	naturalizing, storm damage
<i>Tilia americana</i>	22	10	4b	ovate	p, w	✓			✓		sun/part shade	moderate	not as ornamental, naturalizing
<i>Tsuga canadensis</i>	20	9	4b	pyramidal	p, w	✓					sun/shade	moderate	naturalization, tolerates shade
<i>Ulmus americana</i>	25	20	4a	upright	w	✓	✓	✓	✓	✓	sun	moderate	*DED susceptible, naturalizing

tree selection

Natural Environment Plan- Approved species

Shrub species list

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Alnus incana</i>	15	7	2a	pyramidal	p, w						sun/part shade	moderate/high	good for erosion control
<i>Alnus serrulata</i>	3	2	4b	rounded	p, w						sun/part shade	moderate/high	tolerant of compaction
<i>Amelanchier arborea</i>	8	5	4a	variable	s, p, w						sun/part shade	moderate/high	showy cultivars
<i>Amelanchier bartramiana</i>	2	1	5	variable	p, w				✓		sun/part shade	moderate/high	can be confused with Choke Cherry
<i>Amelanchier canadensis</i>	4	2	3a	variable	p, w			✓			sun/part shade	moderate/high	attractive to wildlife, edible
<i>Amelanchier laevis</i>	7	4	4	variable	p, w			✓			sun/part shade	moderate	attractive to wildlife, edible
<i>Amelanchier sanguinea</i>	3	2	4	variable	p, w			✓			shade	moderate/low	attractive to wildlife, edible
<i>Comptonia peregrina</i>	1.5	1	2	spreading	p, w	✓	✓		✓		sun/part shade	moderate/low	plant fixes nitrogen, edible fruit
<i>Cornus alternifolia</i>	8	8	4	spreading	p, w						part shade/ shade	moderate/high	specimen plant, attractive to wildlife
<i>Cornus racemosa</i>	4	4	3	irregular	p, w						sun/shade	moderate	attractive to wildlife
<i>Cornus sericea</i>	2	3	3	rounded	p, w			✓	✓		sun/part shade	moderate/high	landscape shrub, winter interest
<i>Crataegus chrysoarpa</i>	5	3	4b	pyramidal	s, p, w		✓		✓	✓	sun/part shade	moderate/high	tolerant of wind, compaction, Juglone
<i>Crataegus mollis</i>	8	7	3	rounded	s,p,w		✓		✓	✓	sun/part shade	moderate	tolerant of wind, compaction, Juglone
<i>Gaylussacia baccata</i>	1	1	5	rounded	p, w				✓		sun/part shade	adaptable	edible fruit, attractive blooms
<i>Gaylussacia dumosa</i>	0.5	0.5	5	rounded	p, w				✓		sun/part shade	adaptable	acid loving, woodland garden
<i>Ilex verticillata</i>	3	2	3	rounded	p, w	✓			✓		sun/part shade	moderate/high	woodland plant, showy fruit (female)
<i>Juniperus communis</i>	3	4	2	spreading	p, w	✓		✓	✓		sun	moderate/low	low maintenance when established
<i>Lonicera canadensis</i>	1.5	0.5	3	upright	p, w				✓		sun/part shade	moderate/high	woodland planting, attracts wildlife
<i>Lonicera oblongifolia</i>	1.5	0.5	3	irregular	w						part shade/ shade	high	bog plant
<i>Myrica pensylvanica</i>	2	2	2	spreading	s, p, w	✓		✓			sun/part shade	low	seaside plant, soil stabilization
<i>Rhododendron canadense</i>	1	0.7	2a	rounded	s, p, w	✓					sun/part shade	moderate	showy flowers
<i>Rhus glabra</i>	3	3	2	spreading	s, p, w				✓	✓	sun/part shade	moderate/low	edible fruit , site naturalization
<i>Rhus typhina</i>	5	5	3	spreading	s, p, w				✓		sun/part shade	moderate/low	colonizes landscape, quickly growing
<i>Ribes americanum</i>	1	0.5	2	upright	w				✓		sun/part shade	moderate/high	edible fruit

shrubselection

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Rosa carolina</i>	1.5	2	3	rounded	p, w	✓		✓	✓		sun	moderate/high	showy flowers, attracts wildlife
<i>Rosa palustris</i>	2	2	2	rounded	p, w	✓		✓			sun	moderate/high	showy flowers, attracts wildlife
<i>Rosa virginiana</i>	1.5	2	3	upright	s, p, w	✓		✓	✓		sun	moderate/low	showy flowers, attracts wildlife
<i>Rubus allegheniensis</i>	3	2	3	spreading	w	✓			✓		sun/part shade	moderate/low	will colonize rapidly , edible fruit
<i>Rubus flagellaris</i>	1	3	3	spreading	w				✓		sun/part shade	moderate/high	sprawling species, edible fruit
<i>Rubus idaeus</i>	2	1.5	3	upright	w				✓		sun/part shade	moderate	will colonize rapidly , edible fruit
<i>Rubus odoratus</i>	2.5	2.5	3	spreading	p, w				✓		sun/part shade	moderate/high	full-season bloomer, attracts wildlife
<i>Rubus pubescens</i>	0.5	0.5	3	spreading	w	✓					sun/part shade	moderate/high	trailing shrub, attracts wildlife
<i>Sambucus canadensis</i>	4	4	3	rounded	p, w	✓			✓	✓	sun/part shade	moderate/high	wind tolerant, attracts wildlife
<i>Sambucus pubens</i>	4	4	2	rounded	p, w				✓		sun/part shade/ shade	moderate/high	showy fruit, attracts wildlife
<i>Sambucus racemosa</i>	2.5	2.5	2	rounded	p, w	✓			✓		sun/part shade/ shade	moderate/high	showy fruit, attracts wildlife
<i>Spiraea alba</i>	2	2	3	rounded	p, w						sun/part shade	moderate/high	fragrant flowers
<i>Spiraea latifolia</i>	1.5	1.5	3	rounded	p, w						sun/part shade	moderate/high	naturalized aesthetic
<i>Spiraea tomentosa</i>	1	1	3	rounded	p, w						sun/part shade	moderate/high	attractive mass planting
<i>Symphoricarpos orbiculatus</i>	2	2	2	rounded	s, p, w		✓		✓	✓	part shade/ shade	moderate	showy fruit, edible
<i>Taxus canadensis</i>	1	2.5	2	spreading	s, p, w	✓					sun/part shade	moderate	best used in mass
<i>Vaccinium angustifolium</i>	0.5	0.5	2	compact	p, w	✓					sun/part shade	moderate/high	edible fruit, showy fall colour
<i>Vaccinium corymbosum</i>	2	2	3	irregular	p, w	✓					sun/part shade	moderate/high	edible fruit, showy fall colour
<i>Viburnum lantanoides</i>	3	2	3	rounded	p, w	✓			✓		sun/shade	moderate/high	showy flowers
<i>Viburnum opulus</i>	3	4	3	rounded	s, p, w				✓		sun/part shade	moderate/high	showy flowers
<i>Viburnum recognitum</i>	3	3	3	rounded	p, w						sun/part shade	moderate/high	naturalized plantings

Shrubselection

Natural Environment Plan- Approved species

Perennial species list

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Agalinis neoscotica</i>	0.3	0.3	6	upright	w	✓	✓				sun	high	naturally occurring in a small pocket of south-west Nova Scotia and Maine
<i>Agrostis scabra</i>	0.5	0.3	4	clump	p, w		✓	✓			sun	moderate	effective as a mass planting
<i>Andromeda polifolia</i>	0.5	0.3	3	rounded	p, w	✓					sun/part shade	moderate/high	thrives in acidic soil
<i>Arisaema triphyllum</i>	0.75	0.75	3	upright	w	✓					part shade	moderate/high	attractive form, all parts poisonous
<i>Asarum canadense</i>	0.3	0.4	3	spreading	p, w						sun/part shade	moderate	medicinal, groundcover
<i>Asclepias incarnata</i>	1.2	0.75	2	upright	s, p, w	✓			✓		sun/part shade	moderate	attracts wildlife, showy blooms
<i>Asclepias syriaca</i>	1	1	2	upright	s, p, w				✓		sun/part shade	moderate/low	fragrant, attracts wildlife
<i>Asclepias tuberosa</i>	0.75	0.75	3	rounded	s, p, w		✓				sun/part shade	moderate/low	bright showy flowers, attracts wildlife
<i>Aquilegia canadensis</i>	0.8	0.3	3	upright	s, p, w		✓		✓		sun/part shade	moderate	attracts wildlife, suitable for low soil environment
<i>Campanula rotundifolia</i>	0.5	0.5	2	spreading	s, p, w		✓		✓		sun/part shade	moderate/low	suitable for low soil, dry environment
<i>Clematis occidentalis</i>	2	0.5	3	climbing	p, w						part shade	moderate/low	vine, poisonous parts
<i>Cornus canadensis</i>	0.2	0.3	1	spreading	s, p, w	✓					sun/part shade	moderate/high	ground cover, showy flowers and fruit
<i>Dryopteris intermedia</i>	0.7	0.7	2	upright	p, w	✓					sun/part shade	moderate/high	clumping fern
<i>Echinacea purpurea</i>	0.75	0.6	3	upright	s, p, w				✓		sun	moderate/low	attracts insects, showy blooms
<i>Elymus virginicus</i>	1	0.3	2	upright	s, p, w	✓			✓		sun/part shade	moderate	attractive in mass
<i>Festuca rubra</i>	0.4	0.3	3	spreading	p, w		✓		✓		sun/part shade	moderate/low	maritime shore grass, turf species
<i>Hierochloa odorata</i>	0.6	0.2	3a	spreading	p, w				✓		sun	moderate/high	notable species used by aboriginal communities
<i>Iris versicolor</i>	0.6	1	5	spreading	s, p, w	✓			✓		sun/part shade	moderate/high	attractive in mass
<i>Lilium canadense</i>	1.5	0.3	5	upright	p, w						sun/part shade	moderate/high	edible bulb
<i>Lupinus polyphyllus</i>	1.5	0.6	3	upright	s, p, w		✓		✓		sun/part shade	moderate/high	nitrogen fixer, rapid colonizer
<i>Maianthemum racemosum</i>	0.9	0.6	3	spreading	p, w						part shade	moderate/high	attractive flowers, doesn't like disturbance
<i>Mateuccia struthiopteris</i>	1.5	0.9	1	upright	s, p, w	✓			✓		sun/part shade	moderate/high	attractive in mass
<i>Monarda didyma</i>	0.9	0.5	4	upright	s, p, w				✓		sun	moderate/high	attracts wildlife, medicinal
<i>Monarda fistulosa</i>	1	1	3a	upright	s, p, w				✓		sun	moderate/high	attracts wildlife, medicinal
<i>Onoclea sensibilis</i>	0.9	0.9	4	spreading	p, w						part shade/ shade	moderate/high	edible
<i>Panicum virgatum</i>	2	0.6	3	upright	s, p				✓		sun/part shade	moderate	multi-season interest, attracts wildlife

perennial selection

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Spartina pectinata</i>	2	2	4	clump	s, p, w				✓		sun/part shade	moderate/high	prairie grass
<i>Symphotrichum laevis</i>	1	0.5	3a	upright	s, p	✓	✓		✓		sun	low	suitable for xeriscape
<i>Trillium erectum</i>	0.4	0.3	4a	clump	p, w	✓					part shade/ shade	moderate	woodland plant
<i>Trillium undulatum</i>	0.3	0.3	4a	clump	p, w	✓					part shade/ shade	moderate	woodland plant
<i>Viola spp.</i>	0.2	0.2	4	clump	s, p, w						part shade/ shade	moderate	heat intolerant, many colours
<i>Vitis labrusca</i>	15	-	3	spreading	s, p, w	✓					sun/part shade	moderate/high	vine

perennialselection

Natural Environment Plan- Approved species
Annual species list

name	height (m)	spread (m)	hardiness zone	form	planting site street(s), park (p), woodland (w)	native species	drought tolerance	salt tolerance	soil adaptability	pollution tolerance	light requirements	moisture demands	notes
<i>Helianthus annuus</i>	3	0.3	7	upright	s, p				√		sun	moderate	self-seeding, attracts wildlife, edible

annual selection