

APPENDIX D 1

STORMWATER MANAGEMENT POND PLANTING GUIDELINES

CVC would like to thank the staff of the following organizations for their technical input in developing these guidelines:

- Toronto and Region Conservation Authority
- Conservation Halton
- Ministry of Natural Resources
- City of Brampton
- Town of Halton Hills
- Ontario Seed Company
- The MBTW Group Landscape Architects
- Strybos Barron King Ltd. Landscape Architecture
- Alexander Budrevics & Associates Ltd. Landscape Architects
- NAK Design Strategies Landscape Architects
- Baker Turner Inc. Landscape Architecture
- Schollen and Company Inc. Landscape Architecture
- City of Mississauga

D1. Stormwater Management Wet Pond Planting Guidelines

These guidelines were developed to assist landscape architects or other professionals in preparing planting plans for stormwater management (SWM) wet ponds. The following sections provide guidance on various aspects relevant to SWM landscaping design including the moisture zones present in a typical SWM wet pond, plant selection, seed mixes, calculations of plant materials, stocking sizes, and topsoil and site preparation.

Plantings within SWM wet ponds provide various functions including contributing to water quality, shading of the permanent pool, stabilization of the pond slopes, and minimizing maintenance requirements. Further, the plantings assist with municipal canopy cover targets and, when compatible and complementary, help protect and enhance adjacent natural heritage features and areas. Note however, that despite being compatible, SWM wet ponds are not considered part of natural heritage systems.

In order to expedite the approval process and limit the number of submissions, the landscaping submission should include a cover letter indicating whether the submitted plans conform to CVC guidelines. The letter should also identify what aspects of the plan do not meet the guidelines and provide an explanation.

Moisture Zones

CVC has identified five moisture zones within SWM wet ponds (**Figure D1**). These zones are defined by water depth within the pond and storm event levels. The defining contours should be obtained from the engineering plans and included on the landscaping plans. Following is a description of the zones:

- Zone 1: Water depths between 0.5 m and 2 m within the pond
- Zone 2: Water depths between the permanent pool level and 0.5 m within the pond
- Zone 3: Between the permanent pool level and the extended detention level
- Zone 4: Between the extended detention level and the 5 year storm level
- Zone 5: All areas above the 5 year storm level within the SWM Block

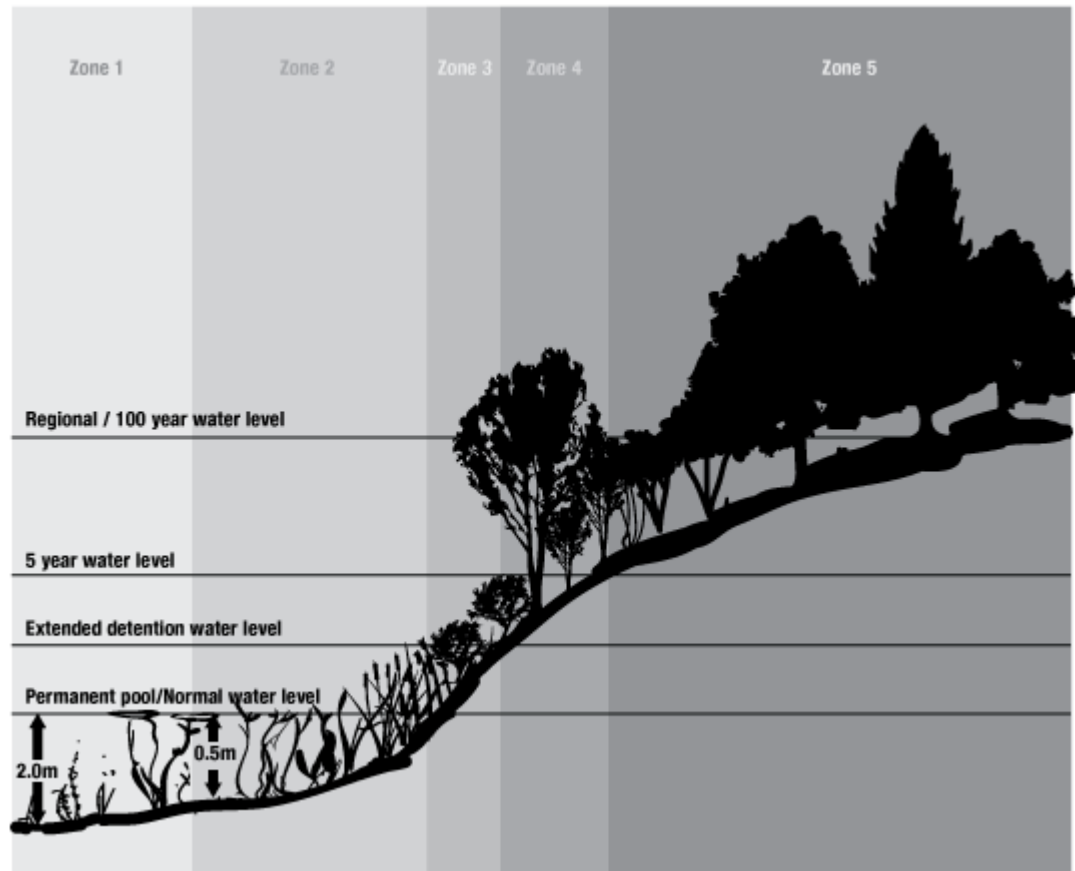


Figure D1: SWM Wet Pond Moisture Zones (N.T.S.)

Plant Selection

Species that are appropriate for the conditions within each zone should be provided. Following are the plant assemblages that should be provided in each zone:

- Zone 1: include plugs of submergent and floating species
- Zone 2: include plugs of at least 4 emergent species
- Zone 3: include plugs of suitable sedges, rushes, and/or herbaceous species along the fringe of the permanent pool and a seed mix and a minimum of 2 species each of shrubs and trees throughout the zone
- Zone 4: include a seed mix and a minimum of 4 species each of shrubs and trees
- Zone 5: include a seed mix and a minimum of 4 species each of shrubs and trees

At least two species that spread quickly should be used in Zones 1 and 2. The same shrub and tree species can be used to meet the minimum recommendations for each zone. Successional species and species that are compatible and complementary to adjacent natural areas should be considered in the development of the plan.

Refer to the CVC Plant Selection Guideline for a list of plants acceptable for use within the Credit River watershed. The CVC Plant Selection Guideline can be found at: <http://www.creditvalleyca.ca/planning-permits/policies-guidelines/>. The guideline identifies:

- Recommended SWM wet pond moisture zones for all plants
- A selection of plants specifically recommended for use within SWM pond blocks
- Plants that are emergent, submergent, and floating aquatic species

Recommended Species for Seed Mixes

To stabilize soils appropriate seed mixes should be specified for all areas above the permanent pool. A dry seed mix and a wet seed mix are recommended for application above and below the 5 year storm level respectively. Sod is generally not acceptable within a SWM wet pond. Cover/Nurse crops (refer to the CVC Plant Selection Guideline) should be included to establish quick vegetative cover and to stabilize the site.

CVC has developed two lists of recommended species for the seed mixes (Table D1 and Table D2). These lists are comprised of species that appear to be successful within SWM wet ponds based on a review of SWM wet ponds within our watershed and the following reports: *Performance Assessment of a Highway Stormwater Quality Detention Pond* (SWAMP 2003) and *Town of Aurora Stormwater Ponds Vegetation & Wildlife Study* (Aurora Environmental Advisory Committee 2007).

Table D1: CVC Recommended Species for Dry Seed Mix

Scientific Name	Common Name
<i>Solidago altissima</i> var. <i>altissima</i>	Late Goldenrod
<i>Solidago canadensis</i> var. <i>canadensis</i>	Canada Goldenrod
<i>Rudbeckia hirta</i>	Black-eyed Susan
<i>Symphotrichum lanceolatum</i> ssp. <i>lanceolatum</i>	Panicled Aster
<i>Symphotrichum novae-angliae</i>	New England Aster
<i>Anemone canadensis</i>	Canada Anemone
<i>Juncus dudleyi</i>	Dudley's Rush
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod

Table D2: CVC Recommended Species for Wet Seed Mix

Scientific Name	Common Name
<i>Eupatorium maculatum ssp. maculatum</i>	Spotted Joe-pye Weed
<i>Verbena hastata</i>	Blue Vervain
<i>Anemone canadensis</i>	Canada Anemone
<i>Symphyotrichum lanceolatum ssp. lanceolatum</i>	Panicled Aster
<i>Symphyotrichum novae-angliae</i>	New England Aster
<i>Rudbeckia hirta</i>	Black-eyed Susan
<i>Carex vulpinoidea</i>	Fox Sedge
<i>Juncus effusus ssp. solutus</i>	Lamp Rush
<i>Juncus torreyi</i>	Torrey's Rush
<i>Juncus dudleyi</i>	Dudley's Rush
<i>Bidens cernua</i>	Nodding Bur Marigold
<i>Bidens frondosa</i>	Devil's Beggarticks
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod

To match the range of moisture conditions present within each area the lists include facultative (mesic) species in addition to dry or wet species. It is recommended that the seed mixes specified on the planting plan include a high proportion of the listed species. As other species may be appropriate for your site, any species that meets the CVC Plant Selection Guideline could be added to species above.

Calculation of Plant Material

The quantity of trees and shrubs needed for the SWM pond block above the permanent pool should be calculated based on 5 m centres (25 m²) and 1 m centres (1 m²) respectively. This spacing is used to calculate total quantities only; the plants can then be specified in nodal groupings to promote natural colonization and spreading. Trees should be planted no closer than 2.5 m on centre and shrubs should be planted 0.75 m – 1.5 m on centre.

The formula below allows for flexibility in the respective numbers of trees and shrubs while providing the appropriate amount of overall woody coverage.

$$A = (\# \text{ trees} \times 5^2) + (\# \text{ shrubs} \times 1^2)$$

Where A = full area of the pond block above the permanent water level that is to be planted (i.e. excluding trails, access roads, sediment drying area, etc) in m²

To use the formula choose the desired amount of trees or shrubs and solve for the other. The chosen number of trees or shrubs should be a reasonable amount and ensure that all other aspects of these guidelines are being addressed.

A sample calculation is provided below:

Area of SWM pond block to be planted: 1.0 ha (i.e. 10,000 m²)

Chosen number of trees to be planted: 350

$$10,000 \text{ m}^2 = (350 \times 5^2) + (\# \text{ shrubs} \times 1^2)$$

$$10,000 - 8750 = \# \text{ shrubs}$$

$$1250 = \# \text{ shrubs}$$

The quantity of aquatic plants should be calculated based on 3 units per linear metre of water's edge for each of Zones 1 and 2. Additional plantings should be provided in a zone if it is greater than 2 m in width.

Aquatic plants should be planted 0.3 m – 1.0 m on centre and can be specified in nodal groupings to promote natural colonization and spreading. In general, plants that spread slowly should be specified on the low side of the range while plants that spread quickly can be specified on the high side of the range.

Stocking Sizes

Plants of the following stocking sizes are recommended as they generally have established root systems and are less susceptible to herbivory and competition for sunlight from herbaceous species. Recognizing the harsh conditions typically present in SWM wet pond settings these factors will help decrease the length of time needed for plant establishment and increase planting success. Further, plants of these sizes will provide more immediate shade than smaller stock. To maximize these immediate thermal benefits, it is preferable to locate the larger tree sizes specified on the plan close to the permanent pool.

- Whips: 1.5 m – 2.5 m in height
- Caliper: 40 mm – 60 mm
- Conifers: 1.5 m – 2.0 m in height
- Shrubs: provide a range between 40 cm – 100 cm in height

Review Table

In order to help expedite CVC's review a table summarizing the information outlined above should be provided directly on the planting plans. Seed mixes do not need to be indicated in this table. See the following example:

Moisture Zone	Length or Area	Quantity of Plants Required	Quantity of Plants Provided	Species		Size
				Scientific Name	Common Name	
1	Length (m) of Water's Edge					
2	Length (m) of Water's Edge					
3	Area (m ²) of SWM Block to be Planted					
4						
5						

Topsoil and Site Preparation

- Details on soil management and site preparation considerations can be found in the document *Preserving and Restoring Healthy Soil: Best Practices for Urban Construction Version 1.0* (Toronto and Region Conservation, June 2012). Although this is not specific to stormwater management facilities the information can be adapted for landscaping practices in these features.
- The design engineer and site supervisor should review suitability of subsoil and topsoil material with landscape architect. Considerations include: texture, compaction, pH and organic matter. Confirmation that soil conditions are appropriate for planting should be included with the submitted plans.
- If needed, amendments to the existing subsoil or topsoil should be made as directed by the landscape architect. The ultimate soil conditions should be reflective of the type of vegetation that is to be established.
- Subsoil should be de-compacted/scarified in consultation with the design engineer to ensure proper integration between subsoil and topsoil.

- There are two recommended options for the provision of topsoil above the permanent pool level within a SWM pond block. Topsoil depths must be considered in the final pond grades:
 - Option 1: Provide 0.45 m to 1.0 m of topsoil spread evenly throughout the entire area in a continuous layer
 - Option 2: Provide a minimum 0.15 m depth of topsoil spread evenly throughout the entire area in a continuous layer. In areas where trees and shrubs are being planted provide a minimum topsoil depth of 1.0 m and 0.45 m respectively. This can be achieved in either raised or excavated beds.
- Provide 0.30 m of topsoil for the first 2 m in depth below the permanent pool level (i.e. in Zones 1 and 2).
- Stabilize topsoil within the construction year's growing season. If this cannot be achieved then topsoil should not be spread until the following spring and an interim stabilization measure should be used to prevent erosion of graded substrate (e.g. erosion matting).
- Stabilize topsoil prior to planting woody material using an acceptable seed mix.
- The site should be protected from further compaction during site preparation.

Design Considerations

- If a forebay is part of the pond design it is recommended that this area only be planted with Broad-leaf Cattail (*Typha latifolia*), as other submergent, emergent and aquatic species may be less apt to re-colonize after sediment dredging operations.
- If sediment drying areas are present they should be seeded with the appropriate mix(es). Further, the SWM pond maintenance plan should indicate that a native seed mix(es) acceptable to CVC should be utilized to rehabilitate the area after sediment drying has taken place.
- In order to minimize thermal impacts to downstream fisheries a high density of trees and shrubs should be used in proximity to the permanent pool level, especially on the south and west aspects of the pond.
- Increase density of compatible vegetation along the portion of the SWM Pond Block adjacent to natural areas.
- Utilize dense shrubby vegetation close to the permanent pool to discourage loafing geese. Note that protection of planting nodes may still be required.
- The restoration/enhancement of disturbed areas associated with the construction of the pond outfall(s) should be included on the plan. Acceptable seed mix(es) should be used to stabilize soils and woody vegetation should be used to shade the flow path and to minimize rilling and gulying.
- Discussions between the design engineer and landscape architect should occur early in the planning process before pond blocks are determined. This will ensure that the pond design establishes the conditions that will ensure the successful establishment and

survival of vegetation and address ecological concerns. Considerations include: pond orientation, site preparation, and the topsoil depth relative to pond liners and pond storage volumes. Information on pond orientation can be reviewed in section 3.3.1.3 of CVC's document: *Thermal Impacts of Urbanization including Preventative and Mitigation Techniques* (CVC, January 2011).