



## STORMWATER MANAGEMENT POND PLANTING GUIDELINES

September 2007

The following guidelines should be used when designing the stormwater management planting plans for water quality ponds. Some of these requirements should also be reflected on the engineering plans.

These are TRCA Guidelines. Local municipal staff should also be consulted as requirements may vary.

There are five distinct moisture zones found within SWM ponds (see figure on page 4). Plantings that are appropriate for the conditions of each zone should be provided. Please refer to the attached table for acceptable species. Early successional native species of trees, shrubs and herbaceous vegetation that are compatible and complementary to adjacent natural areas should be used. The moisture zones include:

- Zone 1. *Deep water areas* – include a minimum of 2 species each of submergent and floating species between water depths of 1-2m.
- Zone 2. *Shallow water areas* – include a minimum of 2 species each of robust, broadleaved and narrowleaved emergent plants for water depths less than 0.5m.
- Zone 3. *Extended detention or shoreline fringe areas* – include a minimum of 2 species each of hydric grasses and shrubs up to 1m inland (horizontal) from the permanent water level.
- Zone 4. *Floodfringe areas* – include a minimum of 2 flood tolerant species each of grasses and herbs and 4 flood tolerant species each of shrubs and trees within the 2 to 100 year storm levels. Within 3m (horizontal) of the permanent water level, suitable overhanging trees should be planted to provide shade to the pond. A suitable mix of deciduous and coniferous trees should be used.
- Zone 5. *Upland areas* – include a minimum of 2 upland species each of grasses and herbs and 4 upland species each of shrubs and trees at least 3m (horizontal) from the maximum water level, including all areas surrounding the pond (other than maintenance road, sediment drying areas, etc.). These species should be early successional and tolerant of drought conditions. A suitable mix of deciduous and coniferous trees should be used.

### General Guidelines

In order to protect downstream cool to coldwater fisheries, bottom-draw outlet structures should be employed, complemented by high densities of shading trees and shrubs. Increased solar heating of standing pond water may have thermal impacts on downstream aquatic resources, which will require mitigation. Consideration should also be given to the design of the outlet structure, for example the use of infiltration techniques, or other devices may be required to further mitigate thermal impacts to the receiving watercourse.

### Aquatic:

These guidelines apply for Zones 1 and 2.

#### Plantings

- Provide cattails (*Typha* spp.) as an interim vegetation in sediment forebay to aid in sediment trapping (NOTE: it is accepted that this material will be removed during sediment dredging operations). Plantings of cattails should be limited to areas away from maintenance access areas. Other aquatic species should not be planted in the sediment forebay as they may be less apt to re-colonize post-dredging.
- *Typha latifolia* should be used instead of *T. angustifolia* or *T. x glauca* which are invasive and non-native. The latter seed very prolifically and can spread even from temporary detention areas to adjacent natural areas. *Typha latifolia* seeds germinate and grow extremely rapidly and can be directly sown onto sites.
- Protection from waterfowl may be required.

#### Topsoil

- Provide 0.3 m of topsoil for the first 1 m below the permanent water level.
- The design engineer and/or site supervisor should review the suitability of subsoil material and compaction with the landscape architect.

### Terrestrial:

These guidelines apply for zones 3, 4 and 5.

#### Plantings

- Generally there are no size requirements for vegetation to be planted. Typically, TRCA prefers greater numbers of smaller-sized vegetation over fewer numbers of larger-sized vegetation. We note that planting large vegetation may cause more disturbance to the site, although caliper material may be used to screen adjacent private lands and/or facility infrastructure. However, ensure that spreading and suckering vegetation, such as canopy trees or sumac are setback approximately 3 m from private property and the access road/sediment drying areas.
- Quick growing, water tolerant tree species should be planted close to the normal water level on the south and west aspects of the pond to help mitigate some of the thermal impacts to the permanent pool.
- No-maintenance seed mixes should be used to stabilize soils and provide groundcover. However, ensure that these mixes do not contain invasive species. Sod is not acceptable within the SWM pond. Nurse crops consisting of fast growing annual grasses should be added to the mix to establish quick vegetative cover.
- Consider soil bioengineering measures, as appropriate (e.g. live staking on steep slopes)
- If applicable, salvage on-site wet area seedbank material as appropriate if species identification can be confirmed as native. Do not remove plants from natural wetlands and do not use roadside ditch material as these are likely the exotic invasive varieties of plants.
- Increase density of vegetation along the portion of the facility adjacent to the valley corridor to create a live fence.
- Plant in nodal groupings to promote natural colonization and spreading.
- Dense shrubby vegetation placed close to the permanent waterline will help to discourage loafing geese, however protection of planting nodes may also be required.

**Topsoil**

- Provide 0.45 to 1m topsoil above the permanent water level.
- The depth of topsoil can be achieved in either raised and/or excavated beds or spread evenly throughout the facility in a continuous layer.
- 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 some interim stabilization measure should be used to prevent erosion of graded substrate (e.g. erosion matting).
- Stabilize topsoil prior to planting woody material using a TRCA approved seed mix.

**Calculation of Plant Material**

Terrestrial:

An overall coverage of 50% of each of Zones 3-5 should be achieved.

- number of shrubs based on 1 m centres (1 m<sup>2</sup>) for the dry area of pond (i.e. above the permanent water elevation).
- number of trees based on 5 m centres (25 m<sup>2</sup>) for the dry area of pond (i.e. above the permanent water elevation).

Aquatic:

- number of aquatics based on 3 units per linear metre of water's edge for each of Zones 1-2.

The calculation of plant material and species list should be shown directly on planting plans. Calculations and species should be provided in separate tables, directly on the planting plans.

Example of Calculation Table:

Zone	A = Area of Pond in Each Zone (m <sup>2</sup> )	B = Linear Metres of Water's Edge (m)	C = # of Aquatic Species	D = Overall Woody Coverage (m <sup>2</sup> )	E = # of Trees	F = # of Shrubs
			C=B*3	D=A*0.5	D=(E*25)+F	
1	n/a	500 m	1500	-	-	-
2	n/a	500 m	1500	-	-	-
3	1000 m <sup>2</sup>	n/a	n/a	500	-	500
4	2000 m <sup>2</sup>	n/a	n/a	1000	25	375
5	2200 m <sup>2</sup>	n/a	n/a	1100	30	350

## **SWM Pond Outfalls**

Storm pond outfalls require flow dissipation measures such as plunge pools, or equivalent, to reduce erosive velocities at the end of pipe. Discharge velocities should be reduced to allow for grass lined, meandering outfall swales. Pond outfall swales should be terminated away from the receiving watercourse, if possible, to avoid alteration to fish habitat on creek banks. If engineering requirements allow, additional flow spreaders or dissipators should be employed at the end of the outlet swale to promote diffuse flow on the floodplain, to encourage some level of infiltration, evaporation, or evapotranspiration prior to entering the watercourse. Water tolerant trees and shrubs should be planted in dense quantities between the flow spreader or dissipator at the end of the outfall swale, and the receiving watercourse, to minimize erosion (rilling and gullyng).

If flow spreaders, or equivalent, are not feasible at the end of the outfall swale, then outlet channels should be grass lined, meandering swales that extend to the watercourse bank. Tree and shrub planting along the outfall channel is required, with densities sufficient to provide a closed canopy over the outlet swale.

Infiltration trenches or additional measures may be required to minimize thermal impacts to receiving watercourses which are classified as coldwater resources.

The need for stone erosion protection at the creek bank should be minimized by effectively dissipating storm flows. Outfall channels must be restored using native herbaceous (seed mix) and woody plant material.

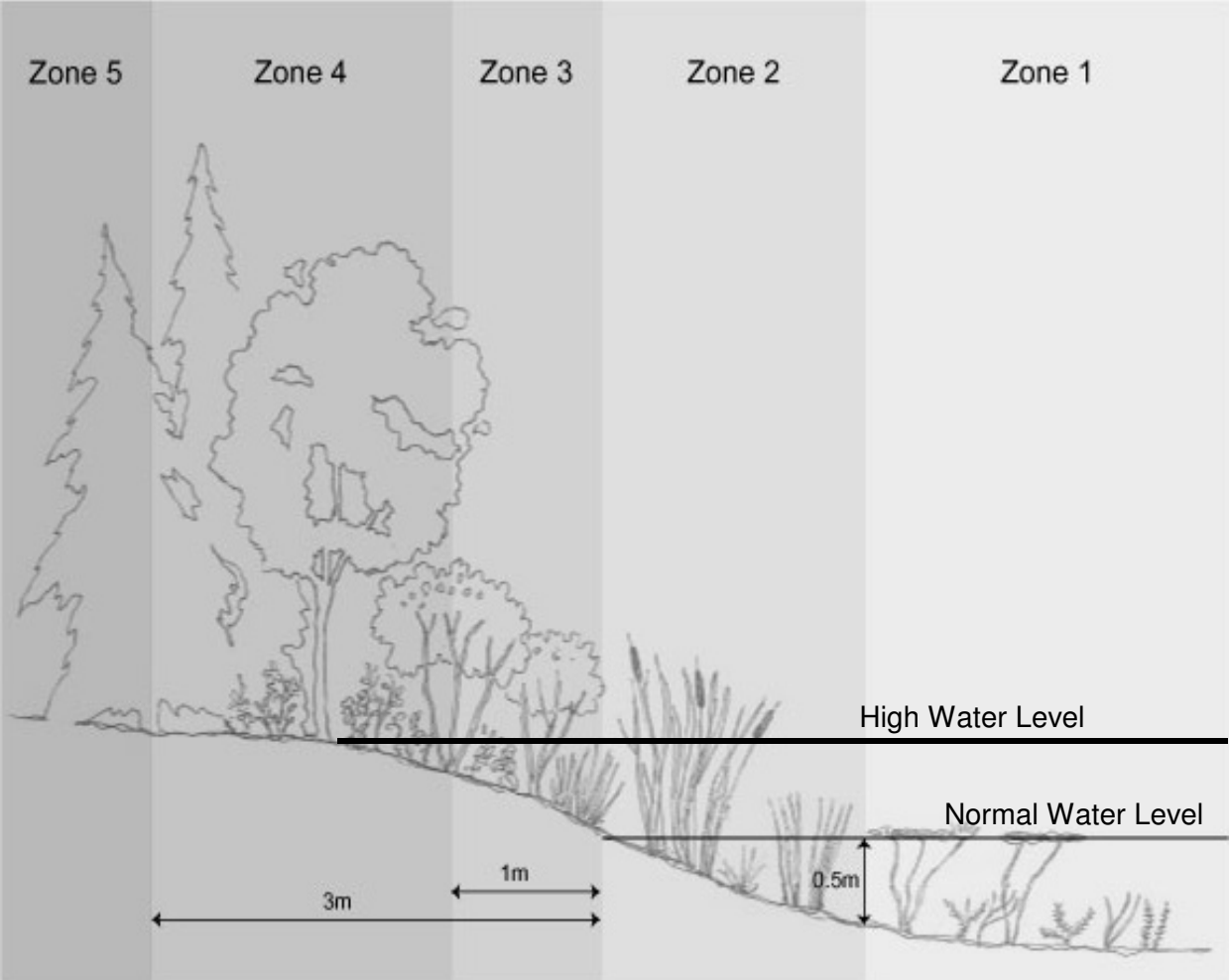
Sediment controls must be installed prior to construction of the outfall structure and grassed swale.

## **Monitoring**

The permanent water elevation in the SWM pond should be observed twice a year for approximately two years by both the design engineer and landscape architect to ensure that the facility is functioning as designed, prior to planting aquatics (other than temporary planting of cattails in sediment forebay) in order to allow time for conditions in the pond to stabilize. Pending these observations and discussions with TRCA staff, revisions to the planting plan for 1-3 vegetation zones may be necessary.

A two year guarantee of the planted material is required.

NB: This document is dated August 2007 and is consistent with current policies adopted by the TRCA at this time. These guidelines are not meant to be exhaustive but present the typical requirements of the TRCA and are subject to change.



**Moisture Zones within Stormwater Management ponds.**

### Acceptable Floral Species for SWM Pond Planting

Please note that acceptable native species may vary by Municipality due to Asian Longhorn Beetle, Emerald Ash Borer, etc.

Plant Type	Common Name	Scientific Name	Suitable Moisture Zone	Notes
Tree	Sugar Maple	<i>Acer saccharum ssp. Saccharurr</i>	5	
	Red Maple	<i>Acer rubrum</i>	3, 4,5	
	Silver Maple	<i>Acer saccharinum</i>	3, 4,5	
	Bur Oak	<i>Quercus macrocarpa</i>	4,5	
	Red Oak	<i>Quercus rubra</i>	5	
	White Ash	<i>Fraxinus americana</i>	5	
	Green Ash	<i>Fraxinus pennsylvanica</i>	4,5	
	Black Ash	<i>Fraxinus nigra</i>	3, 4,5	
	Black Cherry	<i>Prunus serotina</i>	5	
	Balsam Poplar	<i>Populus balsamifera spp. balsamifera</i>	4,5	
	Trembling Aspen	<i>Populus tremuloides</i>	5	
	Shagbark Hickory	<i>Carya ovata</i>	5	
	Bitternut Hickory	<i>Carya cordiformis</i>	5	Mid to upper slopes
	White Spruce	<i>Picea glauca</i>	4,5	
	White Cedar	<i>Thuja occidentalis</i>	3, 4,5	
	Tamarack	<i>Larix laricina</i>	4,5	
	Shining Willow	<i>Salix lucida</i>	3, 4	
	Black Willow	<i>Salix nigra</i>	3, 4	
	Peach-leaved Willow	<i>Salix amygdaloides</i>	3, 4,5	
White Pine	<i>Pinus strobus</i>	5		

Plant Type	Common Name	Scientific Name	Suitable Moisture Zone	Notes
Shrub	Red Osier Dogwood	<i>Cornus stolonifera</i>	3,4,5	
	Gray Dogwood	<i>Cornus foemina</i> spp. <i>racemosa</i>	4,5	
	Alternate Leaved Dogwood	<i>Cornus alternifolia</i>	5	
	Chokecherry	<i>Prunus virginiana</i>	5	
	Witherod Viburnum	<i>Viburnum cassinoides</i>	3, 4	
	Nannyberry	<i>Viburnum lentago</i>	4,5	
	Highbush Cranberry	<i>Viburnum trilobum</i>	3, 4	
	Serviceberry	<i>Amelanchier</i> spp.	5	
	Bush Honeysuckle	<i>Diervilla lonicera</i>	4,5	
	Black Chokeberry	<i>Aronia melanocarpa</i>	3,4	
	Common Winterberry	<i>Ilex verticillata</i>	3,4	
	Common Elderberry	<i>Sambucus canadensis</i>	3,4,5	
	Pussy Willow	<i>Salix discolor</i>	3,4	
	Sandbar Willow	<i>Salix exigua</i>	3,4	
	Shining Willow	<i>Salix lucida</i>	3,4	
	Peach-leaved Willow	<i>Salix amygdaloides</i>	3,4	
	Slender Willow	<i>Salix petiolaris</i>	3,4	
	Bebb's Willow	<i>Salix bebbiana</i>	3,4	
	Sage-leaved/Hoary Willow	<i>Salix candida</i>	3,4	
	Narrow-leave Meadowsweet	<i>Spiraea alba</i>	3,4	
	Black Willow	<i>Salix nigra</i>	3,4	
	Staghorn Sumac	<i>Rhus typhina</i>	5	
	Common Buttonbush	<i>Cephalanthus occidentalis</i>	3,4	
Common Ninebark	<i>Physocarpus opulifolius</i>	3,4		
Speckled Alder	<i>Alnus incana</i> spp. <i>ranus</i>	3,4		

Plant Type	Common Name	Scientific Name	Suitable Moisture Zone	Notes
Aquatic - Submergent	Common Waterweed	<i>Elodea canadensis</i>	1	
	Coontail	<i>Ceratophyllum demersum</i>	1	
	Tape Grass	<i>Vallisneria americana</i>	1	
	Northern Water Milfoil	<i>Myriophyllum sibiricum</i>	1	Not to be confused with invasive Eurasian Milfoil ( <i>M. spicatum</i> )
	Water Starwort	<i>Callitriche hermaphroditica</i>	1	
	Slender/Small Pondweed	<i>Potamogeton pusillus</i>	1	
Aquatic - Floating	White Water Lily	<i>Nymphaea odorata</i>	1	
	Floating Pondweed	<i>Potamogeton natans</i>	1	
	Large-leaved Pondweed	<i>Potamogeton amplifolius</i>	1	
	Yellow Pond Lily	<i>Nuphar variegatum</i>	1	
Aquatic - Robust Emergent	Common Cattail	<i>Typha latifolia</i>	2	
	Bulrush	<i>Scirpus spp.</i>	2	
Aquatic - Broadleaved Emergent	Broadleaved Arrowhead	<i>Sagittaria latifolia</i>	2	
	Common Water Plantain	<i>Alisma plantago-aquatica</i>	2	
Aquatic - Narrowleaved Emergent	Burreed	<i>Sparganium spp.</i>	2	
	Grasses	<i>Leersia spp.</i>	2	
	Sedges	<i>Carex spp.</i>	2	