Article 75

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Pollutant Removal Dynamics of Three Wet Ponds in Canada

Communities in the Toronto metropolitan area have long relied on wet ponds and wet extended detention ponds to treat stormwater runoff from new development. According to provincial guidelines, wet ponds are sized based on two primary factors: the quality of fishery habitat present downstream (designated as fishery level one through four) and the amount of impervious cover present in the upstream catchment (OME, 1994). Based on these factors, engineers must achieve a numeric target for suspended sediment removal in the stormwater pond to protect the downstream fishery habitat (Table 1). The Ontario approach for sizing ponds results in wet ponds that often have more water quality storage than many of their American counterparts, given that many Ontario watersheds still contain high quality fishery habitat.

Over the last five years, a consortium of local and provincial stormwater agencies have investigated how various kinds of ponds perform under the demanding climatic conditions of the Toronto metropolitan region. This research program, known as the Stormwater Assessment Monitoring and Performance Program (SWAMP), has added greatly to our understanding of how modern ponds remove stormwater pollutants during both the summer and winter in northern latitudes. The SWAMP study is also notable because it commissioned a series of supplemental research studies to investigate the internal dynamics of stormwater ponds. These studies included monitoring wetland plant colonization over time, sediment deposition rates, sediment quality, the impact of chlorides from road salts, and the impact of ponds on stream warming. With apologies to our Canadian friends, we confess to being metrically challenged, and have converted some of their metric data into American units for the convenience of our stateside readers.

The basic design utilized in the SWAMP program involved sampling three ponds during both the growing season and more demanding wintertime conditions. Automated flow and water quality samplers were located at the inlet(s) and outlets from each pond during the summer and fall. Due to ice cover, grab samples of pollutant concentrations were collected at inlets and outlets to characterize how the ponds influenced pollutant concentrations during winter and snow melt conditions. Each of the three ponds selected for intensive monitoring employed several innovative pond design concepts, such as sediment forebays, extended detention over the permanent pool, generous water quality storage volumes, reverse-sloped pipes, multiple cells,

Table 1: Sizing Guidelines for Wet Ponds in Ontario (OME, 1994)

Watershed Protection Level	Required water quality storage for Ontario wet ponds (inches per acre)			
	35% imp	55% imp	70% imp	85% imp
Level 1 fishery (excellent habitat) 80% sediment removal	0.56	0.76	0.90	1.0
Level 2 fishery (good habitat) 70% sediment removal	0.36	0.44	0.52	0.60
Level 3 fishery (poor habitat) 60% sediment removal	0.24	0.30	0.34	0.38
Level 4 retrofit and redevelopment 50% sediment removal	0.24	0.24	0.24	0.26

Note: Indicated storage is allocated to permanent pool, except up to 0.16 inches which can be supplied as extended detention storage.