Evaluation on the implications of microbial survival to the performance of an urban stormwater tree-box filter

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Abstract

   Most of the studies about stormwater low impact development technologies used generalized observations without fully understanding the mechanisms affecting the whole performance of the systems from catchment to the facility itself. At present, these LID technologies have been treated as black box due to fluctuating flow and environmental conditions affecting its operation and treatment performance. As such, the implications of microbial community to the overall performance of the tree-box filter were investigated in this study. Summer season was found to be the most suitable season for microorganism growth since more microorganism were found during this season. Least microorganism count was found in spring because of the plant growth during this season since plant penology influences the seasonal dynamics of soil microorganisms. Litterfall during fall season might have affected the microorganism count during winter since, during this season, the compositional variety of soil organic matter changes affecting growth of soil microbial communities. Microbial analyses of sediment samples collected in the system revealed that the most dominant microorganism phylum is Proteobacteria in all the seasons in both inlet and outlet comprising 37% to 47% of the total microorganism count. Proteobacteria was followed by Acidobacteria, Actinobacteria and Chloroflexi which comprises 6% to 20%, 9% to 20% and 2% to 27%, respectively of the total microorganism count for each season. These findings were useful in optimizing the design and performance of tree box filters considering physical, chemical and biological pollutant removal mechanisms.

Keywords : Low impact development; microorganism; tree-box filter; stormwater management

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