JEP> Vol.3 No.8A, August 2012

OPEN ACCESS

Coliform Bacteria: The Effect of Sediments on Decay Rates and on Required Detention Times in Stormwater BMPs

PDF (Size:249KB) PP. 787-797 DOI: 10.4236/jep.2012.328094

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ABSTRACT

Fecal indicator bacteria, such as total coliforms and *E. coli*, are a challenge to control in urban and rural stormwater runoff. To assess the challenges of improving bacterial water quality standards in surface waters, microcosm experiments were conducted to assess how decay rates of total coliforms and *E. coli* are affected by sediments and associated organic matter. Samples were collected at a lake embayment to create laboratory microcosms consisting of different combinations of unsterilized and sterilized water and sediment. Calculated first-order decay rate constants ranged from 0.021 to 0.047 h^{-1} for total coliforms and 0.017 and 0.037 h^{-1} for *E. coli*, depending on how each microcosm was prepared. It is evident that sediment in contact with the water column decreases bacteria decay rate, showing that care should be taken when designing stormwater treatment measures. In addition, high organic carbon content in the sediment temporarily increased bacteria concentrations in the water column. The results demonstrate that stormwater treatment measures, such as extended detention basins and constructed wetlands, must hold water for several days to allow for reduction of bacterial concentrations to acceptable levels. In addition, to troubleshoot detention basins and constructed wetlands for causes of high effluent bacterial concentrations, analyses of sediment, organic carbon, and water column depth should be conducted.

KEYWORDS

Fecal Indicator Bacteria; Decay Rate; Sediment; Nutrients; Organic Carbon; Best Management Practices (BMPs)

Cite this paper

A. Kinnaman, C. Surbeck and D. Usner, "Coliform Bacteria: The Effect of Sediments on Decay Rates and on Required Detention Times in Stormwater BMPs," *Journal of Environmental Protection*, Vol. 3 No. 8A, 2012, pp. 787-797. doi: 10.4236/jep.2012.328094.

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