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Bioretention: Evaluating their Effectiveness for Improving Water Quality in New England Urban Environments

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Abstract
Nonpoint source (NPS) pollution is one of the leading causes of water quality problems in the United States. Bioretention has become one of the more frequently used stormwater management practices for addressing NPS pollution in urbanized watersheds in New England. Yet despite increased acceptance, bioretention is not widely practiced. This study explores and evaluates the efficacy of bioretention for protecting urban water quality.

This research found that numerous monitoring methods are used by researchers and industry experts to assess the effectiveness of stormwater best management practices (BMPs) and low impact development (LID) practices that include bioretention. The two most common methods for analyzing and evaluating water quality data are

pollutant removal efficiency and effluent quality. While effluent quality data is useful for characterizing classes of BMP treatment performance on a statistical basis, pollutant removal efficiency is more representative of the actual pollutant load being reduced by the stormwater treatment practice over time, and is used in Total Maximum Daily Load (TMDL) assessments. However, despite this difference, monitoring is still arguably the best method for determining the effectiveness of stormwater treatment practices.

Monitoring of bioretention performance results is needed to inform improvements to design standards and guidance to aid state and local municipalities in the proper selection of bioretention/stormwater controls. This study advocates for instituting fine-scale, “safe-to-fail” design experiments as part of an adaptive management process that is used to advance bioretention design guidance and future applications of monitoring practice(s) that target reduction of pollutants in downstream receiving waterbodies. This innovative approach could result in increased use of bioretention in New England urban environments.

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