Assessing and Predicting the Effectiveness of Stormwater BMPs on Water Quality, Flow, Thermal Regime, and Substrate Integrity in the Delaware River Basin

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Assessments of the effectiveness of stormwater best management practices (BMPs) have focused on measurement of load or concentration reductions, which can be translated to predict biological impacts based on chemical water quality criteria. However, many of the impacts of development are related to alteration of habitat - channel morphometry, substrate, flow, and thermal regime. The purpose of this project is to assess the effectiveness of stormwater BMPs on water quality, flow, thermal regime, and substrate integrity on a small watershed scale. This project focuses on the Delaware River Basin (DRB), a 350 mile long river system within a 13,500 mi² watershed, which encompasses portions of New York, Delaware, New Jersey, and Pennsylvania. The DRB project is part of a larger EPA initiative studying the effectiveness of green infrastructure in different climatic regimes (e.g., humid vs. arid) and at multiple scales.

Historic habitat, temperature, periphyton, macroinvertebrate, and fish community data from the DRB are being compiled into an Access database, along with the locations of stormwater BMPs. A toolkit of approaches is being assembled (valley segment and watershed classification, predictive models for habitat features, predictive models for community composition, empirical derivations of species optima and tolerances) to assess and predict the effectiveness of stormwater BMPs in maintaining and improving habitat and biological integrity of streams in the Mid-Atlantic region and beyond.

Urbanization-response models and thresholds are being constructed along urban to rural watershed development gradients, using watershed attributes and indices and existing sources of monitoring data. Expected condition will then be compared to actual condition in small watersheds with implemented stormwater BMPs, with the intent of determining the extent to which green infrastructure is capable of reducing stormwater impacts (altered hydrologic regimes, temperatures, nutrients, and other contaminants) to biological assemblages in streams. Additionally, the extent to which biological condition can be enhanced by green infrastructure will be evaluated, which will provide useful information when considering restoration, development, re-development, and conservation management decisions. This presentation will focus on data collection methodologies, data analysis, and preliminary results in the DRB.

Keywords:

Stormwater BMPs, Green infrastructure, Watersheds, Biological Condition Gradient, Urbanization