Gary Conley Abstract

Pragmatic model design and BMP field verification for improved stormwater management tracking

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Stormwater managers are increasingly being required to quantify effectiveness of projects to satisfy MS4 permit requirements or obtain funding. The temporal variability of urban runoff, spatial distribution of BMPs, and variable performance condition of BMPs (which is rarely quantified) create severe limitations for directly measuring overall stormwater program effectiveness throughout an MS4. Cost-effective, user-oriented models can fill monitoring data gaps and provide information on timeframes relevant to stormwater decision making needs. We present an example application of the BMP module of the web-based, spatially distributed Stormwater Tool to Estimate Load Reductions (www.swTELR.com) that is integrated with supporting assessment tools to quantify structural BMP performance (BMP RAM www.bmpram.com) and non-structural BMP implementation (Parcel RAM www.parcelram.com) to prioritize urban catchments for action and quantify stormwater and pollutant load reductions. The model represents the MS4 landscape with a set of interconnected drainages that route water between catchments and ultimately to receiving waters, integrating stormwater impacts and mitigation benefits to downstream flows. Structural and non-structural BMPs are represented with a combination of lumped and spatially explicit quantification to account for the benefits of each BMP type as water is routed through catchments. Non-structural BMPs such as disconnection of impervious surfaces or street sweeping are represented by reduction of runoff or pollutant generation potential from parcels and roads. All upstream runoff and pollutant load reductions are incorporated to estimates of stormwater delivered to downstream centralized structural BMPs where a hydrograph separation technique is applied to a set of event-based flows designed to characterize 30-year flow distributions. BMP-type specific performance decay curves are used to scale estimated benefits over time based on laboratory and field experiments that define relationships pollutant loading rates, maintenance intervals, and infiltration rates. BMP performance condition is specified based on BMP field verification using a set of standard protocols that can improve modeled loading estimates, fulfill reporting MS4 requirements, and be used to prioritize maintenance activities to maximize stormwater program benefits.