Session L4: Monitoring Effectiveness of BMPs for Urban Stormwater

Room A106
8:00 – 9:30 am

0562
L4-1

Implementing an In-Stream Stormwater Monitoring Program to Measure BMP Effectiveness

Chris French and Bonnie Brown

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A comprehensive stormwater monitoring plan has been designed and initiated in the Reedy Creek watershed (City of Richmond) through the collaborative efforts of the Reedy Creek Coalition (RCC), the Alliance for the Chesapeake Bay (Alliance), and Virginia Commonwealth University (VCU). Monitoring activities include collection of biological (E. coli and benthic macroinvertebrate), chemical (nutrients, chlorophyll, and suspended solids), and physical (stream stage and discharge) data at multiple sites within the watershed. All field work is conducted by both Alliance staff and RCC volunteer water monitors trained by the Alliance. Chemical analyses such as nutrients are performed through laboratory analysis.

Initial monitoring results are designed to document current baseline conditions throughout the watershed and identify pollution hotspots. This also sets the stage to evaluate the success of the intensive educational programs and Best Management Practices being implemented by RCC and the Alliance to reduce polluted runoff from residential and commercial properties. The data will also provide valuable information about pollutant loadings in an urban system and facilitate TMDL implementation activities in this impaired watershed.

This presentation will provide details of the long-term monitoring plan, its integration with watershed protection and restoration activities, and biological, physical, and chemical results from the first two years of monitoring.

0220
L4-2

Evaluation of Effects of Middleton's Storm Water Management Activities on Streamflow and Water Quality Characteristics of Pheasant Branch, 1975–2008

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US Geological Survey, Wisconsin Water Resources Science Center, Middleton, Wis., USA

Few long-term data sets are available to evaluate the effects of urban management practices. Over 30 years of streamflow and water quality data are available to evaluate the effectiveness of Middleton's storm water management practices on Pheasant Branch. The data were evaluated relating structural and non-structural best management practices employed during that period.

Annual streamflow, baseflow and flood peaks have increased based on 34 years of data Flood peaks increased 37 percent for the 2-yr flood and 83 percent for the 100-yr flood. An adjacent rural stream, had increases for the same frequencies of 43 and141 percent. Because flood peaks on Pheasant Branch have not increased as much, it appears the stormwater management practices have been successful in mitigating effects of urbanization since urbanization usually increases flood peaks. The increase in flood peaks in both streams is probably the result of the substantial increase in precipitation.

The storm water management practices decreased the average annual sediment and phosphorus load even with increasing annual runoff and flood peaks. Since 2002 the annual sediment load has decreased from 2,650 to 1,450 tons or 45% and the phosphorus load decrease from 12,200 to 6,300 pounds or 48%. Nearby streams didn't show the same decrease. A Storm Water Quality Plan shows Middleton met the requirements of reducing TSS by 20 % and is close to meeting the 40 % reduction in TSS by 2013.

To evaluate the effect of road deicing, chloride monitoring was conducted during two winter seasons. The maximum concentration of chloride was 931 mg/L, exceeding the USEPA acute criterion of 860 mg/L. Chloride concentrations exceeded the USEPA chronic criterion of 230 mg/L for at least 55 days.**0069**

L4-3
Assessing Watershed Scale Responses to BMP Implementation in Urban Watersheds

John Jastram

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The USGS Virginia Water Science Center, in cooperation with the Fairfax County Stormwater Planning Division, is conducting a study of urban/suburban watersheds in Fairfax County, Virginia to assess watershed-scale water- quality responses to implementation of Best Management Practices (BMPs) and stream restoration activities. Specifically, the objectives of the study are to: 1.) Describe current conditions and trends in both water quality and water quantity, compute loads in water-quality constituents, and use these data to evaluate water-quality improvements that are associated with BMP implementation and stream restoration activities, and 2.) Evaluate the transferability of results from intensively monitored watersheds to other watersheds with less-intensive monitoring. This unique study is reliant upon a long-term data collection effort in 14 small (1-6 mi^2) watersheds that represent the range of land-use conditions in suburban Fairfax County. The study was designed to include a mix of intensively monitored watersheds, for which continuous streamflow and water-quality parameters are measured and over 100 routine and storm event samples are collected and less intensively monitored watersheds, for which periodic streamflow and water-quality measurements are made.

This presentation will include critical elements of the study design, the novel monitoring methods employed, and a discussion of preliminary results.

0046
L4-4

Portland Documents Stormwater Management Success through Green Streets

Tim Kurtz

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Streets represent a large portion of the impervious area in urban areas, and managing pollutants from street runoff is critical in meeting regulatory requirements in both our sewer and open channel systems.

Green Streets use soil and plants to slow, retain, and clean street runoff. Green Streets are built by private developers to meet city stormwater requirements for new development and redevelopment projects, and by the City to manage its sewer system, reduce erosion and local flooding, and to meet water quality requirements. There are approximately 1,000 green street facilities currently in service, with another 500 planned over the next 3 years.

Monitoring of green streets began in 2003, with eight years of continuous flow monitoring data available at one green street, and 45 design storm simulations performed at more than 25 other green streets located throughout Portland. Storm simulations are reproduced using a fire hydrant or water truck, and a flow meter. Simulated design storms include Water Quality (0.83 inches in 24 hours) and two combined sewer overflow storms (three year summer events - 1.41 inches in 24 hours, and 2.17 inches in 35 hours).

Data from the continuously monitored site, the Glencoe Rain Garden, show the retention of 87% of annual rainfall over eight years, 100% retention of Water Quality Design Storm sized storm events, and 60% or more retention of the combined sewer overflow storm simulations.

Results at other facilities have been similar, with Water Quality Design Storm retention averaging 93%, combined sewer overflow design storm retention averaging 76%, and 25-year peak flow reduction averaging 90%. Site conditions, design configuration, and antecedent conditions produce small variations, but results have been consistent.

Green Streets have consistently performed well and performance data justifies their increased use by the City. Green Streets are effective at reducing peak flows and flow volumes, and preventing runoff up through the Water Quality Design Storm. They also provide additional community and watershed health benefits like traffic calming, reduced urban heating, better air quality, and improved livability.