

Roundtable on Urban Ecohydrology Science and Practice

July 24th, 2012

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Center for Watershed Protection

Underground Drainage Networks

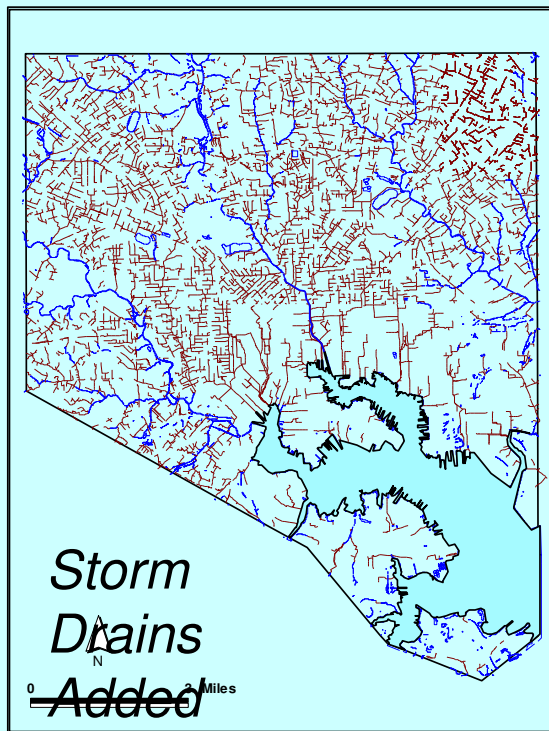
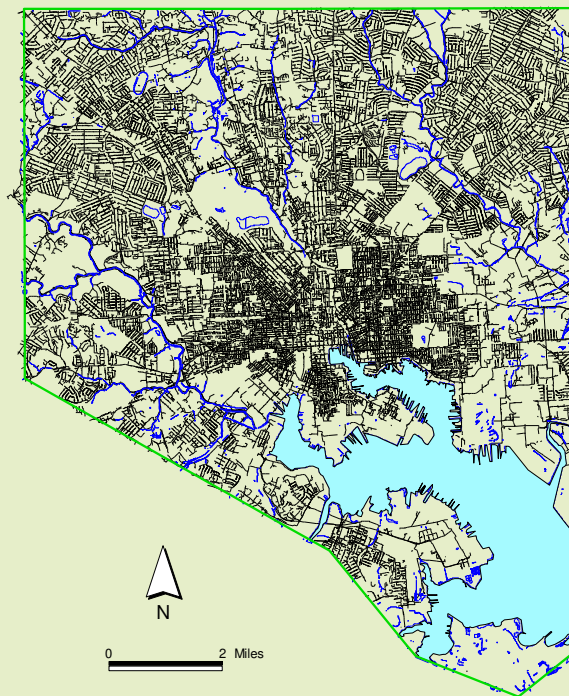
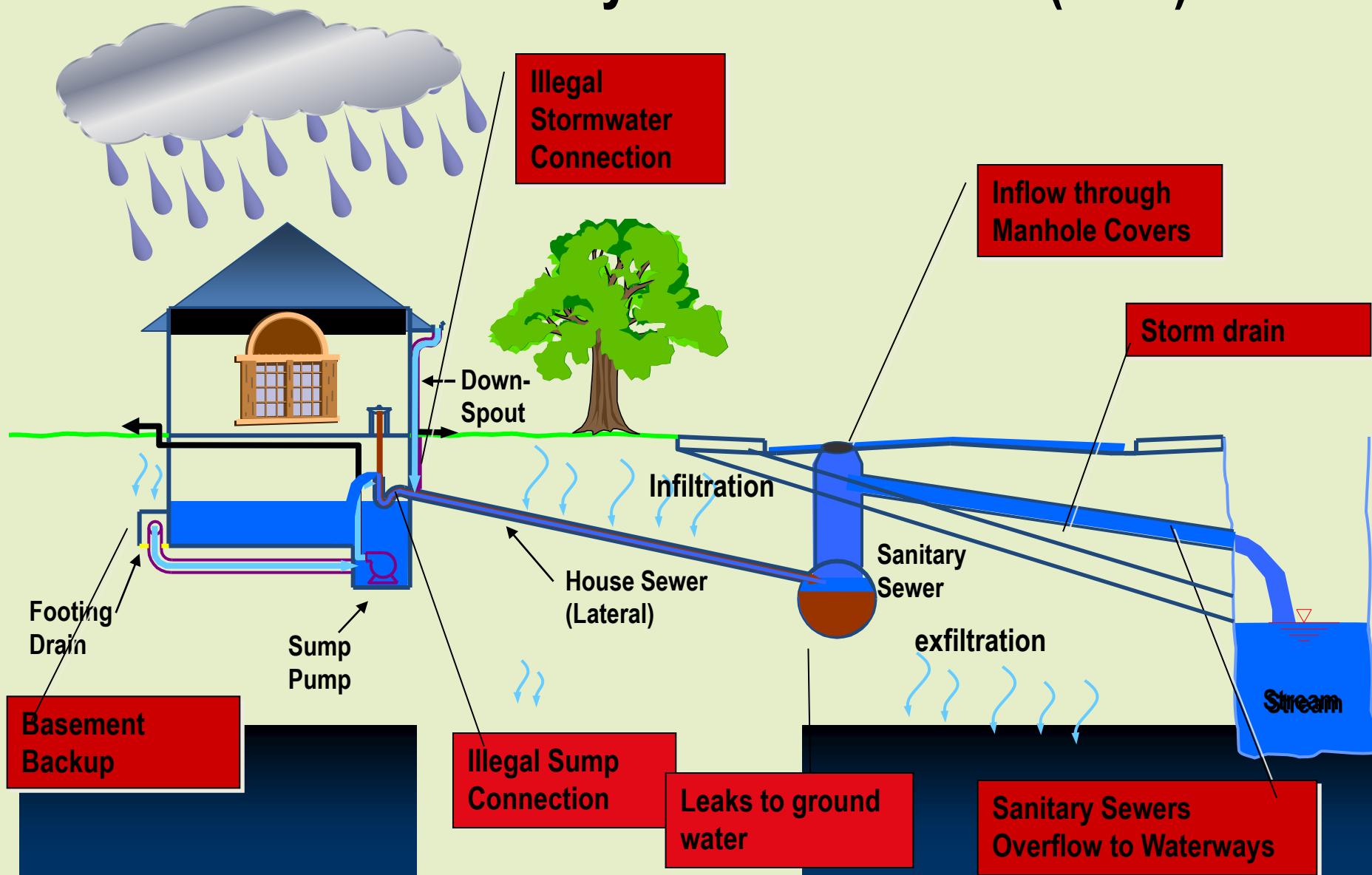


Figure xx. Stormdrain

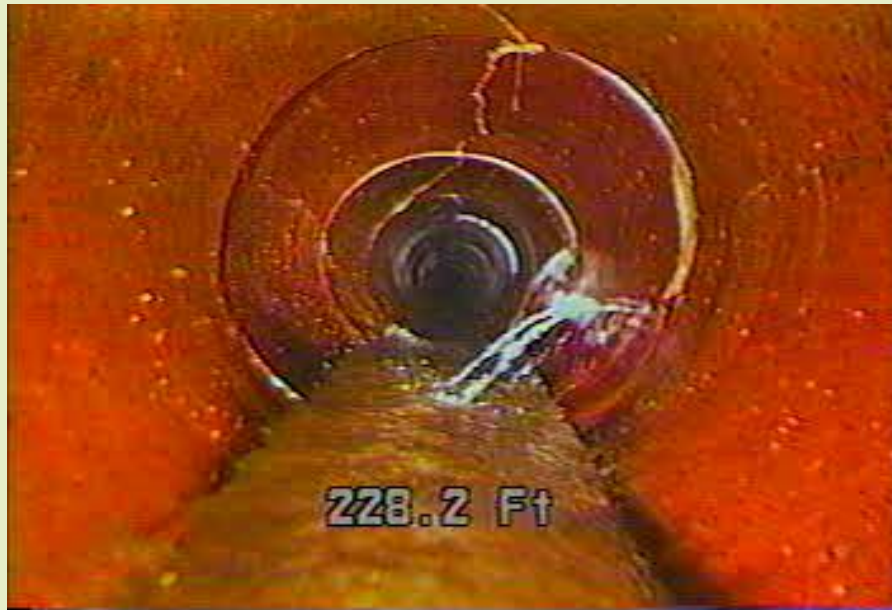
Baltimore City Sanitary Lines



What is a Sanitary Sewer Overflow (SSO) ?



Sanitary Sewer Inspection



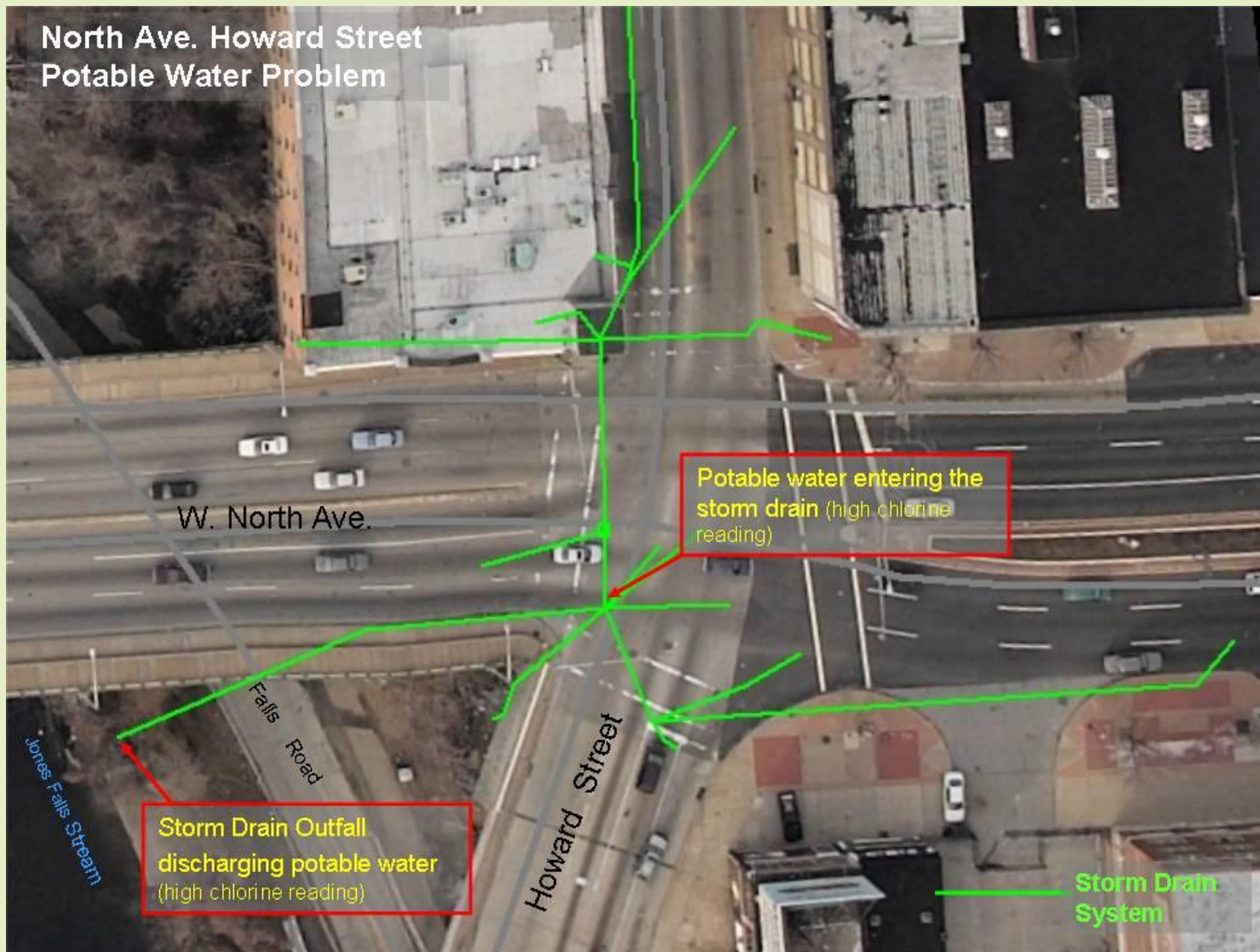
Urban streams can be a thing of beauty



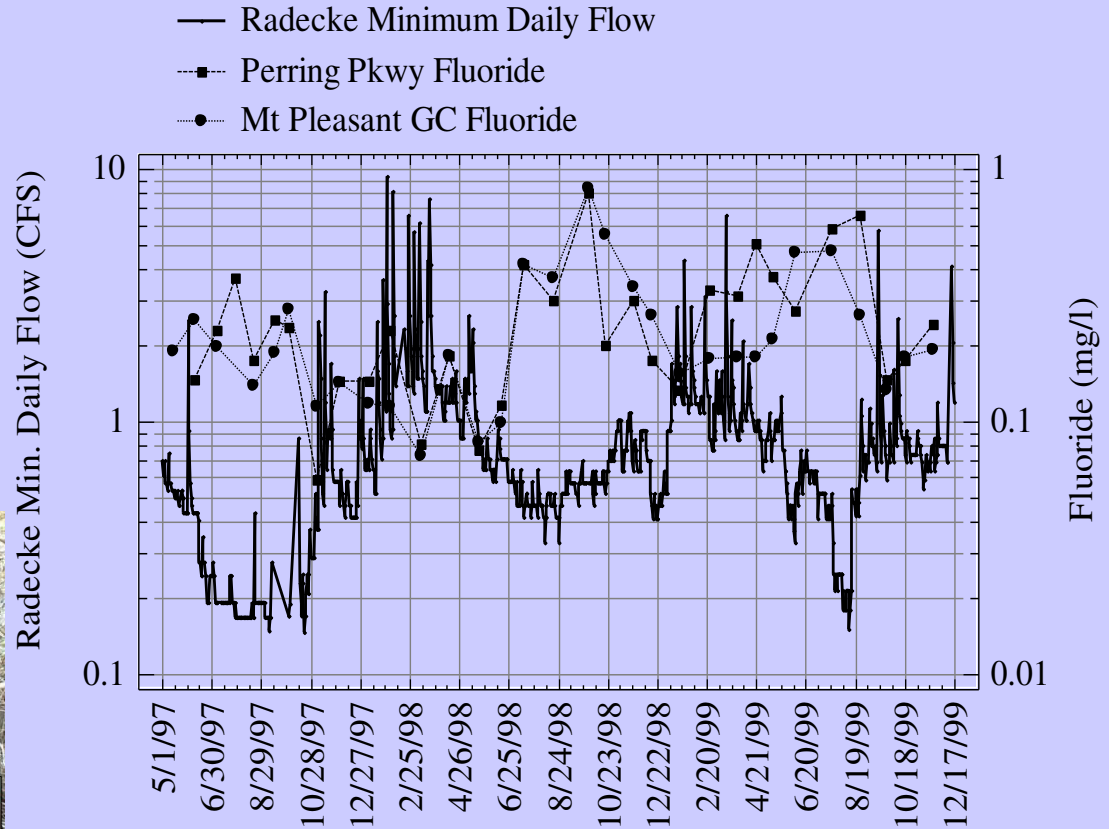


= 143 1/2-acre bioretentions to treat TP (49 to treat TN); cost of \$590K-\$1.7M

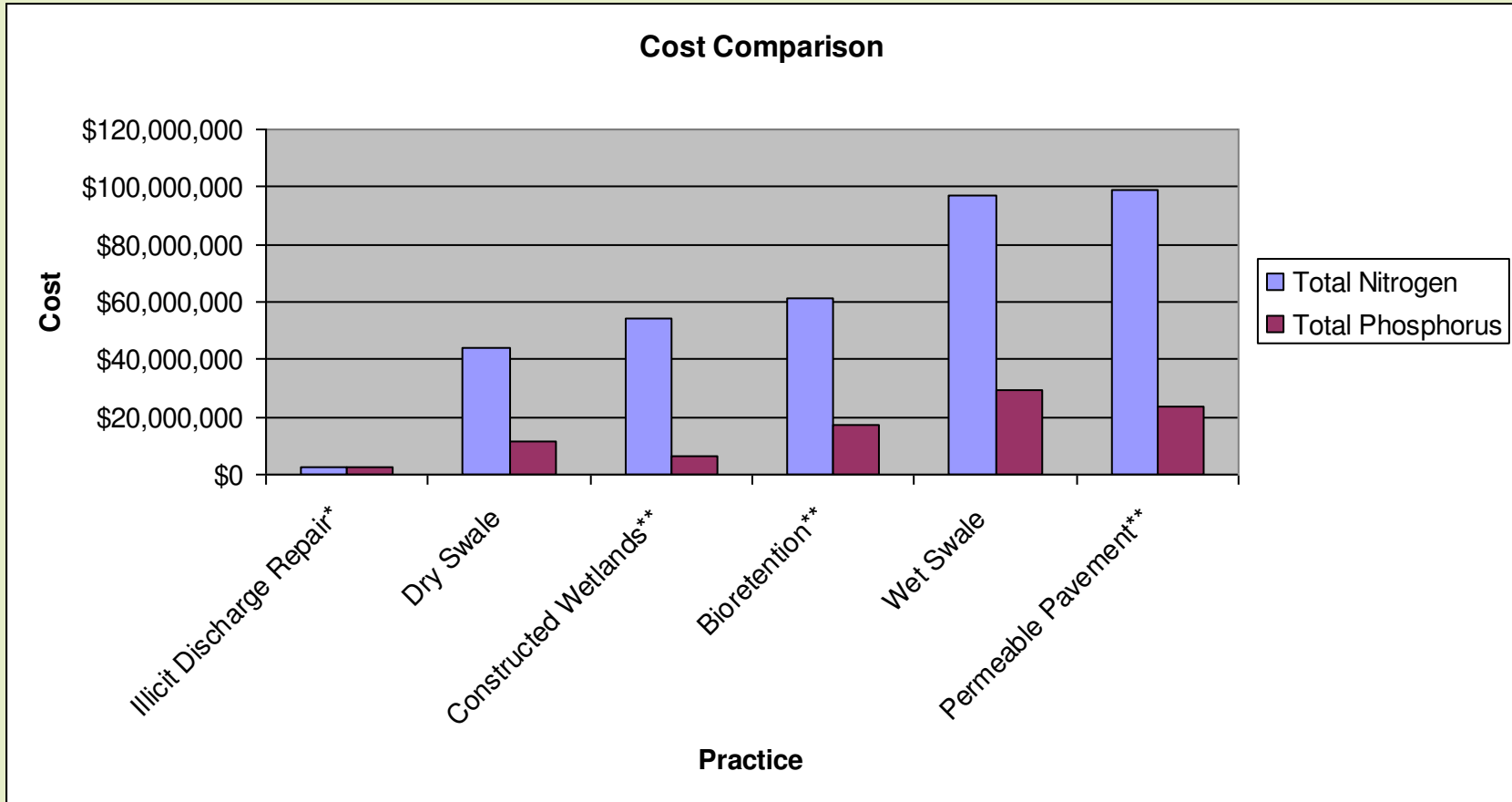
Tracking Water Leaks



Fluoride vs. Baseflow



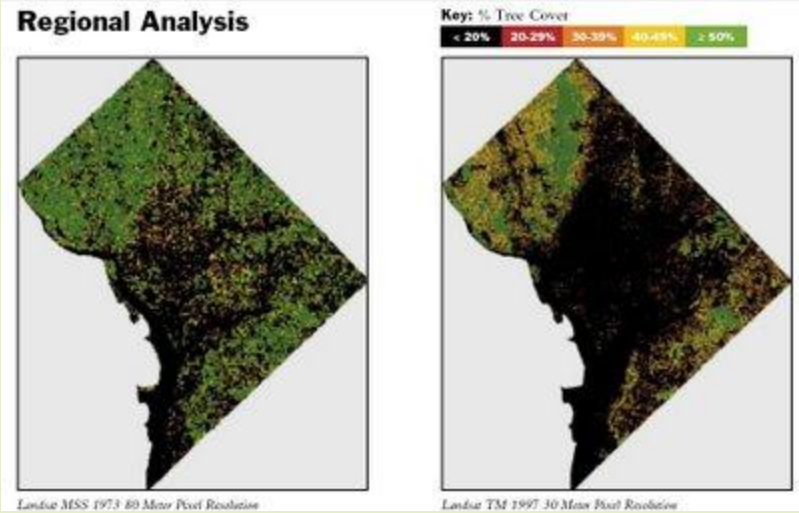
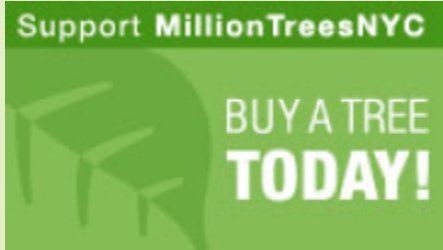
Illicit discharge elimination is a cost effective approach to nutrient management



*Assumes 50K per repair

**Assumes 100% of the water quality volume provided by treating 1" of rainfall

Is planting trees the panacea?



Wicomico County WIP includes 2000 acres of urban tree plantings to meet Bay TMDL

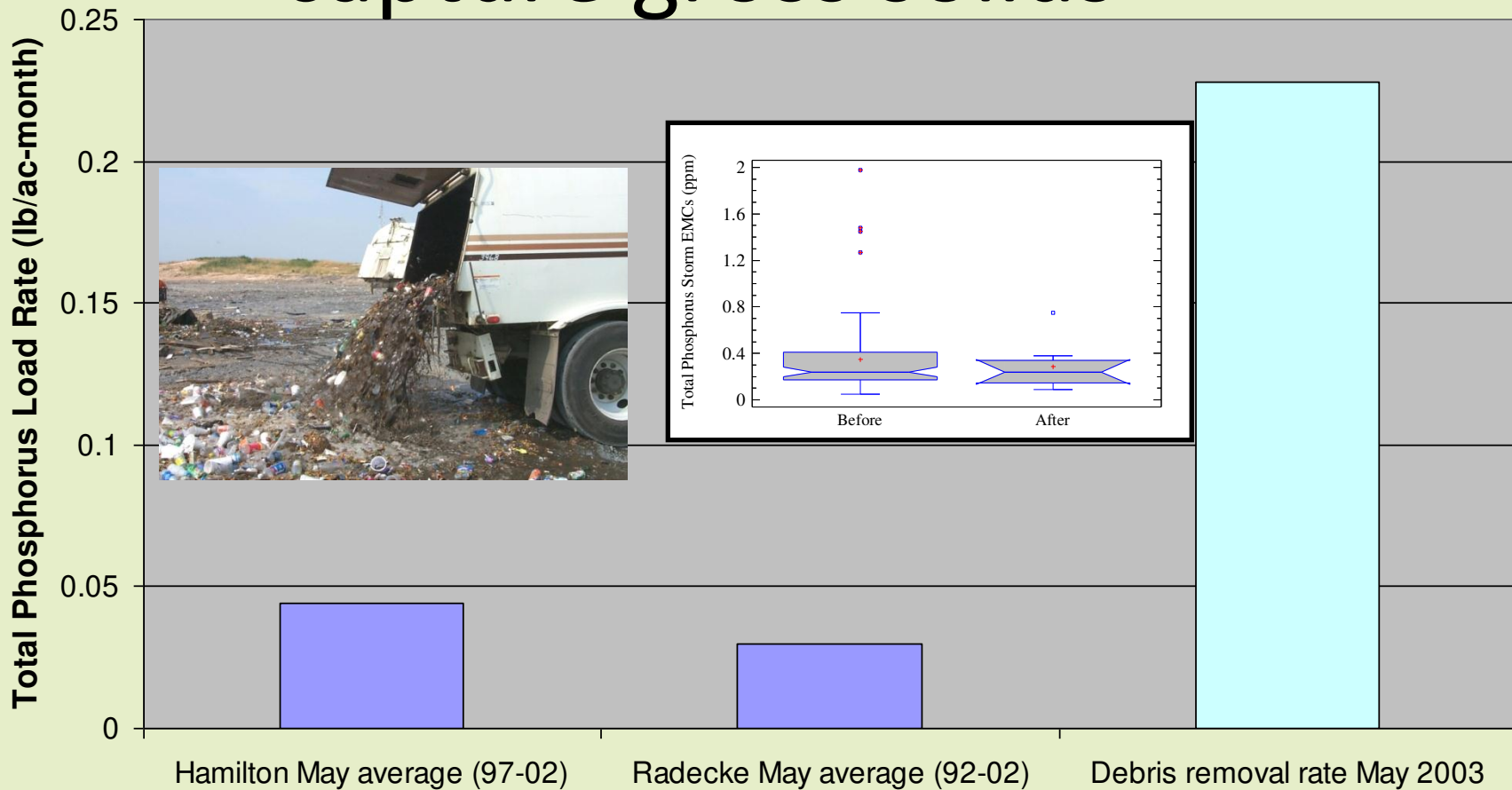
Gross Stormwater Solids



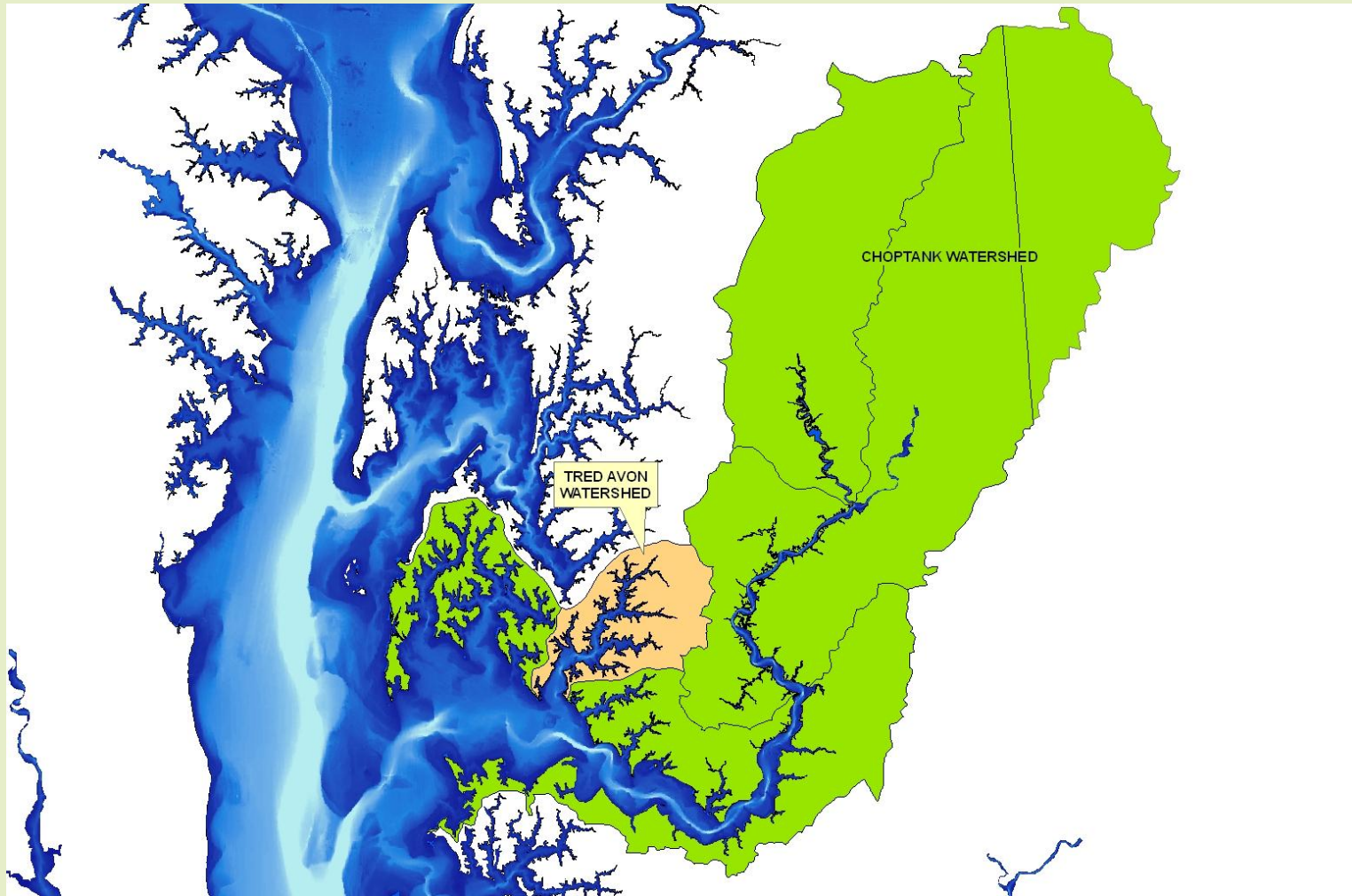
Screening vegetative debris from gross solids



Monitoring methods do not capture gross solids



TRED AVON RIVER WATERSHED



Bag filter sampling process



Gross solids nutrient concentration

Average concentration (mg/kg)			
GROSS SOLIDS	TN	TP	Description
Tred Avon net filters	5453	368	whole sample, 85-97% leaves
Broadway Outfall CDS Unit (FL)	8050	557	<i>as TKN, leaves only</i>
STREET SWEEPING			
City of Baltimore, MD	2728	183	hopper of street sweeping, mixed urban land use
Berretta and Sansalone 2010 (FL)	1439	426	residential, 27 MS4 data

Cost Summary Comparison

- Annual cost to remove equivalent annual TN load

Practice	Type of practice	Equivalent Annual cost	Source & Notes
Bag filter	Structural	\$6,105*	Based on 10-yr expectancy
Bioretention	Green infrastructure	\$6,038	King and Hagan 2011, Hirshman et al. 2008
Wet pond (new, retrofit)	Conventional, structural	\$6,200 - \$12,100	King and Hagan 2011, Hirshman et al. 2008
Street sweeping	Non-structural	\$1,980	Berretta et al 2011

* Based on costs over 10-year compared to 20-year cost estimate from King and Hagan 2011.
Bag filter 20 year annual cost \$4,794