



The Road Ahead:
Implementing Environmental Site Design in Maryland

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Chesapeake Stormwater Network

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Key Themes

- About Chesapeake Stormwater Network
- The Future of Stormwater: Tommy the Swammi
- Baywide Stormwater Design Specifications
- MD Runoff Reduction Spreadsheet
- Special Stormwater Technical Bulletins
- **Baywide Stormwater Training**
- Master Stormwater Engineers

Chesapeake Stormwater Network

Nonprofit organized to align the local, state, federal and private sectors to solve the Bay stormwater problem through an independent network of concerned stormwater professionals



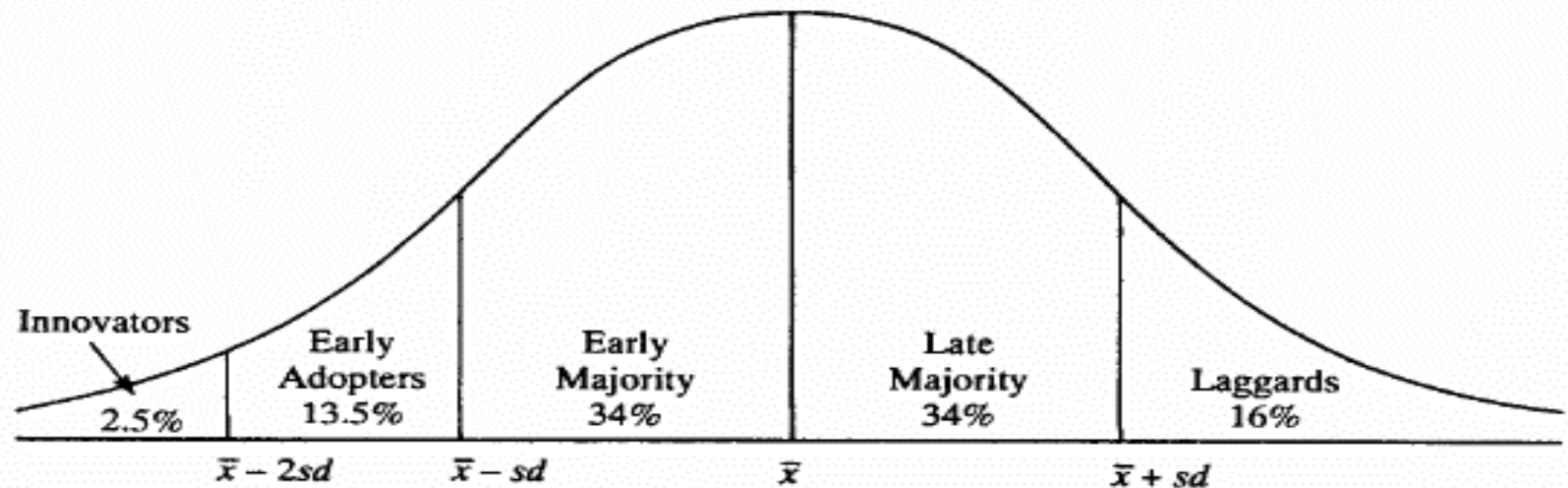
www.chesapeakestormwater.net



Growing the Network & Bringing the Sectors together

Innovation and Adopter Categories

Figure 7-3. Adopter Categorization on the Basis of Innovativeness



The innovativeness dimension, as measured by the time at which an individual adopts an innovation or innovations, is continuous. The innovativeness variable is partitioned into five adopter categories by laying off standard deviations (sd) from the average time of adoption (\bar{x}).

The Future of Stormwater in MD



Tommy the Swammi

Some Future Predictions

Uneven local implementation of new ESD regulations

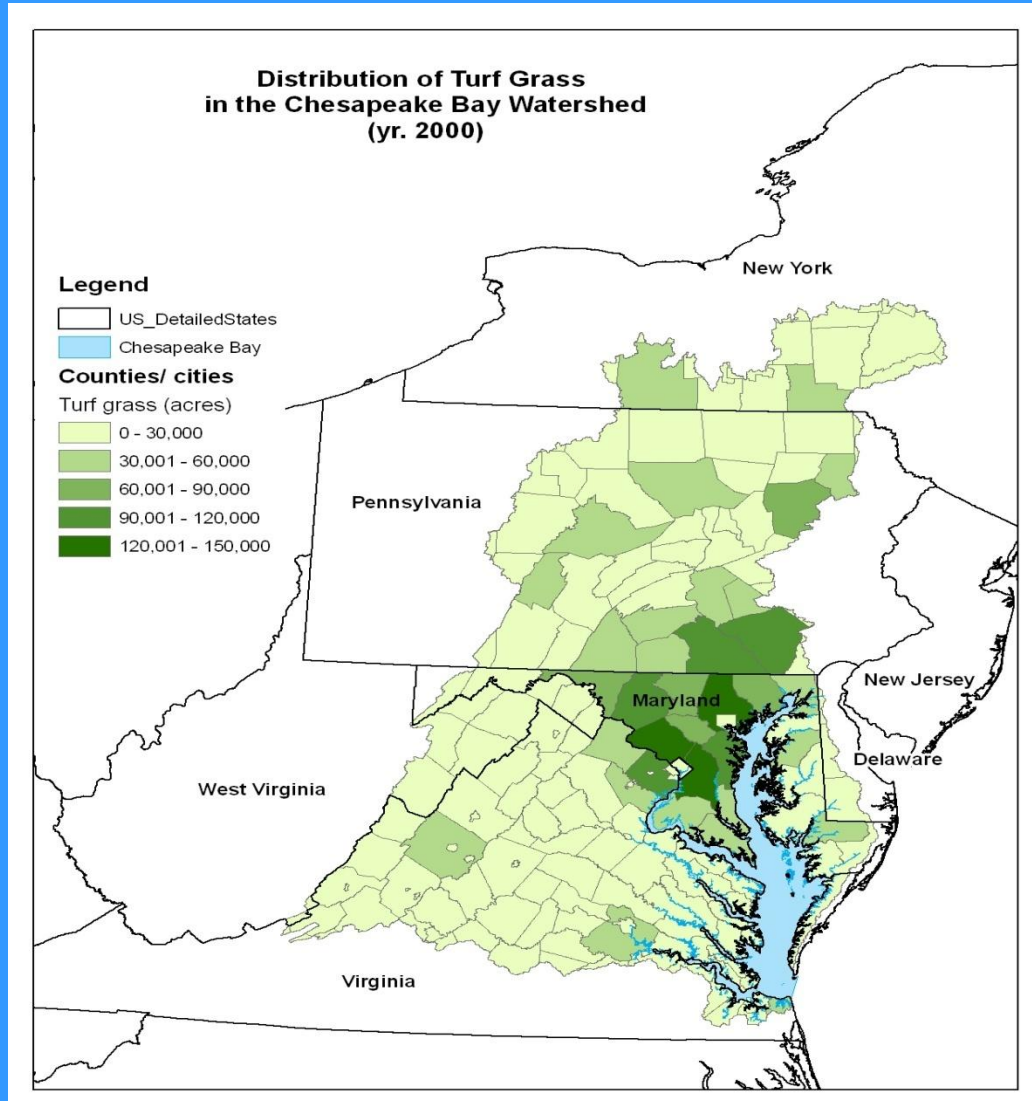
Rapid changes in practices, technology and compliance tools

More stringent EPA stormwater rules for Chesapeake Bay (or nationally)

More numeric municipal, industrial and construction NPDES permits, with more accountability and enforcement

Local nutrient reduction requirements from Bay TMDL

We have Reached the Clipping Point



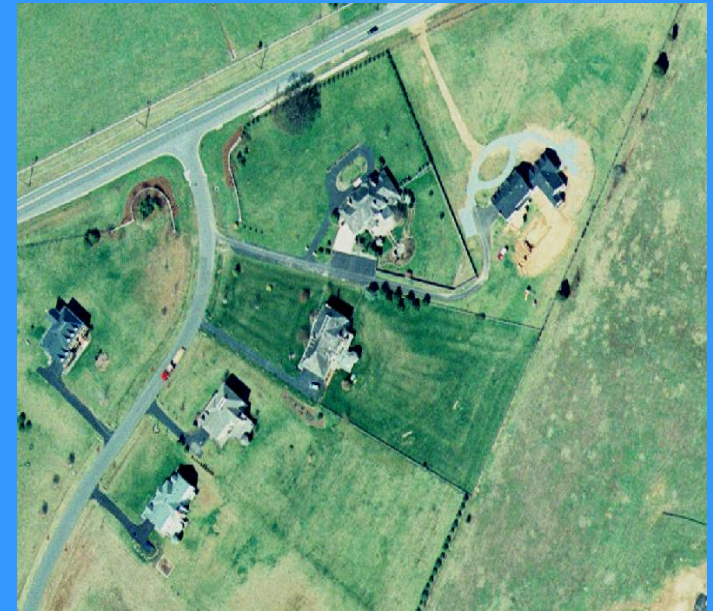
The Clipping Point: Emergence of Turf Cover As a Major Bay Ecosystem

TURF COVER, BAY WATERSHED 2000

Method 1: 3.82 million acres
Method 2: 3.79 million acres

TURF As PERCENT OF BAY LAND AREA

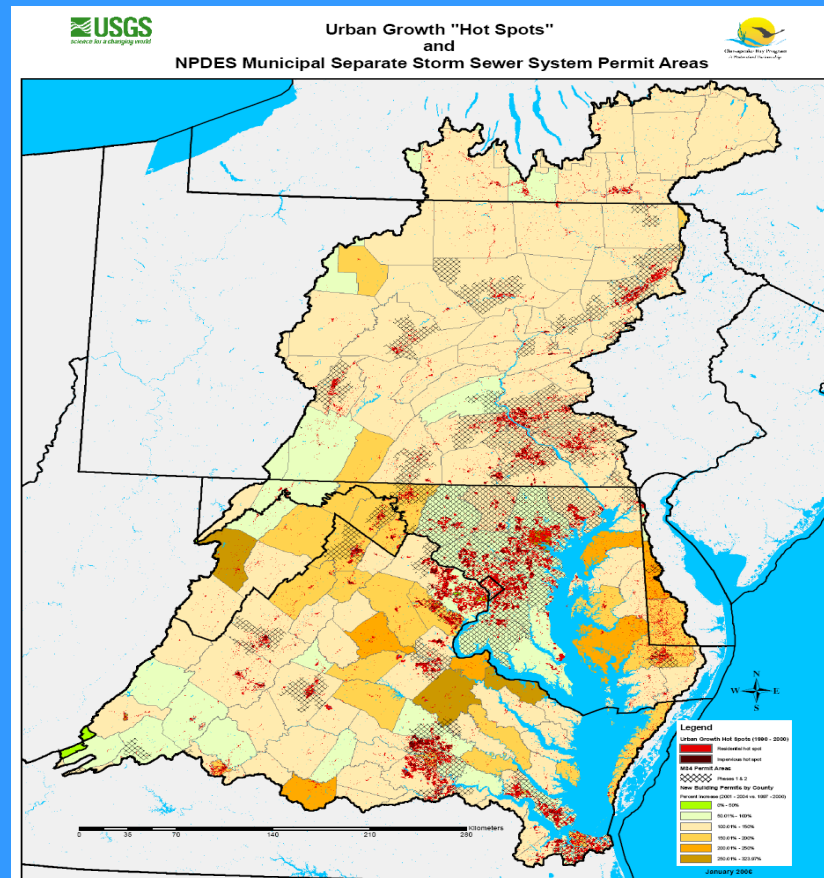
Method 1: 9.5%
Method 2: 9.5%



COMPARISON TO OTHER BAY LAND USES

Row Crops:	9.2% of watershed
Pasture:	7.7%
Hay and Alfalfa:	7.4%
Wetlands:	3.8%

First Annual Bay-wide Stormwater Performance Scorecard 2009



Ten Core Implementation Tools Graded

1. Stormwater Permits: Larger Communities
2. Stormwater Permits: Smaller Communities
3. Updated State Stormwater Regulations
4. Updated State Stormwater Manual
5. State Outreach to Localities
6. Public Stormwater Outreach
7. Industrial Stormwater Permits
8. Construction Stormwater Permits
9. Permit Compliance and Enforcement
10. State and Local Stormwater Financing



TABLE 1: BAYWIDE STORMWATER SCORECARD-2009

Core Programs	DC	MD	PA	VA	WV
Large MS4 Permits	A-	C-	-	D	-
Small MS4 Permits	-	F	D	C+	A
Stormwater Regs	I	B+	I	I	B+
Stormwater Manual	I	C-	B	A-	I
MS4 Outreach	B	D	D	B-	B
Public Outreach	A	D+	F	B	I
Industrial Permits	D	D	D-	B-	D
Construction Permits	B+	C-	D+	C-	D
Permit Enforcement	B+	D	D-	D	D-
Local/ State Financing	A-	C-	F	C+	D+
OVERALL GRADE	B+	D+	D	C+	C

NPDES Permitting: The gap between wastewater and stormwater



RUNOFF REDUCTION

Runoff reduction (RR) is defined as the total volume reduced through canopy interception, soil infiltration, evaporation, rainfall harvesting, engineered infiltration, extended filtration or evapotranspiration at small sites



MD Runoff Reduction Spreadsheet

1. Post-Development Project & Land Cover Information					
Constants					
Annual Rainfall (inches)	43				
Target Rainfall Event (inches)	1.00				
Phosphorus EMC (mg/L)	0.28				
Target Phosphorus Load (lb/acre/yr)	0.28				
Pj	0.90				
Land Cover (acres)					
	A soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space -- undisturbed, protected forest/open space or	0.0	2.0	4.0		6.0
Managed Turf -- disturbed, graded for yards or other turf to be		6.0	14.0		20.0
Impervious Cover (all soil types)	14.0				14.0
				Total	40.0
Rv Coefficients					
	A soils	B Soils	C Soils	D Soils	
Forest/Open Space	0.02	0.03	0.04	0.05	
Managed Turf	0.15	0.20	0.22	0.25	
Impervious Cover	0.95				

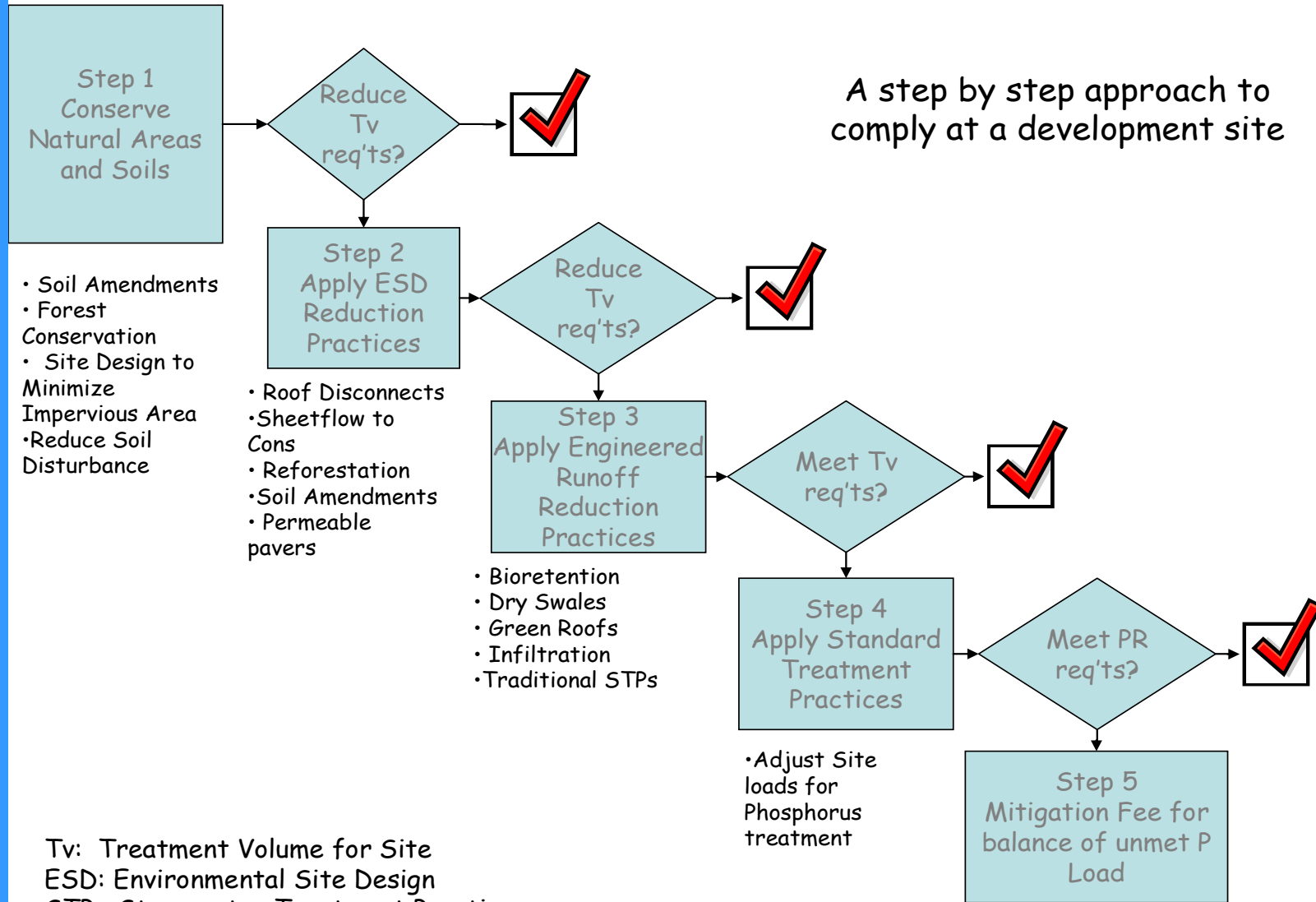
Adapted from VA, but Modified to Conform to MD ESD regs

VA Runoff Reduction Spreadsheet

The VA DCR spreadsheet developed to simplify compliance and has been tested (and revised) on dozens of sites by hundreds of engineers

- ✓ Based on New Science on Runoff Coefficients and Runoff Reduction of Practices
- ✓ Compliance Tool for Early Concepts and Final Design (although individual practice design still required)
- ✓ Excellent Tool for Training and Plan Review
- ✓ Truly Integrates all Practices Together and Rewards a Treatment Train

A step by step approach to comply at a development site



Annual Runoff Reduction Rates (%)

Infiltration	50 to 90
Bioretention	40 to 80
Pervious Pavers	45 to 75
Green Roof	45 to 60
Dry Swale	40 to 60
Rain Tanks/Cisterns	40 +
Roof Disconnection	25 to 50
Grass Channel	15 to 30
Dry ED Pond	0 to 15
Wet Pond	0
Sand Filter	0

Source: CWP and CSN (2008)

BIORETENTION DESIGN

LEVEL 1 DESIGN

$$TV = (R_v)(A)$$

Filter media at least 24" deep

One form of accepted pretreatment

At least 75% plant cover

One cell design

Underdrain

LEVEL 2 DESIGN

$$TV = 1.25 (R_v)(A)$$

Filter media at least 36" deep

Two or more forms of accepted pretreatment

At least 90% plant cover, including trees.

Two cell design

Infiltration design or underground stone sump

MD Runoff Reduction Spreadsheet

CSN and CWP expect to release MD version by end of 2009

Will initially calculate ESD treatment volume using MDE woods in good conditions "look up" table.

The spreadsheet then accounts for progressive runoff reduction by different ESD practices from up to five different sub-drainage areas at the site.

Allows plan reviewers that ESD to the MEP has been achieved or not, and quickly test alternative combinations

Also computes curve number reductions for larger storms

Need for New Design Tools


- CSN/CWP released 14 new design specs
- Focus on better design, installation and maintenance

DRAFT BAY-WIDE STORMWATER DESIGN SPECIFICATIONS: BIORETENTION

BIORETENTION DESIGN SPECIFICATION

VERSION 1.0

OPEN FOR COMMENT UNTIL MAY 15, 2008



How You Can Develop a Better Bioretention Design Spec for Use in the Chesapeake Bay


Our goal is to produce a simple standard specification that can boost performance, increase longevity, reduce maintenance burden, and create an attractive amenity – and at the same time drive down the unit cost of treatment. So please give this a careful review, and e-mail your comments to Tom Schueler at watershedguy@hotmail.com, or post comments or upload information at chesapeakestormwater.net. This draft has annotations highlighting key issues and design needs. This draft is open until May 15 2008, when a final draft will be produced based on your comments. Thanks in advance for your participation in this important project.

Bioretention of 2 Chesapeake Stormwater Network 3/15/08 1

SOIL RESTORATION BAY-WIDE DESIGN SPECIFICATION

VERSION 1.0

OPEN FOR COMMENT UNTIL JUNE 1, 2008



How You Can Develop the First Soil Restoration Design Spec in the Chesapeake Bay

Our goal is to produce a simple standard specification that can boost performance, increase longevity, reduce maintenance burden, and create an attractive amenity – and at the same time drive down the unit cost of treatment. So please give this a careful review, and e-mail your comments to Tom Schueler at watershedguy@hotmail.com, or post comments or upload information at chesapeakestormwater.net. This draft has annotations highlighting key issues and design needs. This draft is open until June 5 2008, when a final draft will be produced based on your comments. Thanks in advance for your participation in this important project.

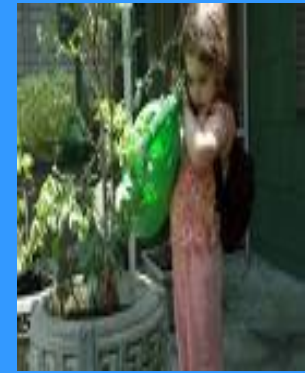
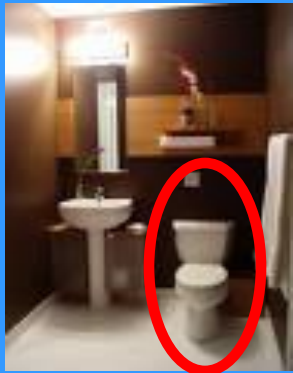
Draft Bay-wide Design Specifications

- Rooftop Disconnection
- Filter Strips
- Grass Channels
- Soil Amendments
- Green Roofs
- Rain Tanks/Rainwater Harvesting
- Permeable Pavement
- Infiltration
- Bioretention
 - Urban Bioretention
- Dry Swales
- Filtering Practices
- Constructed Wetlands
 - Wet Swales
- Wet Ponds
- Extended Detention Ponds

Drafts available at CSN website: www.chesapeakestormwater.net

BAY WIDE DESIGN SPEC NO. 6

RAIN TANKS AND CISTERNS

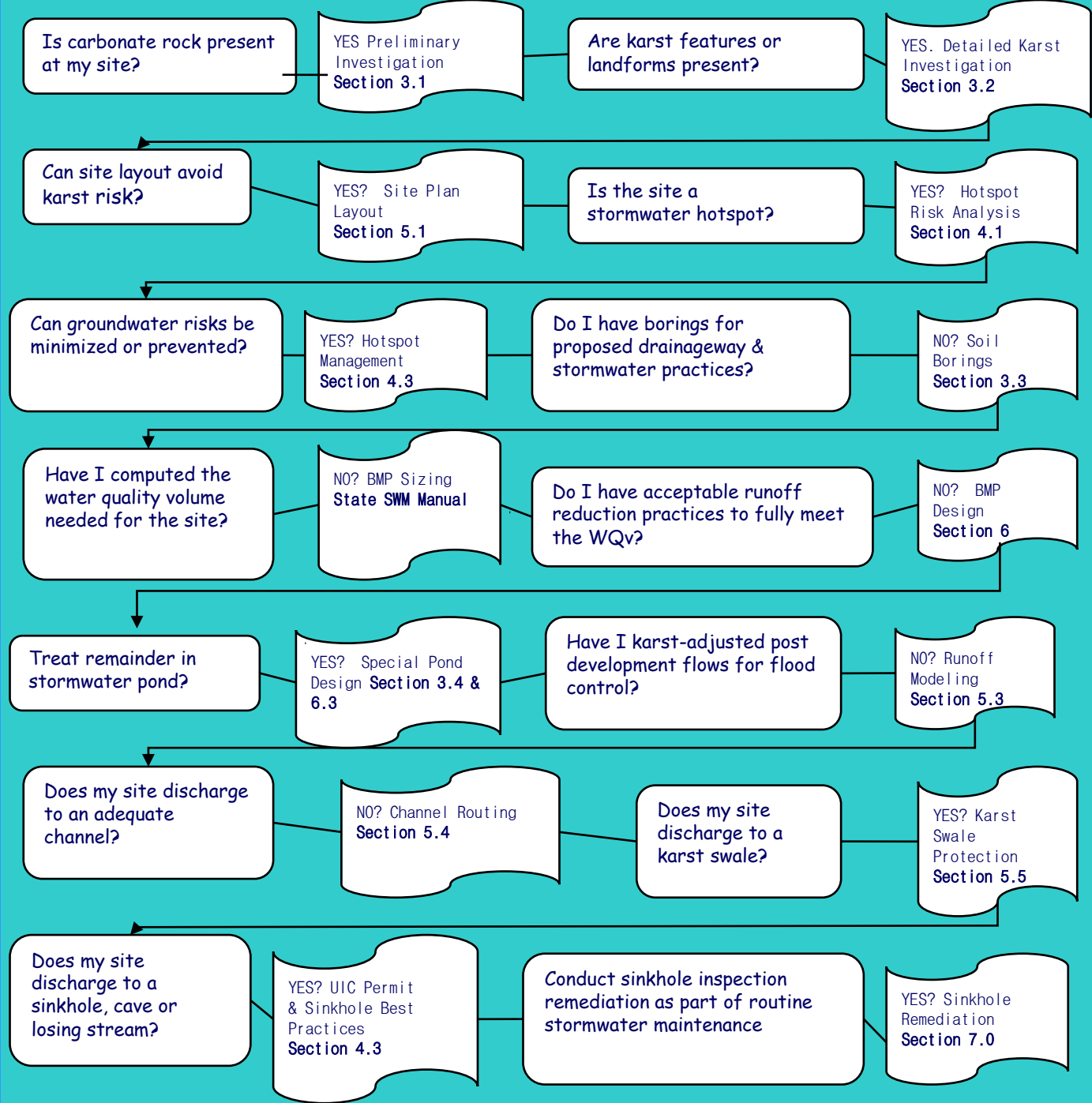


CSN TECHNICAL BULLETIN No. 1



STORMWATER DESIGN GUIDELINES FOR KARST TERRAIN IN THE CHESAPEAKE BAY WATERSHED VERSION 2.0





CSN TECHNICAL BULLETIN No. 2



STORMWATER DESIGN GUIDELINES FOR COASTAL PLAIN TERRAIN IN THE CHESAPEAKE BAY WATERSHED VERSION 2.0



BMP Selection in Coastal Plain

Preferred	Accepted	Discouraged	Prohibited
Constructed Wetland	Sand Filter	Wet ponds	NONE
Shallow Bioretention	Small-scale Infiltration	Dry ED ponds	
Wet Swale	Green Roofs	Grass Channel	
Rain Tanks/Cisterns	Soil Compost Amendments	Large Scale Infiltration	
Shallow Dry Swale			
Roof Disconnection & Filter Strips			
Permeable Pavers			

New and Innovative Sustainable Stormwater Practices for the City

1. Green Roofs
2. Cisterns and Rain Tanks
3. Foundation Planters
4. Permeable Pavers
5. Expanded Tree Pits
6. Regular Bioretention
7. Street Bioretention
8. Soil Restoration
9. Reforestation
10. Sand Filters



Designating Stormwater Hotspots

Future status of development determines how much treatment is required, whether runoff can be infiltrated or what on-site pollution prevention practices are needed



A Lot of Change Going On in the Bay States

STATE	Runoff Reduction	Channel Protection	Status
DC	Reduce Runoff 1 st Inch of Rainfall	No	New Regs New Manual
DE	Reduce Runoff from 2.4 inches of rainfall	YES	New Regs New Manual
MD	Reduce Runoff from 1.0 to 2.4 inches of rainfall	YES	New Regs New Manual?
PA	Reduce Runoff from 1.0 to 2.4 inches of rainfall	YES	2005 Manual
VA	Reduce Runoff from 1.0 to 2.4 inches of rainfall	YES	New Regs New Manual
WV	Reduce runoff from 1st Inch of rainfall	No	New Permit New Manual

Bay-wide Stormwater Training Partnership



- Collaborative Stormwater Training in MD, VA, DC and WV w/ focus on local designers and plan reviewers
- \$500,000 NFWF Grant over next 30 months (+ \$600,000 match)
- MD and DC training coordinated by Chesapeake Stormwater Network
- VA and WV training coordinated by Center for Watershed Protection
- Certificates are awarded for participation (but not certification)

Bay-wide Stormwater Training Partners



- Maryland Assoc. of Floodplain and Stormwater Managers
- American Society of Civil Engineers, Maryland Chapter
- Maryland Association of Soil Conservation Districts
- District of Columbia Dept of Environment
- American Society of Civil Engineers, Virginia Chapter
- Virginia Assoc. of Soil & Water Conservation Districts
- Virginia Department of Conservation Resources
- West Virginia Department of Environmental Protection

Piggyback training, resources, and MSEs



Three Levels of Training for Designers and Plan Reviewers

Basic: Participate in several webcasts on new regulations and practices

Advanced: One-day design charrette to apply new tools to real world development and redevelopment sites

Master: Two day training session on special topics and teaching others

Other CSN Priorities in 2010



- Create MS4 Stormwater Managers Exchange
- Technical Bulletins for Stormwater Design in Trout Waters and Ultra-urban Watersheds
- Technical Assistance for MD Critical Area Commission Staff on Stormwater Compliance
- Second Annual Bay-wide Stormwater Partners Retreat and Bay-wide Stormwater Institute
- Stormwater Research Updates

Master Stormwater Engineers



- Up-front two day voluntary training commitment
- Get paid \$1,500 for each local design training workshops
- Be eligible to be paid as a local stormwater circuit rider
- Become a Jedi-master to use the force in your own empire
- Marketing and professional development

Webcast Topics



- Implementing Your State's Stormwater Regs
- Utilizing the Runoff Reduction Spreadsheet
- Design of Innovative Practices
 - Bioretention
 - Rainwater harvesting
 - Permeable paver
 - Rooftop disconnections/soil amendments
 - Others
- Stormwater Design for Special Terrain and Receiving Waters
- Construction Inspection and Maintenance
- OTHER TOPICS DEPENDING ON INPUT/SURVEY



Work Between Now and the End of 2009

- Baseline Survey of Current Design and Review Practices
- Training Needs and Preference Survey
- Initial Class of Master Stormwater Engineers (10 in MD)
- Coordination with States and Professional Societies
- On-line training calendar and registration system

Training During 2010 and 2011



- 10 stormwater webcasts
- 60 one-day stormwater design charettes to teach new methods
- 4 intensive workshops to create 40 master stormwater engineer trainers
- 500 hours of direct on-site technical assistance to requesting local governments
- 20 self-guided, web-based stormwater training modules

Questions ?

