2014 DEQ Environmental Excellence Conference

Track 6: Sustainable Stormwater Management

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Center for Watershed Protection

- Non-profit 501(c)3, non-advocacy organization founded in 1992
- Work with watershed groups, local, state and federal governments
- Provide tools to communities to protect lakes, rivers, streams, and estuaries
- 20 staff in Ellicott City, MD; Field Offices in Charlottesville, VA & Ithaca, NY

www.cwp.org

Overview

- Sustainable Stormwater Practices?
  - Bioretention & It's Cousins
  - Stormwater Wetlands
  - Rainwater Harvesting

Virginia is for Lovers®

BMP

djh@cwp.org

Virginia BMP Clearinghouse

Non-Proprietary BMPs - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.vwrrc.vt.edu/swc/NonProprietaryBMPs.html

Most Visited Getting Started Latest Headlines Rivanna River Basin C...

Non-Proprietary BMPs

Virginia Stormwater BMP Clearinghouse

Search Web site for

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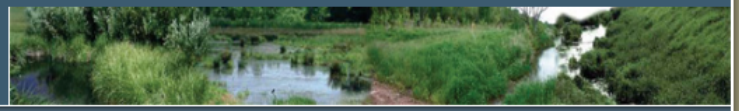


Home Standards & Specs Post-Construction BMP's Non-Proprietary BMPs

Non-Proprietary BMPs

Since the early 1980's, land developers, particularly in fast-growing regions of the United States, have been required by states and municipalities to manage the stormwater runoff from their development sites. Stormwater management has aimed at several specific goals: protecting the biological and physical integrity of stream channels downstream from development sites; protecting from frequent, localized flooding resulting from increased runoff volumes from the new impervious surfaces; and removing pollutants from the site runoff. Other goals that have been added over the years are mimicking the rate of groundwater recharge that existed prior to development, and protecting streams and properties from extreme flood damage.

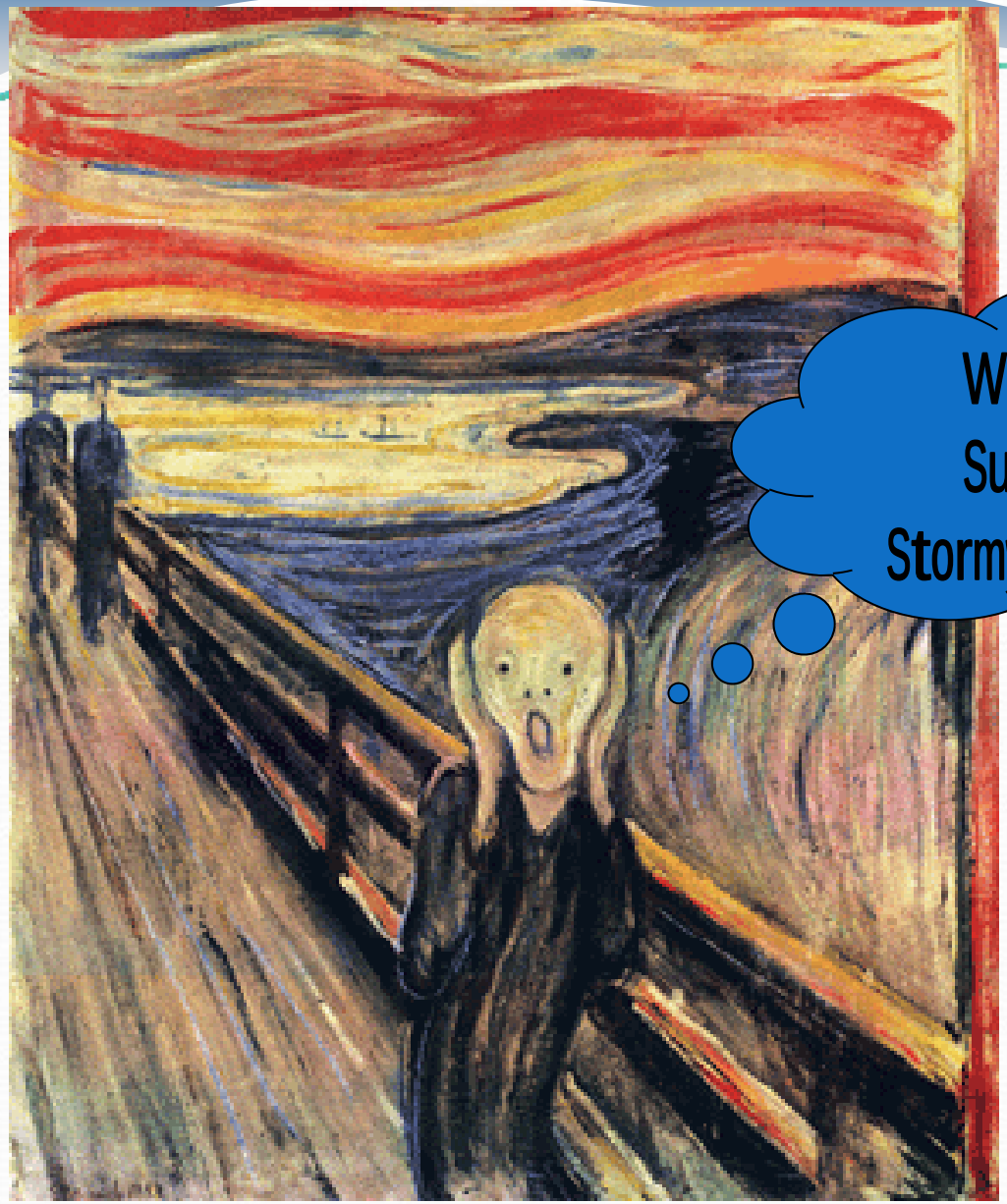
15 Design Specifications

been filtering practices such as grass filter strips and channels, infiltration practices such as dry wells and infiltration trenches, permeable pavement, and impoundment practices, such as wet and dry ponds and constructed wetlands. These earlier practices were largely aimed at *controlling* the volume and discharge of runoff from the site, as well as *providing treatment* for the pollutants in the runoff.

In the last decade, a new type of BMP evolved, aimed at reducing the volume of stormwater runoff leaving the

Done

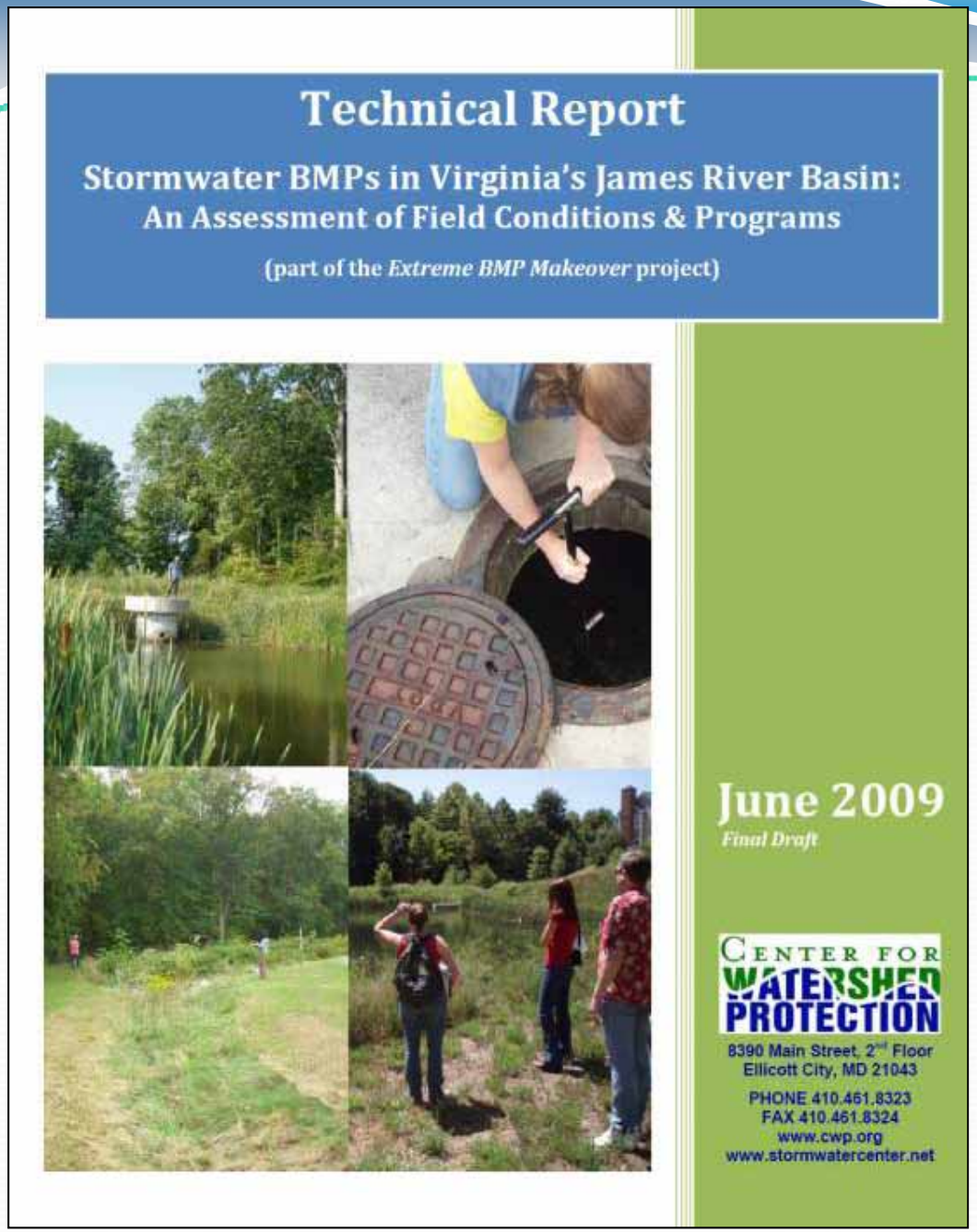
Start Intel(R) PROSet/Wireless 1-Day BMP Workshops Presentations NN 01-20-11 IntroCBST... Session 2A RR Theory ... Stormwater_Team_Kick... Non-Proprietary BMP... 2:47 PM



What Is A Sustainable Stormwater BMP?

It’s Sustainable

Sustainable!
NOT Sustainable!



- Design
- Installation
- Maintenance

1. Bioretention & Its Cousins

Bioretention

Water Quality or Dry Swale

Urban Bioretention

Residential Rain Garden

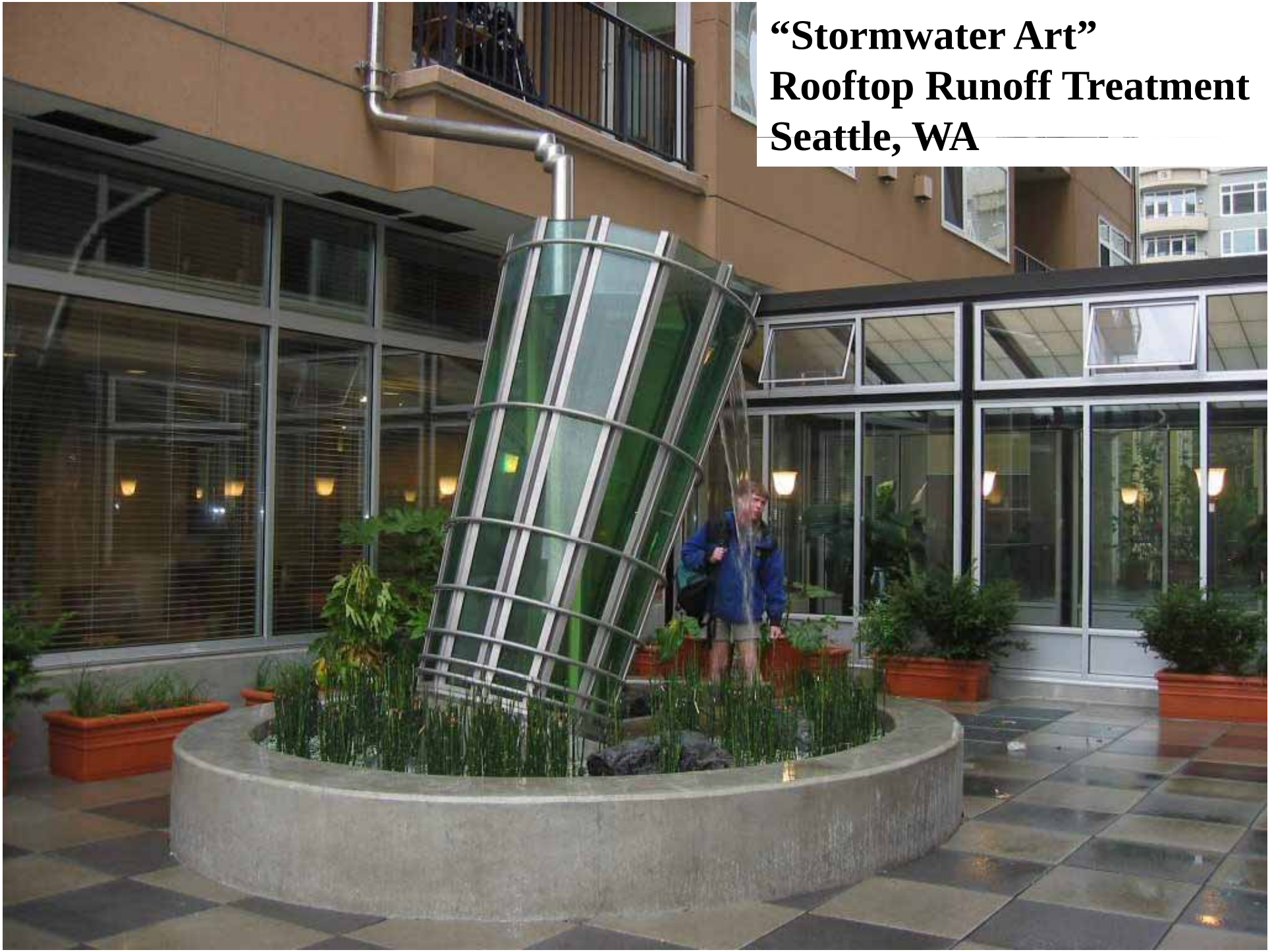
Sustainable!

Bioretention Performance Credit

State	Level 1	Level 2
DC	60% of Storage Volume Provided	100% of Storage Volume Provided
DE	50% of Retention Storage	100% of Retention Storage
MD	Treat Target Rainfall to meet ESD standards	
NY	Volume Reduction = 100% of Retention Storage	
VA	Volume Reduction = 40% TP Reduction = 25% Total Load Reduction = 55%	Volume Reduction = 80% TP Reduction = 50% Total Load Reduction = 90%
WV	60% for Design Volume Provided	100% for Design Volume Provided

Flexibility – Site Conditions

Retrofits



“Stormwater Art”
Rooftop Runoff Treatment
Seattle, WA

Construction Process

Photo Courtesy: James Madison University

NOT
Sustainable!

Nice Practice – No Water Treated

Vegetation Management: The Internet Photo

Several Years Later

Construction!

Bioretention & It's Cousins: Best Practices

- Integrate aesthetically with site: visibility, public exposure
- Smaller drainage areas, multiple practices
- Tight control on construction/installation
- ID desired vegetated condition on original site plan & maintenance docs
- Regular inspection of inlets, vegetation, etc.

2. Stormwater Wetlands

Wetland Basin

Multi-Cell or Pond/Wetland

Subsurface Gravel Wetland

Linear Wet Swale

Sustainable!

Constructed Wetland Performance Credit

State	Level 1	Level 2
DC	10% of Storage Volume Provided	
DE	0% Runoff Reduction TN = 30% TP = 40% TSS = 80%	
MD	Treat Target Rainfall to meet ESD standards	
NY	Can be used for channel & flood protection	
VA	Runoff Reduction = 0% TP Reduction = 50%	Runoff Reduction = 0% TP Reduction = 75%
WV	0% Runoff Reduction, but can be used for larger storms, TMDLs	

NOTE: Many states do NOT have Level 1 and 2 designs because constructed wetlands are not considered a runoff reduction practice for volume reduction criteria.

Key Principle: Runoff Reduction Upstream From Constructed Wetland

Adjustable Weir/Flashboard

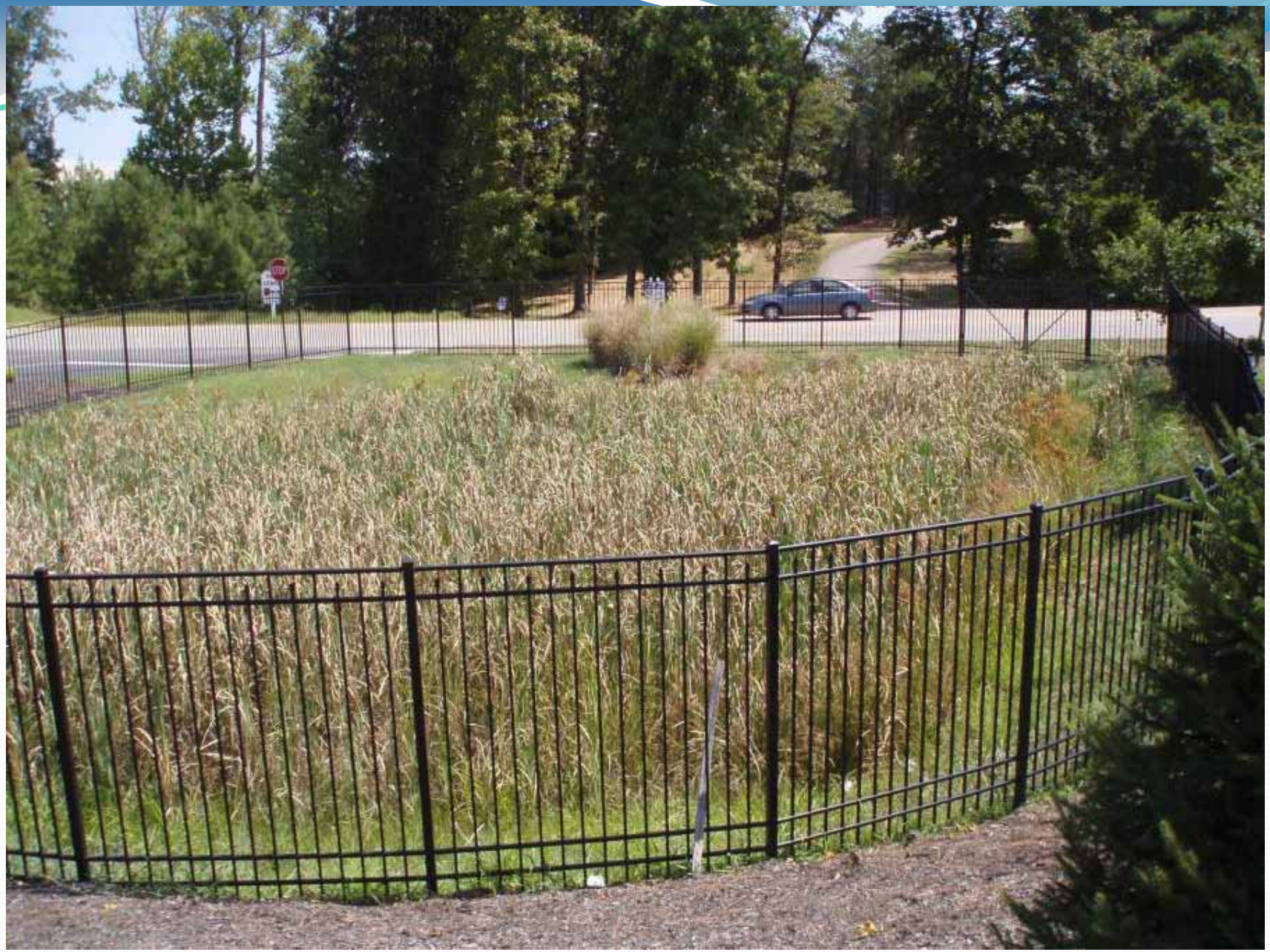
Multiple Cells: forebay, wetland cells

From: Triangle Park Stormwater Treatment Wet Swale, Town of Rising Sun, MD

NOT
Sustainable!

Wetland Without the “Wet”

INVASIVES!



Access for Maintenance

Are YOUR inspectors this adventurous?

Stormwater Wetlands: Best Practices

- Part of Treatment Train with upstream Runoff Reduction Practices
- Accessible, visible
- Multiple cells, different depth zones
- Retrofit of old detention ponds
- Aggressive invasives management (15%)

3. Rainwater Harvesting

Sustainable!

It’s Sustainable

Rainwater Harvesting Performance Credit

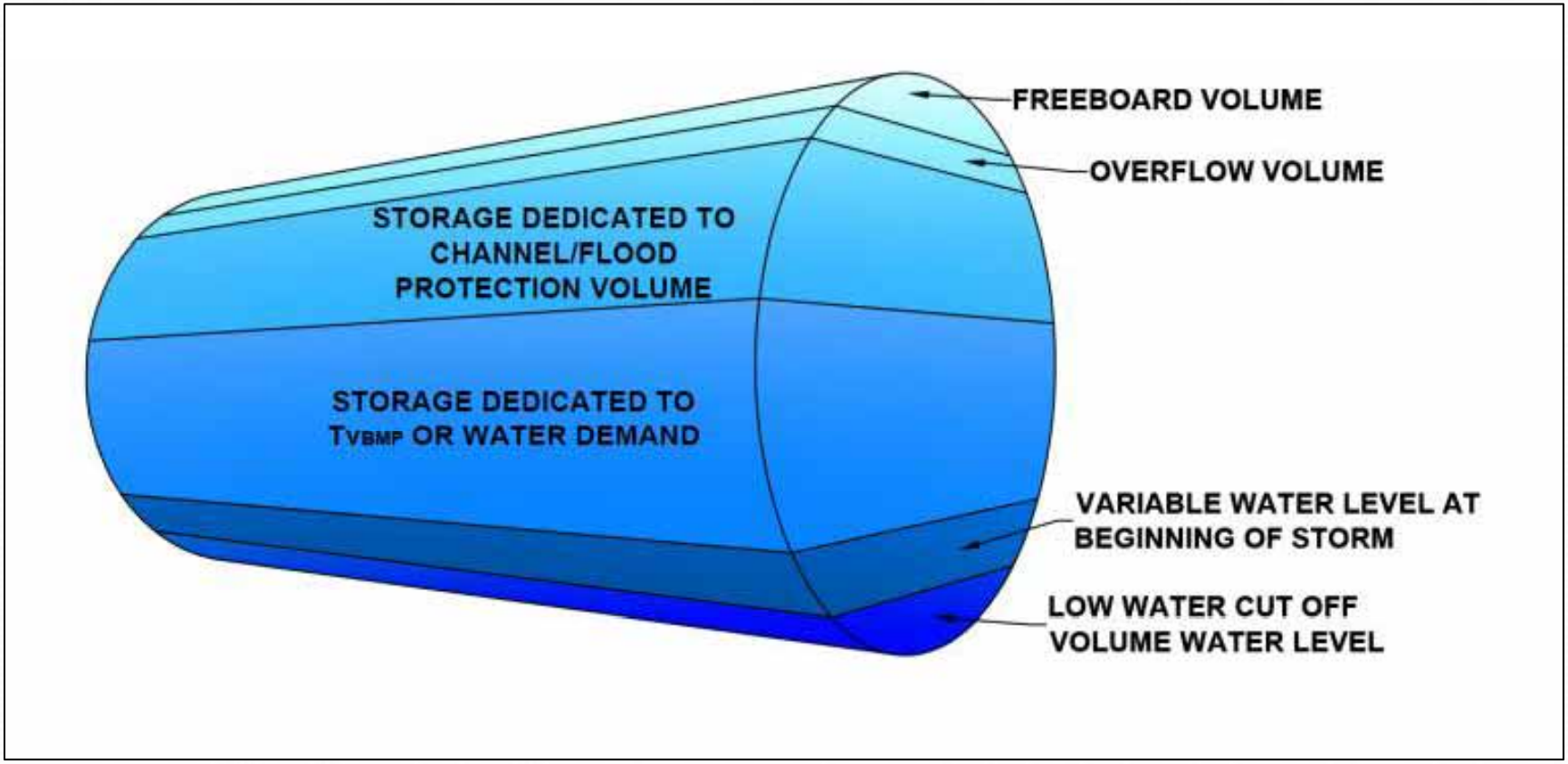
State	Performance	
DC	Volume reduction = Based on cistern storage volume & usage	
DE	*Seasonal Use:*	*Continuous Use:*
	Vol. Red. = 50% of Retention Storage TP/TN/TSS Reduction = 100% of Load	Vol. Red. = 75% of Retention Storage TP/TN/TSS Reduction = 100% of Load
MD	RCN Reduction = Based on cistern storage volume & usage Pollutant Reduction = Based on volume reduction	
PA	Volume Reduction = Based on cistern storage volume & usage TSS/TP/NO_3 = Based on volume reduction	
VA	Volume Reduction = up to 90%, based on cistern storage volume & usage TP Reduction = up to 90%, based on volume reduction	
WV	Volume Reduction = up to 100%, based on cistern storage volume & usage TP/TN/TSS Reduction = up to 100%, based on volume reduction	

Multiple Benefits

- Replace potable water supply
- Energy
- Space efficiency
- Beneficial use of water
- Green buildings

1 2 3 4 5 6

Flexibility in Tank Design



Source: VA BMP Specification No. 6

Figure adapted from Alex Foraste, 2009

NOT
Sustainable!

Complicated Systems

Need Year-Round Use

Laundry washing

Vehicle washing

Toilet flushing

Maintenance

- Inspect tank for sediment build-up
- Clear branches over-hanging roof
- Check integrity of backflow preventer
- Replace damaged system components

Rainwater Harvesting: Best Practices

- Year-round, consistent use, supplemented by seasonal: vehicle/surface washing, laundry,
- Slow release for non-irrigation months
- Automated back-up supply (e.g., municipal)
- Right-sized, hard-working tank
- High land values, replace other BMPs that use land (largest economic driver)
- LEED
- Some stress on municipal water supply or groundwater
- Don't expect saving on water bill to be economic driver (pay back period 25-92 years)

Other Practices: Non-Structural

- **Impervious Disconnection**

- **Sheet Flow to Conservation Area**

Sustainable Stormwater Practice?

- Bioretention & It's Cousins
- Stormwater Wetlands
- Rainwater Harvesting
- Non-Structural
- Others?