Perfecting our Legacy Ponds

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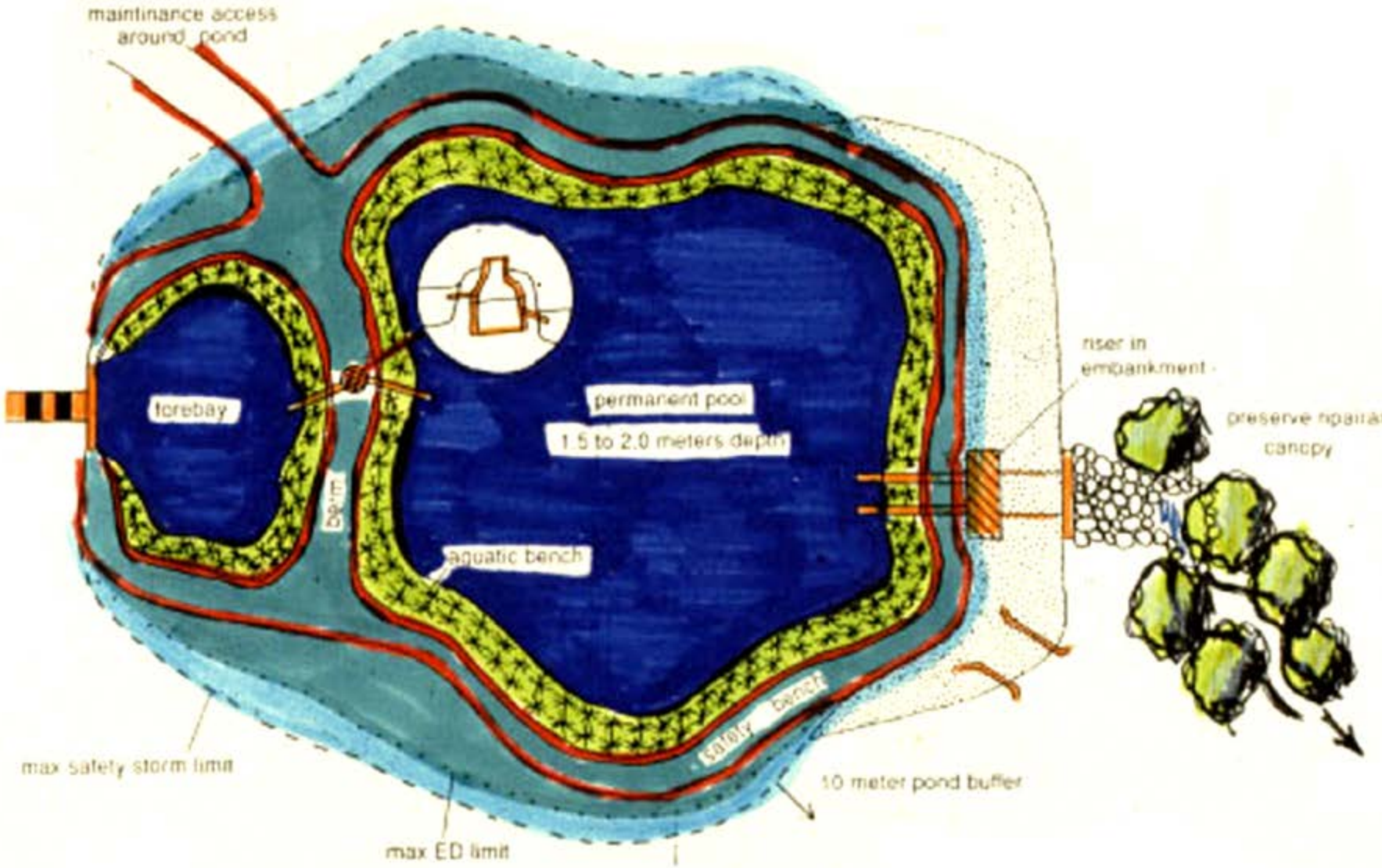
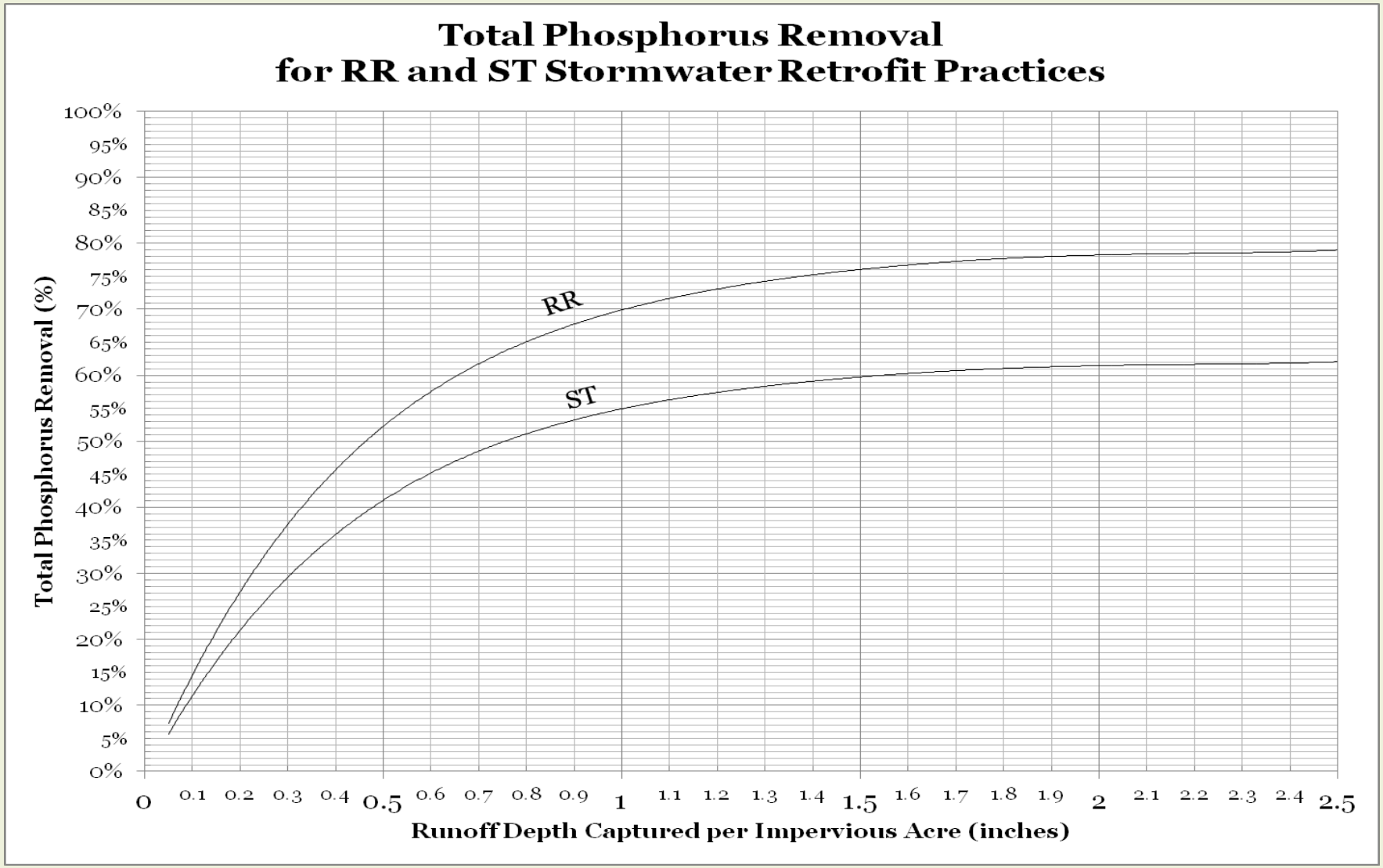
Chesapeake Stormwater Network

Key Topics

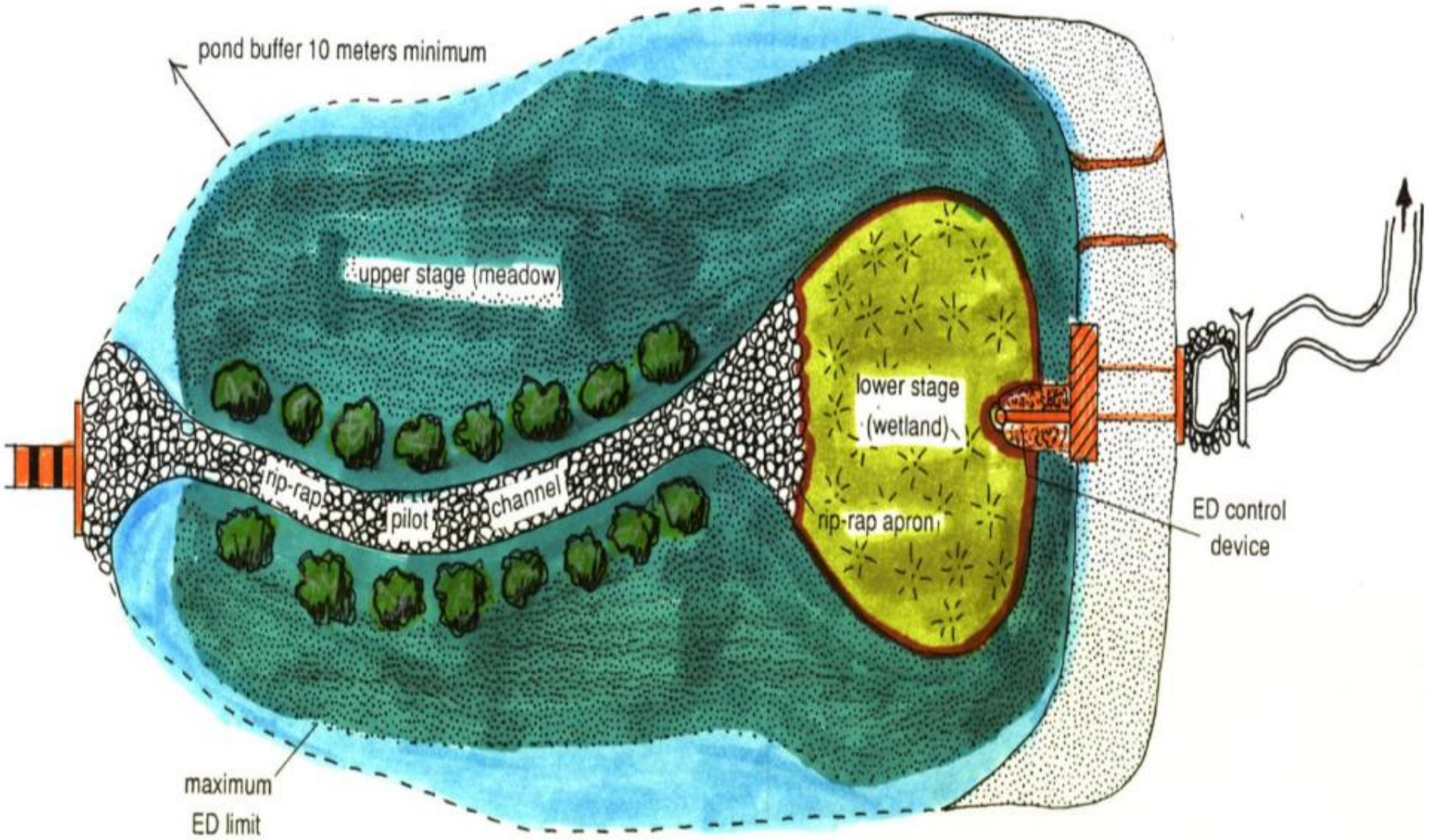
- Basic Pond Pollutant Removal Crediting
- Some New Pond Crediting Proposals
- CSN Pond Protocol
- Strategies for Enhancing Pond Performance

Wet Stormwater Pond




Total Phosphorus Removal
for RR and ST Stormwater Retrofit Practices
Total Phosphorus Removal (%)
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
RR
ST
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4
2.5
Runoff Depth Captured per Impervious Acre (inches)

Dry Stormwater Pond



No Curves for Dry and Dry ED Ponds

- Dry Ponds: TN: 5% TP and TSS: 10%
- Dry ED Ponds: TN and TP: 20% TSS=60%

- These are the CBP-Approved Rates that apply

Process for Crediting New BMPs

- Urban Stormwater Work Group
- Expert Panels
- Threshold Reviews
- BMP Decision Requests – mapping it into existing BMP
- Monitoring data and engineering models

Some Recent Pond Crediting Proposals

- Self-Converting Dry Ponds (m)
- Floating Treatment Wetlands *
- Continuous Monitoring and Adaptive Control (CMAC) *
- Dry Pond Sand Filter Retrofits (m)
- Dry Channel Regenerative Conveyance *
- Runoff Reduction and Prevented Downstream Bank Erosion (m)

Vegetative Conversion

Source KCI

Vegetative Conversion

Pond Management Choices for "Self Conversion"

1. Require return to original landscaping objective
2. Allow Self-Conversion but:
   - Continue to mow embankment and maintenance access
   - Expect increased frequency of FAIL due to clogged low flow pipes, WQV loss, or severe debris deposits at outlets

Design Enhancement: Floating Treatment Wetland in Existing Wet Ponds

Pollutant	Raft Coverage in Pond				
	10%	**20%**	**30%**	**40%**	**50%**
TN	0.8%	1.7%	2.5%	3.3%	4.1%
TP	1.6%	3.3%	4.9%	6.5%	8.0%
TSS	2.3%	4.7%	7.0%	9.2%	11.5%

Use of Regenerative Stormwater Conveyance Retrofits at Outfalls

- Dry RSC practices can be used to solve gully erosion problems and serve as a retrofit below stormwater pipe and pond outfalls stormwater runoff
- Use runoff storage and the “RR” curve to determine removal rates

Cabin Branch RSC project

Evaluating Pond Performance

A Simple Protocol for Ranking Pond Performance Based on Field Inspections

Goals of the Pond Protocol

- Rapidly evaluate the function of stormwater ponds
- Use of rapid visual indicators to assess dam safety and water quality functions for wet and dry ponds
- Establish numeric criteria to trigger critical pond repairs
- Make cost-effective choices on how to manage your inventory of legacy stormwater ponds to optimize nutrient reduction and maintain dam safety

Water Quality “Fails”

- Loss of WQ Volume
- Pond Short-Circuiting
- High Pool Elevations
- Low Pool Elevations
- Geologic Sinkholes
- Upstream Channel Erosion
- Vegetative Conversion
- Invasive Species Domination
- Pond Failure/Breach
- Hyper-trophic Conditions
- Downstream Channel Erosion

Indicators/Triggers/Remedies

Geologic Sinkhole in Wet Pond

Back Side of Burrow Fail

Pond Pollutant Removal Performance Levels Based on Field Inspections

Code	Performance Level	Nutrient Removal (%)	
		TP	TN
NP	Non-Performing Ponds	0	0
UP	Under-Performing Ponds	20	10
P	Performing Ponds	55	35
OP	Over-Performing Ponds	56 to ~70 [1]	36 to ~50 [1]

[1] *variable rate depending on the nature of the pond retrofit enhancement*

Defining Factors for Non-Performing Ponds	
Code	**Pond Types**
NP	• **Any Pond with a DS FAIL[1]** • **Dry Pond** • **Dry ED Pond w/ one WQ FAIL[1]** • **Wet Pond w/ two WQ FAIL[1]**

DS: Dam Safety
WQ: Water Quality
ED: Extended Detention
[1] *Based on Field Inspections Using the WQ and DS Visual Indicators*

Defining Factors for Under-Performing Ponds	
Code	**Pond Types**
UP	• **Dry ED Pond** • **Wet Pond w/ one WQ FAIL** • **Self Converted Dry Pond**
WQ: Water Quality ED: Extended Detention	

Defining Factors for Performing Ponds	
Code	**Pond Types**
P	• **Wet Pond PASS** • **Wet ED Pond PASS** • **Dry Pond Conversion to ST Retrofit (wet or filter)**
ED: Extended Detention ST: Stormwater Treatment	

Defining Factors for Over-Performing Ponds	
Code	**Pond Types**
OP	• **Dry Pond Conversion to RR Retrofit** • **Enhanced Wet Pond Retrofit** o **Floating Treatment Wetland** o **Smart ED Above Pool** o **Others as Approved**
ED: Extended Detention RR: Runoff Reduction	

Techniques to Restore or Increase **Dry Pond** Performance

Technique	*Applies to:*
Dam Safety Remediation	NP to P
Dry Pond Conversion to ST	UP or NP to P
Dry Pond Conversion to RR	UP pr NP to OP
"Smart" Dry Pond Retrofit	UP to P
Pond Repairs to get to PASS	UP or NP to P
Upstream/Downstream Channel Protection	UP to P
Allow Self-Conversion *	NP to UP
* no additional credit offered at this time	

Techniques to Restore or Increase **Wet Pond** Performance

Technique	*Applies to:*
Dam Safety Remediation	NP to P
Major Sediment Cleanout	UP or NP to P
Retrofit: Increase WQv	UP to P or OP
Floating Treatment Wetland	P to OP
Retrofit to Increase Residence Time	NP to P
Upstream/ Downstream Channel Protection	UP to P
Aquatic Management Practices	UP to P
Pond Repairs to go to PASS	UP or NP to P

Questions and Answers