



# Delaware's Afforestation SW BMP Standard & Specification

CBP Urban Stormwater Work Group Meeting  
October 20, 2020

# A Little History

1970 to 1989: ESC  
& SWM Varied by  
Jurisdiction



1991:  
Combined  
ESC/SWM Law  
& Regulation  
(80% TSS Std)



1989:  
First State-Wide  
ESC Law &  
Regulation

# A Little History





# A Little History



## **Conservation Design for Stormwater Management**

**A Design Approach  
To Reduce Stormwater  
Impacts from Land Development  
and  
Achieve Multiple Objectives  
Related to Land Use**

A Joint Effort Between the Delaware  
Department of Natural Resources and  
Environmental Control  
and  
The Environmental Management Center  
of the  
Brandywine Conservancy

September, 1997





# A Little History

## **GREEN TECHNOLOGY: THE DELAWARE URBAN RUNOFF MANAGEMENT APPROACH**

**STANDARDS, SPECIFICATIONS AND DETAILS FOR GREEN  
TECHNOLOGY BMPs TO MINIMIZE STORMWATER IMPACTS  
FROM LAND DEVELOPMENT**

William C. Lucas  
INTEGRATED LAND MANAGEMENT, INC.

Prepared For  
Delaware Department of Natural Resources  
And Environmental Control  
Division of Soil And Water Conservation

JUNE 2005



# A Little History



## **Governor Minner's Task Force on Surface Water Management**

April 1, 2005

A report in response to Executive Order No. 62

# A Little History

## Regulatory and legal recommendations

*Recommendation #9 (approved 3/17/05).*

*State regulations should be updated to establish performance standards for sediment and stormwater practices, operations and maintenance, and appropriate bonding.*

Design and engineering standards at the State level should be strengthened through a revision to the Sediment and Stormwater Regulations. Minimum standards should address **volume management**, conveyance adequacy, pollutant loadings, floodplain management, strict standards for operation and maintenance of structures and management areas.

*- Gov. Minner's Task Force on Surface Water Management (2005)*

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2014:  
Runoff  
Reduction Stds  
Introduced into  
DSSR



# A Little History



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# A Little History





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# A Little History

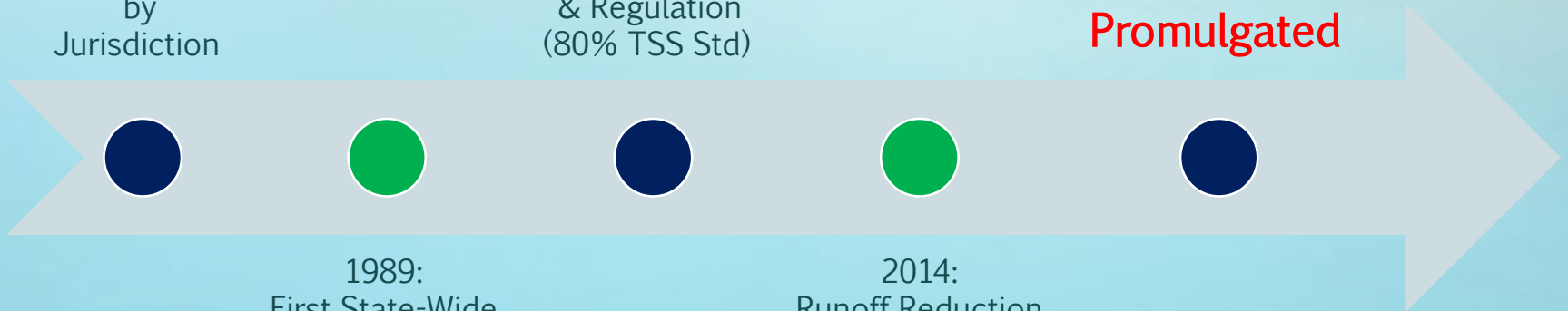
1970 to  
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1991:  
Combined  
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**2019:  
Revised DSSR  
Promulgated**

1989:  
First State-Wide  
ESC Law &  
Regulation

2014:  
Runoff Reduction  
Std Introduced  
into DSSR



# Delaware Post Construction Stormwater BMP Standards & Specifications

**FEBRUARY 2019**



# Post-Construction Stormwater BMP Standards & Specifications

1. Infiltration
2. Bioretention
3. Permeable Pavement
4. Vegetated Roofs
5. Rainwater Harvesting
6. Restoration Practices
7. Rooftop Disconnection
8. Vegetated Channels
9. Sheet Flow to Vegetated Filter Strip or Vegetated Open Space
10. Detention Practices
11. Filtering Systems
12. Constructed Wetlands
13. Wet Ponds
14. Soil Amendments
15. Proprietary Practices
16. Source Controls
- 17. Afforestation**



# What's a Forest?

"Forest" means a biological community dominated by trees and other woody plants covering a land area of one contiguous acre or greater, and that have **at least 100 trees per acre with at least 50% of those trees having a two inch or greater diameter at 4.5 feet above the ground and larger.** Forest does not include orchards or other stands of trees having a curve number equivalent to "woods-grass combination". To determine whether a site meets the definition of a forest at the baseline condition of 2017, the Department or its authorized Delegated Agency may use data from various sources, including but not limited to Land Use/Land Cover data, historic and recent aerial photography, field collected data, etc.

*-Delaware Sediment & Stormwater Regulations, 2019*

# Afforestation - Variants



- Afforestation
- Urban Tree Planting

# Afforestation – SWM Credit

- SWM credit based on runoff reduction from open space (good) condition to wooded (good) condition.
- Credit varies depending on Hydrologic Soil Group (HSG)

$$RR_{\text{HSG A}} = 0.114996 * A * 43560 / 12$$

$$RR_{\text{HSG B}} = 0.144648 * A * 43560 / 12$$

$$RR_{\text{HSG C}} = 0.142903 * A * 43560 / 12$$

$$RR_{\text{HSG D}} = 0.131697 * A * 43560 / 12$$

Where:

RR = runoff reduction credit (cf)

A = area (ac)

- Urban Tree Planting
  - Rpv credit equivalent to 1/200 acre per tree planted



# Engineers' Idea of a Forest





# Afforestation – Design Criteria

- Minimum 10,000 square feet with minimum width of 50 feet
- Upland areas only
- Planting plan must include a minimum of 5 species selected by appropriate region
  - Piedmont
  - Coastal Plain
- Seedlings acceptable
- After 2 years: 200 live plants 6 inches or higher

# Afforestation - Maintenance

Frequency	Maintenance Items
During establishment, Year 1	<ul style="list-style-type: none"> <li>• Conduct weed and invasive plant control prior to planting</li> <li>• Mow once during first year; twice second year</li> <li>• Assess monthly for watering need during growing season</li> <li>• Assess survivability during September 1 – September 30</li> <li>• Perform reinforcement planting the following Spring if survival rate falls below 65%</li> </ul>
Year 2	<ul style="list-style-type: none"> <li>• Mow twice to control weeds and competing undergrowth</li> <li>• Assess to determine if target 200 live trees per acre 6" or higher has been achieved</li> <li>• Perform reinforcement planting the following Spring if target has not been met</li> </ul>
Annually, after Year 2	<ul style="list-style-type: none"> <li>• Mow as needed to control weeds and competing undergrowth</li> <li>• Control invasive plants using appropriate methods</li> </ul>
Year 7	<ul style="list-style-type: none"> <li>• Assess to determine if target 100 trees per acre with 50% having 2" DBH has been achieved</li> <li>• If target has not been met, use adaptive management techniques to maximize survivability of existing trees and add reinforcement plantings as needed</li> </ul>
Year 15	<ul style="list-style-type: none"> <li>• Assess to determine if target 100 trees per acre with 2" DBH has been achieved</li> <li>• If target has not been met, re-evaluate afforestation plan and adjust as needed</li> </ul>



# Where do we go from here?

- Working with DNREC/DPR to explore the efficacy of “natural afforestation”
  - Piedmont site
  - Coastal Plain site
- Sussex County currently developing a program under the Offset District provisions of the 2019 DSSR
  - Afforestation anticipated to be a major component

A serene landscape photograph featuring a calm lake in the foreground, reflecting the surrounding environment. In the background, there are rolling mountains and hills, some of which are shrouded in a thick mist or fog. The sky is a pale, hazy blue. The overall color palette is soft and muted, with various shades of blue, green, and grey. The word "Questions?" is superimposed in the center of the image in a dark, serif font.

Questions?