

DNR Storm Water Program Updates

Topics

- Technical Standards
- Guidance Documents
- MS4
- Other Stuff

Tech Standards

- Urban Soil Health
- Sand Filter
- Dry Pond
- Enhanced Phosphorus (Alum)
- Soil Loss and Sediment Discharge
- Underground Detention Systems

URBAN SOIL HEALTH AS A STORMWATER QUALITY MANAGEMENT PRACTICE

WHY AN URBAN HEALTHY SOILS PROJECT?

- Urban/suburban soils are often highly impacted from historical uses and past land development techniques, which negatively impacts stormwater management.
- The complexity and variation in urban/suburban landscapes can limit the use of traditional and conventional stormwater treatment strategies and options.
- Healthy soils are an important component of high-functioning ecosystems, including in urban/suburban areas, and healthy soils can provide another stormwater strategy and option towards achieving broader water management goals and additional co-benefits.
- Use and adoption of an urban healthy soils strategy is currently limited by lack of knowledge, information, experiences, technical guidance, and current conditions, which can lead to a perception that healthy soils are not a viable option because it does not work, is too costly or would be difficult to maintain.

WHAT ARE THE ANTICIPATED OUTCOMES OF THE PROJECT?

- Compilation of recent research, science and practical expertise that can be used to develop a technical standard or urban soil health strategy.
- Preparation for pilot project that implements an urban health soil practice for water quality and other co-benefits.
- Framework/outline for a public education and outreach initiative to improve stakeholder and public awareness.

WHO IS LEADING THE URBAN SOIL HEALTH PROJECT, AND WHEN DOES THE PROJECT BEGIN?

- A Department of Natural Resources and Milwaukee Metropolitan Sewerage District co-lead project that will begin in May 2023 with an anticipated completion date of December 2023.

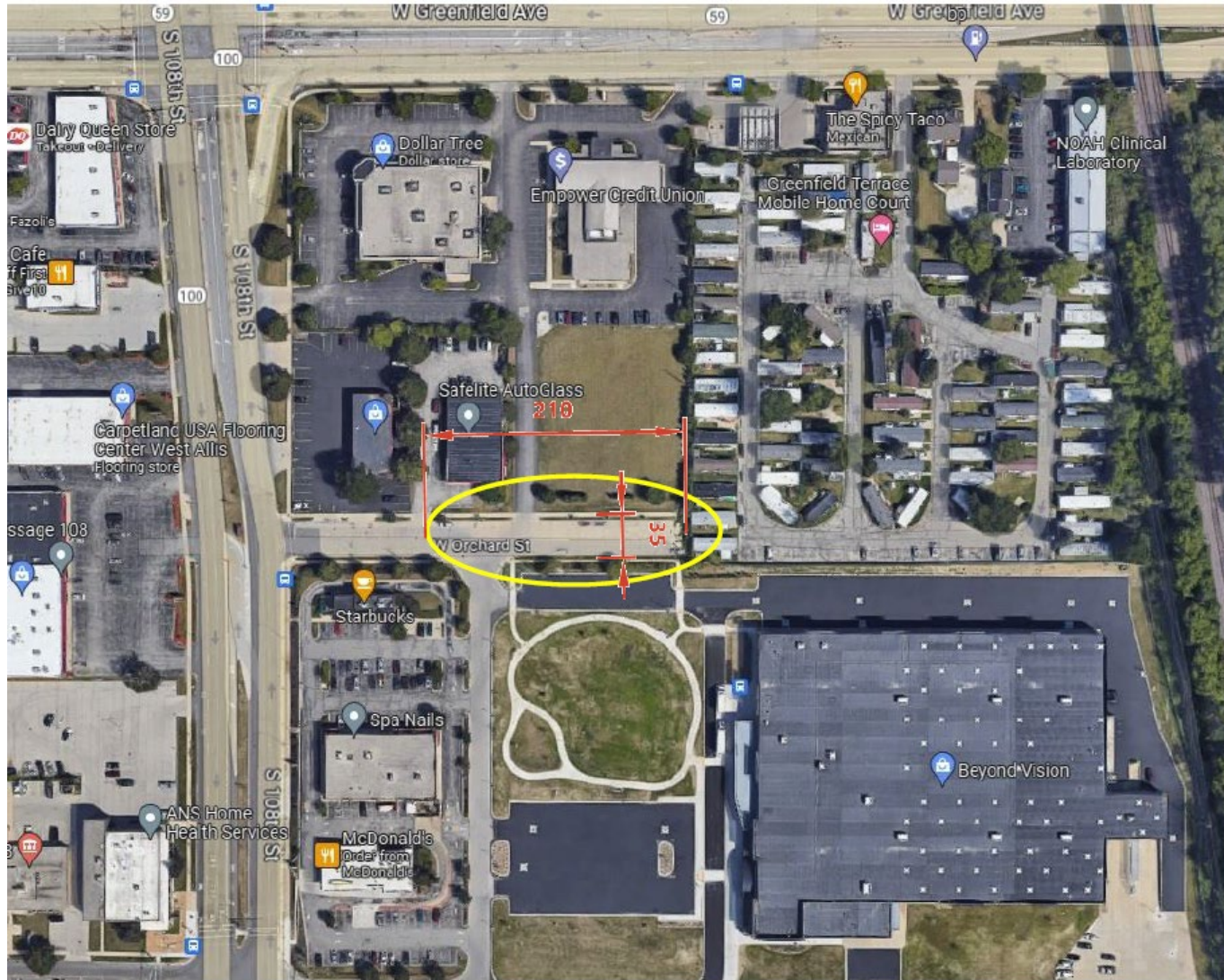
WHAT PROJECT TEAM ROLES ARE NEEDED, WHO SHOULD PARTICIPATE ON THE PROJECT TEAM, AND WHAT IS THE TIME COMMITMENT?

- The project team is looking for individuals or professionals that can serve on the core project team, serve as a technical advisor, or review and validate the deliverables.
- The project team is looking for individuals or professionals with an interest in the promotion and use of a health soils strategy, including the following professionals/individuals
 - Experience with managing soils or landscapes in an urban setting
 - Academia or research institutes with knowledge of soils and related processes
 - Non-governmental organizations or non-profits with experience delivering environmental-focused educational outreach programs and services
 - Governmental organization with experience planning or implementing water quality improvement strategies, approaches, or techniques
 - Recommendations for others?
- Monthly meetings with limited project tasks outside of the meetings.



Urban Soil Health

- Soil Profile Restoration (suburban subsoiling, complete cultivation, soil profile rebuilding)
- Aeration (deep tine hollow core aeration, pneumatic fracturing)
- Top dressing (compost, sand)
- Vegetation (daikon radish cover crop, native vegetation establishment)



Urban Soil Health Technical Standard (Under Development)

DEFINITION

A practice used to restore or create biologically active soil profiles to maximize infiltration and water holding capacity.

PURPOSE

The purpose of this standard is to mitigate the loss of hydrologic characteristics of soil that have been or will be disturbed and compacted by urban development and land use. The standard includes common methods which may be used to meet this purpose.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies within the upper 2 feet of the soil profile in areas that have been compacted by construction or historic urban land use activities. These areas include landscape areas associated with land development projects and existing urban landscape areas.

This standard does not apply to:

- Locations below the ordinary high water mark of waterways or within wetlands without reporting or non-reporting permit coverage from the Wisconsin Department of Natural Resources (WDNR);
- Areas within mapped 100-year floodplains.
- Contamination sites identified on the DNR Bureau for Remediation and Redevelopment Tracking System (BRRTs).

Site Selection. Use urban soil health practices in *project areas* that meet all the following criteria:

1. Permanent vegetation will be established and maintained.
2. Long-term protection from re-compaction is feasible.
3. Slope is less than 10%.
4. Depth to seasonal high groundwater is at least 24 inches.
5. Conflicts with underground utilities are minimal.
6. Runoff contributions from adjacent areas (run-on) are minimal.
7. Increased infiltration will not adversely impact existing or proposed structures.

Suburban Subsoiling Euclid Middle School : Overview



Stu Schwartz, University of Maryland Baltimore County

Soil Texture	Runoff Depth (in) - Compacted	Runoff Depth (in) - Restored	Runoff Reduction (%)
Clay	1.3	1.0	23
Clay Loam	1.2	0.3	75
Loam	0.4	0.06	85
Loamy Sand	0.02	0	100
Sand	0	0	0
Sandy Clay	1.4	0.5	64
Sandy Clay Loam	1.0	0.3	70
Sandy Loam	0.25	0	100
Silt	0.8	0.05	94
Silty Clay	1.1	0.4	64
Silty Clay Loam	1.0	0.2	80
Silty Loam	0.9	0.1	89

NOTE: Interpolated from USDA NRCS Part 650 Engineering Field Handbook Chapter 2, Figure 2-9.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
TECHNICAL STANDARD
STORM WATER SAND FILTER SYSTEM
1012

DEFINITION

A storm water sand filter system collects and filters runoff through a multi-stage treatment system that consists of energy dissipation and forebay for pretreatment, a pretreatment sedimentation basin, and a sand filter bed. The sand filter bed media may be enhanced with additives to control dissolved phosphorus, metals, pathogens, and other pollutants.

PURPOSE

The purpose of this system is to treat pollutants in urban storm water runoff. Enhancing the sand filter bed media with additives allows the storm water sand filter system to better address other pollutants such as nutrients, organic contaminants, and certain soluble pollutants. This system may be part of a larger storm water system that addresses other storm water management requirements.

CONDITIONS WHERE PRACTICE APPLIES

This standard applies to sites treating urban storm water runoff pollution. The practice can be scaled to contributory drainage basin areas typically up to 50 acres, provided adequate drawdown times can be maintained. For drainage areas smaller than two acres, Technical Standard 1004, Bioretention for Infiltration, may be more suitable.

This standard does not apply to locations with continuous flows due to high groundwater, sump pumps, or other permitted discharges.

Application of this standard may attenuate peak flows; however, it is not intended to address flood control. Modifications to the peak flow criteria or additional analysis of potential flooding issues may be needed or required by local authorities. In areas with high groundwater or where runoff comes from source areas listed under s. NR 151.124(3)(a), Wis. Adm. Code, or areas listed under s. NR 151.124(4)(a), Wis. Adm. Code, the use of this practice may present an increased risk for groundwater contamination necessitating the use of a liner and an underdrain, or other design considerations.

If the practice receives construction site runoff or runoff from agricultural areas, additional design considerations and additional operation and maintenance provisions are required to prevent filter media clogging.

CRITERIA

This standard contains requirements to design storm water sand filter systems for the purposes of pollutant removal. This technical standard does not address all possible runoff quantity and peak flow control considerations or provide structural design guidance related to storm water sand filter elements.

General Criteria

Storm water sand filter systems may be used independently or in series with other storm water practices.

Laws and Regulations. Comply with all applicable federal, tribal, state, and local laws, rules, regulations, or permit requirements. This standard does not contain the text of federal, tribal, state, or

Technical Standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your local WDNR office or the Standards Oversight Council office in Madison, WI at (608) 441-2677.

WDNR
January 2026

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
TECHNICAL STANDARD
VEGETATED DRY DETENTION POND
1011

DEFINITION

A vegetated dry detention pond has perennial, native vegetation on its bottom and side slopes and does not have a permanent pool of water. This constructed pond has designed dimensions, inlets, outlets and storage capacity necessary to detain, treat and release storm water runoff.

PURPOSE

The purpose of this practice is to manage runoff to accomplish the following:

- attenuate peak flow,
- capture sediment and associated pollutants while avoiding a permanent pool of water, and
- limit temperature impacts.

A vegetated dry detention pond, by itself, is unlikely to achieve 80% total suspended solid (TSS) control, though it may be used in conjunction with other storm water practices to meet TSS control and other storm water management requirements.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to urban sites where stormwater runoff pollution due to particulate solids loading and attached pollutants is a concern. It also applies where increased runoff from urbanization or land use change is a concern.

This practice is primarily applicable to sites where a vegetated dry detention pond is used in conjunction with other post-construction storm water practices but may be used independently where 80% TSS control is not required. The practice may require a liner when runoff comes from sources listed under s. NR 151.124(3)(a), Wis. Adm. Code and from areas listed under s. NR 151.124(4)(a), Wis. Adm. Code (See also WDNR Technical Standard 1001 Wet Detention Pond).

CRITERIA

General Criteria

This section contains requirements for the design of the practice to accomplish the identified purposes. For specified design storms, refer to local regulatory requirements or the most current version of NOAA Atlas 14, or its successor, to obtain precipitation frequency data.

Laws and Regulations. UComply with applicable federal, tribal, state, and local laws, rules, regulations, and permit requirements. This standard does not contain the text of federal, tribal, state, or local regulations. Requirements specific to peak flow control, runoff volume control, minimum pipe sizes, drainage easements, offsets from property lines, and separation from structures are examples of common local regulations applicable to this practice.

Design Parameters. Vegetated dry detention ponds may be used independently or as a component of a storm water treatment and storage system. Design the pond in accordance with the following measures:

Technical Standards are reviewed periodically and updated if needed. To obtain the current version of this standard, contact your local WDNR office or the Standards Oversight Council office in Madison, WI at (608) 441-2677.

WDNR
January 2026

Figures 1A and 1B
Typical Sand Filter Configuration using Stone Berm / Gabion

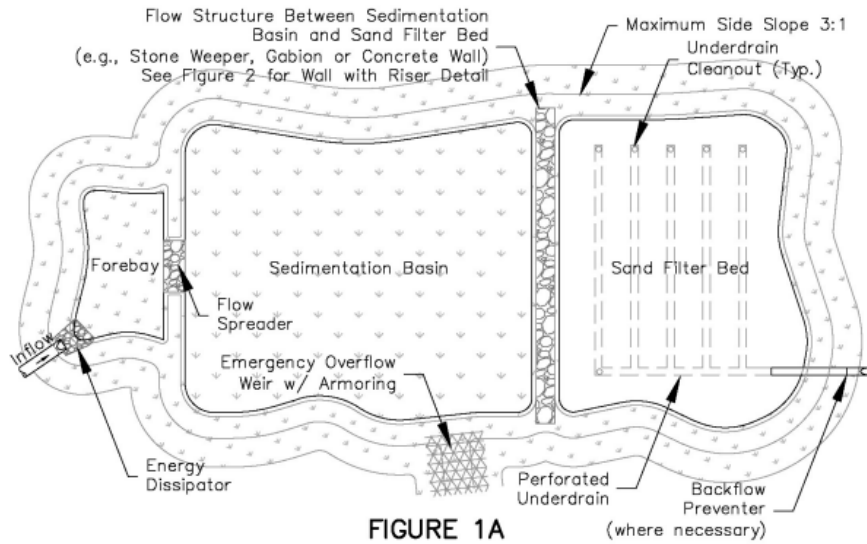


FIGURE 1A

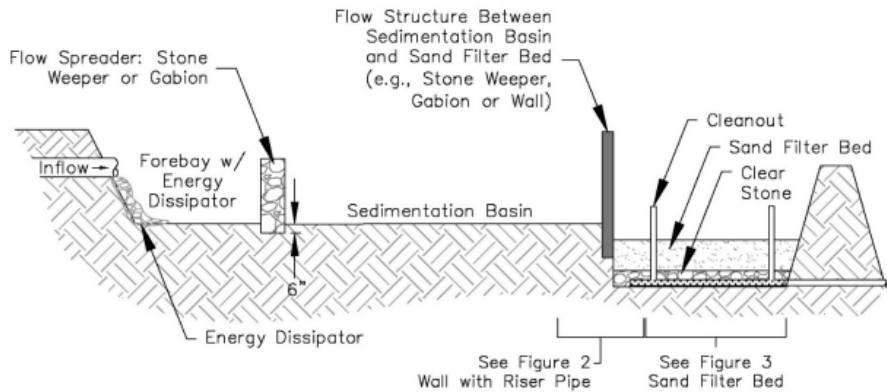


FIGURE 1B

Sand Filter



CONDITIONS WHERE PRACTICE APPLIES

This standard applies to sites treating urban storm water runoff pollution. The practice can be scaled to contributory drainage basin areas typically up to 50 acres, provided adequate drawdown times can be maintained. For drainage areas smaller than two acres, Technical Standard 1004, Bioretention for Infiltration, may be more suitable.

Design Criteria – General

The storm water sand filter system consists of three main design elements: a forebay with energy dissipation for pretreatment, a sedimentation basin, and a sand filter bed. To receive credit toward meeting ch. NR 151, Wis. Adm. Code, performance standards or pollutant allocations contained in U.S. EPA approved Total Maximum Daily Loads (TMDLs), design and construct the storm water sand filter system to contain all three main design elements. For specified design storms, refer to local regulatory requirements or the most current version of NOAA Atlas 14, or its successor, to obtain precipitation frequency data.

Enhanced Sand Filter Bed Media

The sand filter bed media may be enhanced with additives to provide better trapping of pollutants than can be accomplished with a sand media alone. The additives may be uniformly mixed with the sand or layered within the sand filter media. Refer to the tech note for use of additives and specific design criteria.

The term "additives" describes products that are either water-applied or land-applied to perform some water treatment purpose. Additives may come in a variety of chemical formulations, including chemical salts, polymers, acids and bases, metals, and organic chemicals and materials. Additives may cause undesirable and unintended impacts if they are discharged directly to the environment. Use additives on the previously reviewed additive list or obtain written approval from DNR in accordance with s. NR 106.10, Wis. Adm. Code. Submit dosage information, safety data sheets, and toxicological data as requested by the DNR for each product or media mix for which approval is sought.

The use of some additives may require a filtration layer thicker than the eighteen (18) inches shown in Figure 3 and may require a drawdown time longer or shorter than 24 hours from the end of a single precipitation event. Modify the design of the storm water sand filter accordingly, to meet these requirements.

Sand Filter

47. The DNR will allow a filtering credit of 80% for TSS and 35% for TP for treatment through 100% sand meeting one of the gradation options specified in Technical Standard 1004 and following the other design requirements contained in Technical Standard 1004.



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Dry Pond

PURPOSE

The purpose of this practice is to manage runoff to accomplish the following:

- attenuate peak flow,
- capture sediment and associated pollutants while avoiding a permanent pool of water, and
- limit temperature impacts.

A vegetated dry detention pond, by itself, is unlikely to achieve 80% total suspended solid (TSS) control, though it may be used in conjunction with other storm water practices to meet TSS control and other storm water management requirements.

Design and Geometry

- (1) Design vegetated dry detention ponds with a principal outlet or multi-stage outlet. Design the principal outlet to be a maximum of 0.1 feet above the bottom of the pond. Design and size outlets to minimize scour and erosion, limit clogging, and ease maintenance. Refer to local regulations for potential minimum outlet sizing.
- (2) Use a hydrograph producing method to determine storage volume for the pond.
- (3) Maximize the length to width ratio of the flow path within the pond to prevent short circuiting, with a length to width ratio no less than 2:1. Maintain an adequate slope to drain water from the inlet to the outlet but limit slopes to prevent erosion.

Modeling

Use *acceptable models* to quantify pollutant load reduction, infiltration, and peak flow attenuation provided by vegetated dry detention ponds. Refer to DNR [Modeling Post-Construction Storm Water Management Treatment](#) guidance document, as appropriate.

Guidance Documents

- Post-Construction Modeling Guidance (Reminder)
- MS4 Swale, Infiltration Basin and Dry Ponds



STORM WATER PUBLICATIONS/GUIDANCE

These publications and guidance documents provide technical assistance for developing soil erosion control and storm water management plans, designing storm water management practices, practicing pollution prevention, and planning public education programs. You can find additional materials in the [EGAD/SWIMS digital library](#), a searchable database of electronic policy and guidance materials used in the DNR's water quality programs. The documents and subject pages listed below can also be found in the EGAD/SWIMS system, but have been highlighted here for easier access.

The [Modeling Post Construction Storm Water Management Treatment Guidance Document \[PDF\]](#) has been updated to provide clarification in establishing numeric credit for storm water treatment and infiltration. Detailed [response to comments \[PDF\]](#) received during the posting period are also available.

DNR PUBLICATIONS AND GUIDANCE FOR CONSTRUCTION SITES & MUNICIPALITIES

Title	Number	Effective date
Post-Construction Storm water Management Options for Ground-Mounted Solar Array Areas [PDF]	3800-2023-01	Feb-24
Erosion Control Notes [PDF]	3800-2019-01	Oct-19
Water Quality Review Procedures for Additives [PDF]	3400-3800-2019-01	Oct-19
Construction Site Soil Loss and Sediment Discharge [PDF] USLE Model [file contains MS-Excel macro-enabled spreadsheets] [ZIP]	3800-2017-03	Sept-17
Design Considerations for Post-Construction Performance Standards for Public Trails near Waterways and Wetlands [PDF]	3800-2017-02	May-17
Wetland Screening and Delineation Procedures [PDF]	3500-2016-62	Oct-19
Modeling Post-Construction Storm Water Management Treatment [PDF]	3800-2025-20	Jan-25
Protective Areas for Wetlands [PDF]	3800-2015-02	Apr-15
Common Plan of Development [PDF]	3800-2014-02	Feb-15
Uniform Statewide Standards [PDF]	3800-2014-03	Oct-14
Meeting infiltration performance standard of ch. NR 151 [PDF]	3800-2013-05	Mar-14
MS4 Illicit Discharge Detection and Elimination [PDF]	3800-2012-01	Mar-12
Snow Treatment and Disposal for Municipalities [PDF]	PUBL-WR-154-06REV	



BUREAU OF WATERSHED MANAGEMENT PROGRAM GUIDANCE

Watershed Management Team
Storm Water Runoff Program

Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707-7921

Modeling Post-Construction Storm Water Management Treatment

Updated January 2025
EGAD #: 3800-2025-20

This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

APPROVED:

Jason Knutson, P.E., Director
Bureau of Watershed Management

January 21, 2025
Date

MS4 Swale, Infiltration Basin, Dry Basin Modeling Guidance

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Now Available: Updated “Process To Evaluate Vegetated Swales, Infiltration Basins And Dry Detention Basins For MS4 Permit Compliance” Guidance Document

The Wisconsin Department of Natural Resources (DNR) has updated the 2010 guidance, “Process to Evaluate Vegetated Swales, Infiltration Basins and Dry Detention Basins for MS4 Permit Compliance Guidance,” following the public comment period.

The [Process to Evaluate Existing Vegetated Swales, Infiltration Basins and Dry Detention Basins for MS4 Permit Compliance](#) incorporates current research and practices for designing these stormwater management practices that the Municipal Separate Stormwater Permit (MS4) can use to evaluate and model vegetated swales, infiltration practices and dry detention basins for pollutant removal credit.

You are receiving this message because you are a subscriber to the Department of Natural Resources' GovDelivery notification system for the Construction Site Storm Water and/or Municipal Separate Sewer System programs.

MS4 MODELING GUIDANCE

STORM WATER TECHNICAL STANDARDS, MODELS AND BMPS

This section is intended for use by highly technical professionals.

Download the modeling guidance developed for municipalities permitted under the Municipal Separate Storm Sewer System (MS4) WPDES program. The guidance discusses minimum pollutant loading analyses for total suspended solids and phosphorus, including percent TSS reductions to be assessed and areas required to be included in the calculations. The guidance on grass swales provides additional information on how to model the water quality benefits of this practice to establish water quality credits. The MS4 TMDL Implementation Guidance provides direction to MS4 permittees and their consultants on how Total Maximum Daily Load (TMDL) waste load allocations will be implemented within MS4 permits. This guidance also discusses how an MS4 permittee will be expected to model its MS4 service area and storm water management measures to show compliance with TMDL requirements.

MS4 municipalities must, to the maximum extent practicable, implement a reduction in total suspended solids in runoff that enters waters of the state as compared to no controls. See the Errata notes at the end of the table for updates to the standards.

Title	Number	Effective date
MS4 TMDL Implementation Guidance [pdf]	3800-2014-04	Oct-14
MS4 TMDL Implementation Guidance Addendum A (Percent Reduction) [pdf]	3800-2015-13	Feb-16
MS4 TMDL Implementation Guidance Addendum B (Internally Drained Areas) [pdf]	3800-2016-04	May-16
MS4 Modeling - NR 151.13 (20/40% TSS Standard) [pdf]	3800-2010-03	Nov-10
MS4 Modeling - NR 151.13 (20/40% TSS Standard) Addendum A [pdf]	3800-2016-07	Sep-16
Municipal Phosphorus Reduction Credit for Leaf Management Programs [pdf]	3800-2022-01	Feb-22
Process to Evaluate Existing Vegetated Swales Infiltration Basins and Dry Detention Basins for MS4 Permit Compliance [pdf]	3800-2025-21	Feb-26
Internally Drained Area Guidance [pdf]	3800-2009-02	Apr-09

Table 1

Total Length of Swale in MS4 Permitted Area	Minimum Number of Infiltration Test Locations
Less than 10 miles	10
10 to 20 miles	15
Greater than 20 miles	20*

*1 test location per mile of swale is recommended

MS4s

- New MS4 GP
- BMP Menu
- EPA audits

MS4 BEST MANAGEMENT PRACTICES MENU

The Wisconsin Department of Natural Resources (DNR) developed the MS4 BMP menu to assist MS4 Permittees in complying with their MS4 Permit. The menu provides resources and examples that may help permittees choose appropriate storm water strategies. However, as this menu is not intended to be comprehensive, it does not preclude MS4 Permittees from implementing other practices.

The MS4 BMP menu includes information and resources for the six minimum control measures (also referred to as the six storm water management programs), Total Maximum Daily Loads (TMDLs) and impaired waters requirements. Additionally, the MS4 BMP menu includes current DNR publications relevant to the MS4 permit, example MS4 compliance documents and tools to help prepare MS4 permittees for MS4 audits, or to help MS4 Permittees assess the effectiveness of its own programs. Please see the MS4 BMP menu directory with each topic categorized below.

Disclaimer: The MS4 BMP menu is intended solely as a reference tool and additional resource for MS4s, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. It does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this MS4 BMP menu will be made by applying the governing statutes and administrative rules to the relevant facts. The BMP examples and references included within this MS4 BMP menu are not intended to be comprehensive. Additionally, the list of BMPs is not all-inclusive, and it does not preclude MS4s from using other technically sound practices. However, the BMPs or combination of practices chosen by a permittee must achieve the MS4 Permit Standard of Reducing Pollutants to the Maximum Extent Practicable (MEP).

MS4 BMP MENU DIRECTORY:

- [Storm water Management Programs: The Six Minimum Control Measures \(MCMs\) And MS4 Map](#): Learn about each of the six minimum control measures required by the MS4 Permit (i.e., Public Education and Outreach, Public Involvement and Participation, Illicit Discharge Detection and Elimination (IDDE), Construction Site Pollutant Control, Post-Construction Storm Water Management and Pollution Prevention). Each program provides information, resources and BMPs as a tool to help MS4 Permittees comply with MS4 Permit requirements.
- [Total Maximum Daily Loads \(TMDLs\)](#): This page contains information, resources and BMPs on TMDL pollutants, including Total Suspended Solids, Total Phosphorus and Fecal Bacteria. It also contains information and resources on alternative TMDL compliance options, such as adaptive management and water quality trading.
- [Individual and General MS4 Permits](#): The difference between Individual and General MS4 permit coverage which also includes all of the State of Wisconsin's MS4 permits to view and download.
- [MS4 Audits](#): The U.S. EPA requires DNR staff to routinely conduct MS4 Audits to accomplish primary objectives.
- [Additional MS4 Resources](#): A variety of information and resources on funding, past regional MS4 Highlights, shared responsibility and other frequently asked questions or MS4 topics.

Other Stuff



Construction Sites – Demo of Historic Structures

Demolition that will disturb or expose soil is considered a land disturbing construction activity. When demolition is part of a larger common plan of development, conveyance of coverage under the Department of Natural Resources' (department) Wisconsin Pollution Discharge Elimination System (WPDES) Construction Site Storm Water General Permit must be obtained before the start of demolition. Under administrative rule, coverage is required instances where demolition is planned to occur in advance of construction development activities where one or more acres of land will be disturbed.

In compliance with Wisconsin's Historic Preservation regulation under s. 44.40, Wis. Stats., activities that may impact historic properties, especially demolition projects, are encouraged to check the historic status of potentially effected properties to determine if additional evaluation is required under the statute.

Historic status information may be found in the Wisconsin Architecture and History Inventory (AHI), part of the Wisconsin Historic Preservation Database website: [Search the Wisconsin Historical Society's collections](#)

The department may require applicants to supply additional information for projects that impact properties listed in the AHI, including evaluations of State and National Register of Historic Places (NRHP) eligibility, and evaluation of the project's effect on NRHP eligible properties. Consultants specializing in these analyses may be found at the website: [Architecture and History Consultants | Wisconsin Historical Society](#).

[Storm Water Program Construction Staff](#) may be contacted if you have any questions.

INSPECTING STORMWATER MANAGEMENT PRACTICES

GUIDANCE FOR PRIVATE OWNERS



INSPECTION REQUIREMENTS

Permanent stormwater practices (e.g., [Wet Pond](#), [Bioretention Basin](#), [Infiltration Basin](#)) installed as part of a stormwater management permit are required to be maintained by the property owner. Maintenance is critical for the practices to operate as designed and to effectively treat stormwater runoff from the site. The pollutant removal, channel protection, and flood control capabilities of all practices will decrease if regular inspection and necessary maintenance is not performed. Inspection frequency requirements vary by practice, but at a minimum all components of your stormwater practices should be thoroughly inspected at least once per year, and after all rainfalls of 0.5 inches or greater. Check your approved maintenance agreement for practice specific inspection requirements.

The cost, level of effort, and expertise required to maintain stormwater practices varies depending on the type, size, and complexity of the practice. Routine maintenance, such as mowing and removing debris or trash, is needed multiple times per year and can easily be performed by most landowners. More significant maintenance, such as removing accumulated sediment is needed less frequently, but requires more skilled labor and special equipment. Repair of critical structural features that are failing, such as embankments and outlet structures, needs to be performed by a qualified professional that has experience in stormwater. Below is guidance on inspecting common components of stormwater management practices, along with information on when a professional may need to be contacted.

OUTLET STRUCTURES

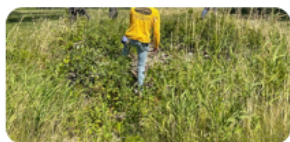
Outlet structures are generally the primary means through which water leaves the facility. They can be concrete with one or more holes- or orifices, along with an open top, or they can be simple standpipes. These often have grates or trash racks on them to reduce the chance of clogging. One or more pipes may connect within the structure.

The inspection of these features involves checking to make sure all parts of the structure are in place (grates, drainage stone, etc.) and looking for debris that may interfere with water entering or leaving the structure, as well as overall structural integrity.

Action Item: Keep the trash rack and outlet area free of sediment, trash, and problem vegetation. Contact a professional if the structure is damaged.



A riser pipe with trash rack



Before and after photos of vegetation management on riprap surrounding an outfall

STORMSEWER OUTFALLS

Many sites direct water to stormwater facilities via underground pipes, also called stormsewers. The location where these enter the facility, or where water discharges to a waterbody, is called an outfall (sometimes referred to as inlet pipes). Outfalls often have stone or riprap protection at the end of the pipe to protect the surrounding ground from the erosive power of the exiting water.

The inspection of these features involves looking for debris or overgrown vegetation that may interfere with water exiting the pipe, the presence and condition of the riprap protection, the presence of erosion or scour, and the buildup of sediment within the pipe or riprap.

Action Item: Keep stormsewer outfalls free of trash and debris, and remove sediment. Also remove plants, especially trees and other wood vegetation, that tend to grow near the end of the pipe. Contact a professional if unable to repair broken trash racks.

VEGETATION MANAGEMENT IN STORMWATER PRACTICES

GUIDANCE FOR PRIVATE OWNERS



THE IMPACT OF VEGETATION

Almost all stormwater management practices incorporate some form of vegetation into their design, whether it's a swale with turfgrass or a bioretention basin with natives plants. Vegetation can provide a wide range of benefits that help mitigate the negative impacts of stormwater runoff, such as:



Pale Purple Coneflower

- **Infiltration:** Vegetation promotes infiltration of stormwater into the soil. Roots, especially the deep roots of native plants, create channels and spaces in the soil, allowing water to penetrate deeper and recharge groundwater aquifers, which helps reduce runoff volume and prevent flooding.
- **Filtration and Treatment:** Vegetation acts as a natural filter, trapping sediments, nutrients, and pollutants carried by stormwater runoff. The root systems of plants can also absorb and metabolize some pollutants, improving water quality.
- **Erosion Control:** The root systems of plants bind soil particles together, reducing soil erosion and sedimentation of water bodies.
- **Temperature Regulation:** Vegetation provides shade and helps regulate surface temperatures, reducing the thermal impact of stormwater runoff on downstream water bodies. Cooler water temperatures support healthier aquatic ecosystems and reduce the risk of thermal pollution.
- **Habitat Creation:** Vegetated areas created as part of stormwater management practices provide habitat for wildlife, including birds, insects, and aquatic organisms, improving biodiversity and ecological resilience.
- **Aesthetic and Recreational Value:** Vegetated stormwater management practices can enhance the aesthetic appeal of urban and suburban areas, providing green spaces for recreation, relaxation, and community engagement.

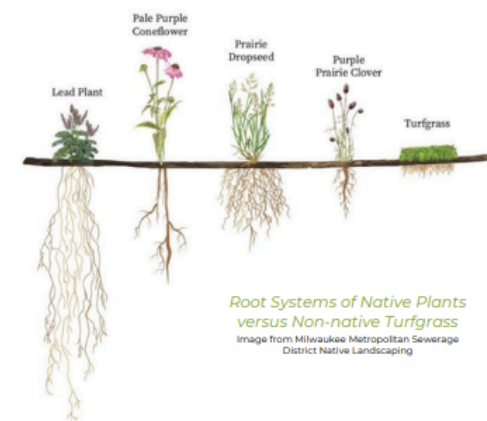
Vegetation plays a multifaceted role in stormwater management, providing ecological, social, and economic benefits. Integrating vegetation into stormwater management practices helps create sustainable and resilient landscapes that support healthy ecosystems and communities. Vegetation maintenance therefore plays a crucial role in ensuring long-term function of stormwater management practices

NATIVE VEGETATION

Native vegetation refers to plant species that naturally occur and have evolved in a specific region or ecosystem over a long period of time, without human introduction or interference.

These plants are adapted to the local climate, soil conditions, and ecological processes of their native habitat. Native vegetation plays a crucial role in maintaining biodiversity, supporting wildlife habitats, and providing ecosystem services such as soil stabilization, water filtration, and carbon sequestration.

In the context of stormwater management, using native vegetation in green infrastructure projects can enhance the effectiveness and sustainability of these practices by maximizing ecological benefits and minimizing maintenance requirements.



Root Systems of Native Plants versus Non-native Turfgrass

Image from Milwaukee Metropolitan Sewerage District Native Landscaping

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OFF THE RECORD"