

An aerial photograph of a suburban neighborhood during autumn. The houses are mostly single-story with light-colored siding and dark roofs. The trees are in various stages of fall color, with many showing vibrant orange, yellow, and red foliage. The streets are paved and have sidewalks. The overall scene is a typical suburban residential area.

Homeowner's Guide

BEST MANAGEMENT PRACTICES

OPERATIONS & MAINTENANCE

Brought to you by the Lancaster County Clean Water Consortium



LANCASTER COUNTY CLEAN WATER CONSORTIUM



**Borough of
Ephrata**



*location
of choice*



The Homeowner's Guide to Best Management Practices Operations & Maintenance is brought to you by the Lancaster County Clean Water Consortium in partnership with Warwick Township, Ephrata Borough, East Hempfield Township, Lititz Borough and LandStudies, Inc.

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Introduction

Stormwater is water that is generated from rain and snow melt—which is commonly referred to as stormwater runoff. We generally do not think about stormwater runoff until an issue arises such as flooding or water enters your basement. However, the quality of water in stormwater runoff is an important consideration as stormwater can directly affect the quality of the drinking water supply, the health of local streams used for fishing or recreation, and overall atmosphere of a locality. In turn, we attempt to manage the stormwater runoff to protect the water quality and reduce the potential for damages associated with flooding. Stormwater management has consistently followed the same general concepts for centuries:

Collect ► Convey ► Discharge to nearby stream

Over the past few decades as flooding became more problematic and water quality degraded, the use of Best Management Practices—or BMPs—was introduced into the stormwater management mechanism. BMPs are structural and/or non-structural practices that are considered an effective and practicable set of means of preventing or reducing water pollution and potentially helping with flooding issues. As a result, the stormwater management concept has evolved into the following:

Collect ► Manage ► Discharge to nearby stream

The manage portion covers a gamut of tools. One of the most important tools is structural BMPs for stormwater management such as dry detention basins, rain gardens, and infiltration trenches. As suburban and urban areas are further developed or re-developed, BMPs are required for implementation to continually manage stormwater runoff and build upon the improvements that have occurred over the past 30+ years. The odds are good that you have a BMP on your property to manage stormwater if you have been provided this manual by your local municipality.

The Homeowner's Guide to BMP Operation and Maintenance includes detailed maintenance tables by different types of stormwater management BMPs, background considerations for your BMP's O&M Plan, and example pictures to help assist with your long-term maintenance activities.



Once a BMP is implemented, an important consideration is the long-term maintenance of the BMPs. BMPs are required to be maintained not only to preserve its function as filtering pollutants and improving water quality, but also as a regulatory requirement of your local municipality's (Township or Borough) Municipal Separate Storm Sewer System (MS4) Permit. This permit not only requires the BMP to be installed in strategic locations, but also to be maintained for the long-term.

A Municipal Separate Storm Sewer System Permit, or MS4 Permit, is a permit that establishes conditions your township or borough must meet for the quality and quantity of stormwater runoff to local streams.

The Homeowner's Guide to BMP Operation and Maintenance was developed to assist a homeowner, small business, or other local entity with maintenance of stormwater management BMPs they own. Maintenance requires periodic inspections and activities by the BMP's owner to ensure the BMP continues to function and manage stormwater as it was originally intended to—and as it was presented and approved for permit approvals.

Each BMP presented in the guide includes a maintenance table that outlines common or required indicators that would trigger a maintenance activity. The indicators are essentially the same issues, such as erosion, that your local municipality will be referring to if they inspect your BMP. Pictures of example common issues with a type of BMP are provided as well to help you identify issues that would need attention. Indicators are conditions that can lead to more problems or inhibit the BMP's ability to function, and include conditions such as erosion or blocked pipe openings.



How to Use This Guide

The primary information in this guide is organized by BMP type. You will want to reference the sections that match your BMP. If you are unsure what BMP you have, contact your local municipality for assistance. Each BMP section is mainly focused on common maintenance issues and activities that need to be performed so the BMP functions as intended.

Each BMP section includes a **Maintenance Table** that outlines typical indicators of common issues and problems and the corresponding maintenance actions necessary to correct the problem.

Each BMP section will generally have pictures for reference of certain issues that are more common than others listed in the Maintenance Table. The pictures are provided to assist you with inspections and determining if an issue is present that needs addressed.

Other supporting information (with several sections providing more guidance through pictures) is also located in the guide to assist with identifying types of plants that may found in your BMP, how to figure out what the vegetation in your BMP should be, where you can find information regarding inspections of your BMP and so on.

Descriptions of the common issues are provided along with several recommendations to consider for maintenance. There are so many variations of a common issue that pictures of all possible variations could not be included in the guide.


The Native and Invasive Plants Picture section is provided to help you identify plants that are native to this region and are well adapted to the conditions found in BMPs. This list also includes noxious weeds or non-native and aggressive plants that pose a threat to the long-term function and aesthetics of the BMP.

Rain Garden / Homeowners BMP Guide / 3.1

Rain Garden Maintenance

Typical Maintenance Problems	Typical Maintenance Actions
Accumulation of sediment (over 2 inches deep or covers vegetation, litter or debris)	Remove and properly dispose of accumulated material, without damage to the vegetation. Confirm that soil is not clogging and that the area drains after a storm event. Fill or replace soil as necessary.
Poor vegetation establishment	Ensure vegetation is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep); remove fallen leaves and debris; prune large shrubs or trees; and mow turf areas.
Overgrown vegetation—woody vegetation not part of design is present	Prune or trim as appropriate but not less than the design height of the vegetation. Replace dead plants and remove noxious and invasive weeds.
Erosion due to concentrated stormwater runoff flow	Regrain/seed eroded areas and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading where necessary. Remove obstructions and sediment accumulations or water diversions.
Standing water (BMP not draining)	Investigate issues are present and persistent, contact RCEP. Repairs/changes should be applied only when absolutely necessary and then only by a licensed professional in accordance with the design.
Obstructed inlet/outlet structure	Clear obstructions.
Damage to structural components (e.g., clogged inlet, or outlet structures)	Repair or replace as applicable.

The original design for your rain garden must fully reflect an amended soil mixture. The soil mixture is an important component for both the vegetation and to allow stormwater to infiltrate. It is important to maintain good drainage soils for the health of your rain garden.



Dry Extension Basin / Homeowners BMP Guide / 3.2

Common basin issues that should be addressed

Invasive Weeds/Poor Vegetation

- Invasive weeds can originate by inlet and outlet structures (left picture) that can inhibit flows into and from the basin.
- A few weeds can soon take over a basin (right picture) in under three years if the vegetation is not managed. Invasive weeds should be removed on a frequent basis and areas re-planted or re-seeded with the vegetation called out in the O&M Plan.
- Preferred weed removal technique is mechanical (i.e. remove by hand). Selective herbicides can be considered but a professional consultant specializing in weed control in aquatic areas should be consulted if this approach is desired (as the basin has been over-run with invasive weeds).
- Refer to the Invasive Weeds section of this guide for pictures of common weeds. If these weeds are encountered, they should be removed.

Blocked Inlet/Outlet

- Blocked inlet and outlet structures can cause flooding problems, create stagnant water, and generally cause the basin to degrade.
- Monitor and remove leaves, trash, overgrown weeds, sediment filling in the pipe, or other debris that builds up on a frequent basis (recommended at least monthly or every time you mow).
- Some inlet and outlet structures may have a "trash rack" (see left picture) to help capture debris and trash. These help minimize the debris and trash entering into the pipes. However, the debris (i.e. sediment, leaves, etc.) and trash built-up in these areas needs to be monitored and removed on a frequent basis as well.



Native Plants / Homeowners BMP Guide / 3.3



Invasive Grasses

Cheatgrass

Common Reed

Ravenna Grass

Shattercane

Noxious weed

Photo sources on pages 66-68

Common Maintenance Activities

CLEARING BLOCKED STRUCTURES



SPRAYING



WEEDING



STABILIZATION OF ERODED AREAS



CLEANING DEBRIS



PLANTING



MOWING



Bioswale

A bioswale is a stormwater conveyance channel that is designed to infiltrate stormwater. Bioswales are planted with vegetation designed to absorb the stormwater, filter out pollutants, and slow stormwater flow during flooding events. Underneath the vegetation, bioswales often have some form of secondary filtration (i.e. gravel or rock). Bioswales are designed to treat large impervious areas, such as parking lots or roadways.

Bioswales contain inflow and outflow structures and some variation of infiltration media. Examples of different types of bioswales are shown in the photos on this page.

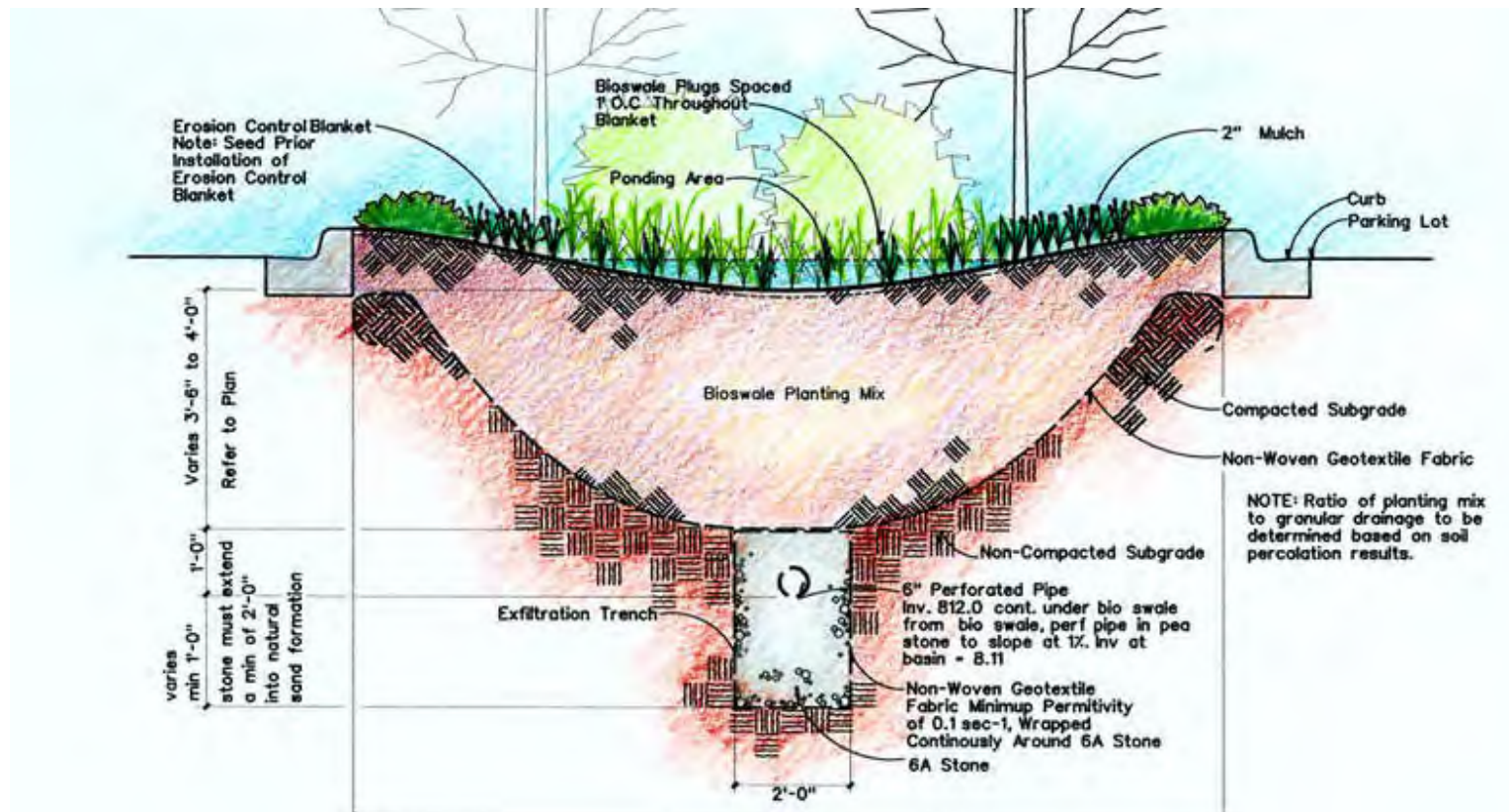


Photo: Ann Arbor District Library aadl.org



Bioswale Maintenance

Typical Maintenance Indicators	Typical Maintenance Actions
Excessive Mowing	Depending on the bioswale design, taller native grasses and vegetation might be installed for filtration purposes and to slow flow in the conveyance channel; however, some landowners prefer to have shorter “lawn” vegetation. Proper mowing in accordance with the individual bioswale O&M plan should be implemented. Excessive mowing can reduce the efficacy of this stormwater BMP.
Poor vegetation establishment and bare spots	Re-seed, re-establish vegetation.
Overgrown vegetation and invasive weeds/plants	Strategically mow or trim as appropriate and remove invasive plants. Selective herbicides can be used if in accordance with local, state, and federal laws. Refer to invasive weeds/plants section of the guide for pictures.
Signs of dumping (grease, piles of grass clippings, discolored grass, etc.)	Contact your local municipality to report a potential illicit discharge/illegal dumping.
Erosion (gullies formed on berms, basin bottom, and/or around inlet/outlet structures)	Repair/re-seed eroded areas (may need added measures such as erosion control blankets or stone at flow entry points), may include re-grading areas.
Signs of rodents/animals (gopher holes)	Fill/repair/re-seed holes and make appropriate corrective measures to prevent rodent activity. May need to contact a professional pest control management company to assist.
Accumulation of sediment, litter, or debris	<p>Remove and properly dispose of accumulated materials such as trash and landscape debris.</p> <p>Dredge accumulated sediment. This may be required every 5 to 15 years and more frequently if there are excess sources of sediment. Dredging is usually a major project requiring mechanized equipment. The work will include an initial survey of depths and elevations; sediment sampling and testing; removal, transport, and disposal of accumulated sediment; and reestablishment of original design grades and sections. Permits may be required.</p>
Standing water (BMP not draining) <i>If mosquito larvae are present and persistent, contact the PADEP. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.</i>	Abate by filling holes in the ground in and around the basin and by insuring that there are no areas where water stands longer than 96 hours following a storm (or shorter timeframe). Filling and re-grading will most likely require re-seeding or re-establishing vegetation as well.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet, or outlet structures; disconnected or failed pipes at structures	Remove any debris or sediment that could plug the outlets. A professional contractor or consultant may be required to assist with re-establishing/re-building a structural component.
General obstructions (trampolines, sporting equipment, stored boats, sheds, picnic tables, etc.)	Bioswales should be free of any general obstructions. This is critical for large and/or long rain events. Take the time to inspect and remove any general obstructions that may be present prior to forecasted rain.

What to Look For

Accumulation of Sediment, Litter, Debris

Standing Water

Erosion

Rodents/Animal Burrows
(gopher holes)

Overgrown Vegetation/Invasive Weeds

Poor Vegetation Establishment/Bare Spots

Obstructed Inlet/Outlet

Structural Damage

Signs of Dumping

General Obstructions
(lawn furniture etc.)

Bioswales are essentially a hybrid of an infiltration basin and a vegetate/grassed swale. Please refer to the guide sheets for infiltration basin and grass/vegetated swale for more information and tips for common issues and maintenance considerations.