

Common Bioswale Issues

Blocked Inlet/Outlet Structures

- Refer to the invasive weed section of this guide for pictures of common weeds. If these weeds are encountered, they should be removed.
- Sediment, trash, etc. can build up at inlet and outlet structures. These obstructions can restrict the flow of stormwater.
- Vegetation can grow in built-up sediment and take over the structure. Excessive vegetation can inhibit the flow of stormwater and reduce the intended function of the overall facility.
- It is important to monitor for obstructions and overgrown vegetation at inlet and outlet structures. Obstructions, accumulated sediment, and any other debris blocking an inlet or outlet structure should be removed.



Lack of Appropriate Vegetation

- From time to time, bare spots in bioswale may generate. This could have been caused by a number of different factors including invasive vegetation and/or weeds that have squeezed out the original vegetation.
- Lack of (or dead) vegetation can create exposed soils or conditions that restrict the ability for the bioswale to infiltrate stormwater and result in other problems that can become more costly to deal with.
- It is important to check for bare spots and re-plant the vegetation (which are generally native plants with deep root systems) originally called out in the design for the bioswale.



Bioswale Considerations

Inlet/Outlet Structures

Stormwater can enter and exit bioswales through structural features referred to as inlet and outlet structures. At times, the stormwater entry or exit points may be a grassed swale. It is important to keep the entry and exit points free and clear of trash, debris, and accumulated sediment.



Trees

Unlike a majority of other stormwater BMPs, bioswales may have trees as part of the overall vegetation. Trees are exceptional performers when considering water uptake and play an important role in the overall infiltration processes that take place in a bioswale. Refer to the pictures of trees in the Native Plants section of this guide.

Spillway

Bioswales may share features similar to a dry detention basin or infiltration basin. One such feature is a spillway that is generally a depressed area along a berm. Spillways should always remain clear of overgrown vegetation, debris, and other obstacles that could inhibit overflows.



Wetland Forebay

Some bioswales may have a wetland forebay to collect sediment, trash, debris, etc. carried by stormwater run-off. A healthy wetland forebay is one of the most important features when considering the forebay's ability to retain runoff and improve the quality of stormwater entering the BMP.

Constructed Wetland

According to the EPA, constructed wetlands are treatment systems that use natural processes involving wetland vegetation, soils, and associated processes to improve water quality. They filter pollutants from water that flow into and through the wetland before reaching the receiving streams or ponds. Vegetation slows the flow of stormwater, allowing sediment to settle and other pollutants to be taken up by the vegetation. Not only does this BMP serve as a filter, they are aesthetically pleasing and they create habitat for native animals.



Constructed Wetland Maintenance

Typical Maintenance Indicators	Typical Maintenance Actions
Poor vegetation establishment/bare spots	Dependent on water level, may need to plant plugs or re-seed.
Signs of dumping (grease, piles of grass clippings, discolored grass, etc.)	Contact your local municipality to report a potential illicit discharge/illegal dumping.
Erosion	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.
Rodents damage	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>
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.



What to Look For

Blocked Structures

Lack of Water Needed to Support Water Loving Plant Materials

Invasive Vegetation

Trash/Debris

Maintenance Considerations

- Regular inspections (can range in frequency depending on maintenance plan)
- Checks should include: inspecting inlet and outfall structures. Cleaning off surfaces where substances have accumulated and are preventing water flow.
- Removing nuisance and invasive species, and maintaining the appearance of the wetland
- May need to occasionally remove sediment accumulation in forbays
- Schedule for cleaning and maintaining inlet and outlet structures
- Depth of sediment accumulation before removal is required

Trash and debris is a common issue in wetlands and should be removed with frequent inspections

Dry Detention Basin

Dry detention basins are very common in Pennsylvania. They come in many sizes and shapes but are generally easy to spot as most can be described as bermed holes in the ground. They are built with the intent to collect and slow down stormwater runoff from areas upstream of the area treated by the basin. A detention basins purpose is to decrease flooding and damage that can occur from flooding.



Inlet Structure

- Stormwater entry points into a basin
- Concrete winged walls (endwalls) or grassed swales
- Some have debris (or trash) racks



Basin Berm

- Sloped mounds encircling the basin area
- Vegetation is generally turf grass that should be mowed on a regular basis (same frequency as the rest of your yard)



Basin Bottom

- Main basin area that stores collected stormwater
- Can either be turf grass or “low-mow” vegetation that resembles a meadow



Outlet Structure

- Stormwater exit points from a basin
- Designed to control the rate of flow exiting the basin



Emergency Spillway

- Overflow point for large storm events
- Can be turf grass, concrete, or stone
- Generally a depressed area along the basin berm

Basin Variations



Low Flow Channels

- Some basins may have a concrete swale known as a “low-flow channel.”
- Low-flow channels can be either concrete, grass, or stone. They generally connect entry points (inlet structures) to exit points (outlet structures).
- There should be no obstructions (i.e. trampolines) or build-up of debris (i.e. grass clippings) in low-flow channels. They can be carried to the outlet structures and clog up the system.

Low-mow Basins

- Certain basins may be designed as “low-mow” basins in lieu of turf grass in the basin bottom. This variation of a basin bottom generally attempts to establish meadow-like conditions.
- These basins are generally only mowed twice a year (once in the spring and once in the fall). Your O&M Plan should call out mowing frequency. Contact a professional consultant or your local municipality if you are unsure.
- The meadow-like conditions of a low-mow basin provide a greater water quality treatment function than a grassed basin. However, a common issue with low-mow basins is a high probability that invasive weeds/vegetation can take over the basin in a matter of a few weeks if the basin goes unchecked.

Outlet Structures

- Outlet structures come in various forms and sizes but all serve the same purpose – control the rate of stormwater exiting the basin.
- Some outlet structures have an overflow built into the same structure (right picture above). Others may be a concrete wing wall with the overflow behind the structure that appears to be an inlet/yard grate.
- A common tell-tale sign of an outlet structure is the presence of what is known as an “orifice plate” (left picture above) – a metal plate bolted to the concrete wall with a small pipe opening.

Spillways

- Spillways can be either grass, stone, or concrete.
- Grassed spillways may be difficult to find at first as the area can blend into the surrounding berms. If you stand in the basin, you can see the spillway profile as the spillway area will generally appear as a dip in the berm (see left picture above).
- If the spillway profile does not appear uniform (as in the left picture above), you should contact a professional engineer as repairs may be needed.
- The right picture above reveals a number of “no-no’s” - spillway where grass clippings have been dumped, weeds and trees have taken over, original vegetation is dead leaving bare spots, and profile has been altered.

Basin Considerations

Rodents/Animals

Rodents and animals can burrow in berms or under concrete spillways jeopardizing the integrity of the structure area. Various rodents and related animals can make their home in pipes connected to inlet and outlet structures (see pictures). This may invite unwanted predators to the area but can also cause water quality and health concerns related to feces.



Basin Discharge

Every basin generally has a discharge point connected to the outlet structure that is located on the other side of the basin berm. This is the point where stormwater exits the area and may enter storm sewer system, swale, or directly into a stream. The components of this structure should be treated and maintained in a similar fashion as the inlet and outlet structures inside the basin (area free of debris and weeds, pipe opening free of clogs, no dumping, concrete is structurally sound, and so on).



Sinkholes

Sinkholes may be encountered in the basin bottom. Sinkholes can generally lead to more issues if not addressed. You should contact a professional engineer or your local municipality immediately after encountering a sinkhole.



Sediment Accumulation

Sediment will most likely accumulate in the basin bottom over time. This will require removal of the accumulated sediment at periodic intervals. A tell-tale sign (see picture) is when the ground is higher than the bottom of an inlet or outlet structure pipe, even if grass is still present. This maintenance will require “digging out” (also known as “dredging”) the sediment and re-planting or re-seeding vegetation called out in the original plans or what was in place before. Contact a professional consultant or your local municipality if you are unsure about accumulated sediment or vegetation to be planted.



Dry Dentention Basin Maintenance

Typical Maintenance Indicators	Typical Maintenance Actions
Poor vegetation establishment/bare spots	Re-seed, re-establish vegetation.
Overgrown vegetation and invasive weeds/plants	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 72 hours following a storm or as specified in your basin's O&M manual. 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.)	Basins 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
(trampolines, etc.)

If you do not have an O&M Plan, either follow the recommendations outlined in this guide to develop a plan and frequencies recommended or contact a professional consultant to help develop an O&M Plan.

These items should be checked at least monthly. Review your O&M Plan for alternate frequencies that may have been approved in the Site Stormwater Management Plan.

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 quickly take over a basin (right picture) in three years or less 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 contacted if this approach is desired (or the basin has been overrun with invasive weeds).
- Refer to the invasive weed 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 pipe. 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.



Clean Riprap

- Some basins may have piles of stone or rock in front of inlet and outlet structures (and at the basin discharge points) commonly known as riprap. This part of the structure is intended to help disperse stormwater flows and/or collect debris, trash, sediment, etc.
- **Riprap areas should be checked monthly and cleared of any debris, trash, invasive weeds, and landscape waste.** The pictures to the right are examples of riprap areas that need to be cleaned up. Periodically, collected sediment will need to be cleaned out (which may require re-setting the rock or stone).



Dead Vegetation/Bare Spots

- Lack of or dead vegetation (turf grass, native plants, etc.) can create exposed soil that can erode and clog the system, along with discharging excessive sediment to nearby streams.
- **Dead vegetation (including turf grass areas) should be replaced to match what was outlined in the original plans.**
- Dead vegetation areas can increase the probability of invasive weeds propagating and taking over the basin causing more headaches down the road.
- Steep berms are more susceptible to erosion from bare spots that generally evolve over time from mower tires (see right picture) running over the same spot every week. Consider alternating mowing patterns to minimize generation of bare spots.

