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**GOLD GUIDE  
for  
STORMWATER  
MAINTENANCE**

**A Property Manager's Guide  
to Managing Stormwater  
Practices**





Photo by PDE



# MANAGING STORMWATER ON YOUR PROPERTY

Water is the most fundamental component of any natural or managed ecosystem. For property managers, there are many options and tools to help maintain the aesthetics of your property and responsibly manage the stormwater it generates. Untreated stormwater can negatively impact the health of local streams, which are a critical source of drinking water. By incorporating stormwater management features into your property, you can protect your community and its creeks and streams, while still maintaining a beautiful property. These management practices typically do not require a lot of effort or money; in fact, it may only require a slight change in how existing features on the property are maintained.

So what is a **stormwater management feature**, or **"Best Management Practice" (BMP)**? Chances are, if you have a large enough property, you already have one or more on site. These are features specifically designed and engineered to manage stormwater from a developed area, like an office complex, parking lot, or residential neighborhood. They manage stormwater onsite to prevent flooding in local communities and pollution in streams and rivers. Examples of common BMPs include stormwater ponds, dry drainage basins, grassy swales, and planted buffer areas. When BMPs include components (like water-loving vegetation) that mimic natural processes to address stormwater and other environmental concerns, they may be considered as a type of **"green infrastructure."** Green infrastructure is an alternative to grey infrastructure, which uses engineered systems of pipes, concrete channels, and other methods to move stormwater from one place to another.

Maintenance is a vital component to keep stormwater BMPs functioning properly. Without proper maintenance, stormwater runoff can overwhelm the system and cause flooding, build up in stagnant pools that breed mosquitos and algae, and pollute nearby streams and rivers. Proper maintenance not only prevents these problems, but it also can also save money when done right. Smarter maintenance doesn't have to mean more maintenance — sometimes all it takes is a little strategic application to maximize the benefit to both the property and the local streams!



Illustration by Frank McShane

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Look for this flag

## ENHANCED PRACTICE:

to learn more about our **Enhanced Practices**, which can provide additional benefits for the environment while also handling stormwater!



Photo by Marcela Gara, Resource Media



## THE BENEFITS OF GOOD STORMWATER PRACTICES

Photo by Partnership for the Delaware Estuary



**Stormwater BMPs** do more than prevent soggy lawns and angry neighbors. In addition to capturing rainwater as it flows across a landscape to reduce flood risks, these BMPs also capture things that water is carrying — sediment from erosion, chemicals from lawn fertilizers and pesticides, leaked motor oil, and more. This type of pollution, typically called “non-point source” pollution, is one of the largest threats to water quality across the country. Most local and state agencies now require landowners to manage their property’s stormwater in one way or another.

### GOOD STORMWATER PRACTICES MEAN:

- Clean, clear water in stormwater ponds and in local streams
- Attractive, functional, thriving landscapes for community members to enjoy
- Lower risk of flooding, and costs associated with structural failure
- Reduce mosquito/pest problems by promoting proper drainage and infiltration of stormwater
- Pollutants like fertilizers, pesticides, motor oil, road salt, and more kept out of local waterways
- Healthy habitat for local wildlife like butterflies, birds, and other critters

A lack of proper stormwater management practices mean the opposite! Algae covered ponds, breeding grounds for mosquitoes, local flooding issues, increased water pollution, and higher maintenance costs in the long term if things go wrong. Older stormwater management features may be especially vulnerable to issues like structural failure, and may require additional maintenance or even retrofits. Fortunately, maintaining and enhancing stormwater BMPs is often fairly straightforward. One just needs to have the right knowledge, tools, and commitment to proper upkeep.

### IN THIS GUIDE...

You’ll find a variety of information designed to support the choices that property managers can make when developing a maintenance routine for stormwater BMPs, including:

- Tips for inventorying existing stormwater management infrastructure on your property
- A simple glossary of terms that relate to stormwater BMPs
- Guidance on properly maintaining stormwater BMPs
- Suggestions for “enhanced” BMPs, which provide additional stormwater and other environmental benefits when compared to traditional practices, along with their maintenance requirements
- Additional resources on stormwater, BMPs, and other relevant tools

**IMPORTANT:** This guide is only meant to give suggestions about maintenance for stormwater BMPs. Nothing in this guide is meant to supersede any specific maintenance plans, engineering designs, local or state ordinances or codes, or other defined protocols for a specific stormwater management facility. Maintenance required in structures that involve confined space entry are not covered in this guide. Stormwater BMPs should always be designed and constructed by a qualified professional.

## STORMWATER MAINTENANCE LINGO

A stream buffer example



Photo by AKRF



Photo by Nanticoke Watershed Alliance

Without a buffer, a stream bank can quickly erode and sedimentation can build up



Photo by Philadelphia Water Department

Porous pavement soaks up water

- **Best Management Practices (BMPs):** a land management practice, either structural or activity-based, that incorporates pollution reduction techniques into the design to address stormwater
- **Buffer:** a protective, vegetated area along a stream, pond, or wetland that filters pollutants before they reach the waterway and provide beneficial habitat
- **Cool season grasses:** grass varieties that grow best in areas where temperatures in winter are cold and summers are hot, including Kentucky bluegrass and perennial ryegrass
- **Depaving:** the act of removing pavement to increase infiltration of water into the ground
- **Downspout disconnection:** re-routing downspouts to yards, grass, or gardens to encourage infiltration rather than flow into the nearest storm sewer system
- **Green Infrastructure:** stormwater BMPs that mimic nature and/or incorporate natural components, such as native plants, into the design to reduce runoff and promote infiltration
- **Infiltration:** when water percolates, or seeps into the ground to replenish groundwater
- **Integrated pest management (IPM):** a method of controlling insects and other pests that uses a variety of techniques that reduce or eliminate pest populations in a manner that is cost-effective and reduces risks to human and environmental health
- **Invasive Vegetation:** plants that aren’t native to the local area and, because of their aggressive nature, may spread quickly and outcompete beneficial native species
- **Native Vegetation:** plant species that have evolved to thrive in local conditions (temperatures, soil type, average rainfall, etc.) and therefore require less water and fertilizer to survive
- **Non-point source pollution:** pollution that comes from many sources and cannot be traced back to a single point of discharge, like runoff roads, lawns, and farm fields carrying various chemicals, oils, and other contaminants
- **Porous (also known as permeable):** hardened surfaces that have tiny pores in their structure, allowing water to pass through and infiltrate into the ground instead of pooling or running off into waterways
- **Sedimentation:** a buildup of sediment that occurs when dirt and other particles erode off the land, are carried by runoff, and settle in a stream, lake, or other BMP
- **Turf grasses:** a category of grass species, which may be either cool or warm season grasses, that are intended to be mowed short and to a uniform length, usually in an area intended for heavy use and foot traffic
- **Warm season grasses:** grasses that grow best where winters are relatively mild, and which may be planted to provide habitat for wildlife, decrease erosion, and may also be used for pasture or hay (if not associated with a stormwater BMP)



# K NOW YOUR BMP TYPES

Knowing what kind of stormwater BMPs exist on your property (or alternatively, what kind of BMPs you'd be interested in installing) is critical to understanding how to properly maintain them. Below are brief descriptions of some common stormwater BMPs.



Photo by PDE

**SWALE:** A grass-covered channel or depression that uses gravity to move stormwater away from structures or roads while settling and filtering pollutants as they pass through the grass



Photo by PDE

**RAIN GARDEN:** A vegetated basin designed to mimic the function of wetland or forest conditions, typically ovetop modified soil or stone added to enhance the capture pollutants and infiltrate stormwater (may also have an underdrain)

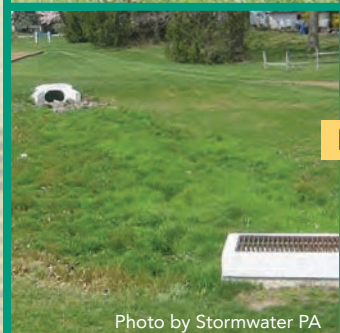


Photo by Stormwater PA

**DETENTION BASIN:** A large, highly permeable pond-like structure, usually planted with turf grass, designed to capture and temporarily hold stormwater during weather events while settling and filtering pollutants

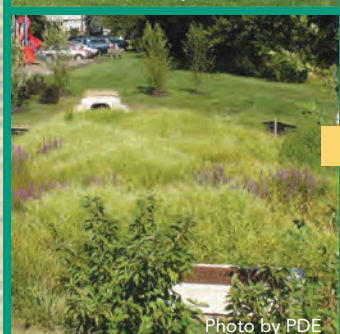


Photo by PDE

**NATURALIZED DETENTION BASIN:** Similar to a traditional detention basin, but planted with native wetland plants and other species to stabilize slopes, minimize erosion, and filter pollutants from Stormwater

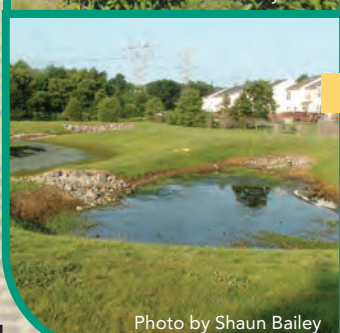


Photo by Shaun Bailey

**RETENTION BASIN/STORMWATER POND:** A large pond designed to capture rainwater and allow it to slowly percolate into the soil or release into the sewer system, but unlike detention basins, these features typically have water in them all the time and may look like other man-made ponds



Photo by Shaun Bailey

**BUFFERED RETENTION POND:** Similar to a traditional stormwater pond, but surrounded by native vegetation (trees, shrubs, grasses) as opposed to mowed turf grass in order to increase the filtration of pollutants, provide wildlife habitat, and decrease the presence of nuisance species like Canada geese



Photo by USDA

**POROUS PAVERS:** Interlocking blocks made of traditional paving stones that are arranged with gaps between the blocks that allows water to infiltrate into the soil below



Photo by PWD

**POROUS PAVEMENT:** A specific type of pavement (asphalt or concrete) with tiny holes in the material that allow water to pass through it and infiltrate into the soil below, or to move it away from the surface through an underdrain



Photo by Robert Lawton

**CATCH BASINS/STORM DRAINS:** Inlet structures, usually adjacent to curbs along roadways, designed to catch stormwater and funnel it through pipes to either a treatment facility or a discharge point in a stream

Examples of metal cisterns

## OTHER COMMON STORMWATER BMPs:

- Depaving Areas
- Tree Trenches/Tree Boxes
- Rain Barrels/Cisterns
- Educational Markers on Storm Drains
- Green Roofs

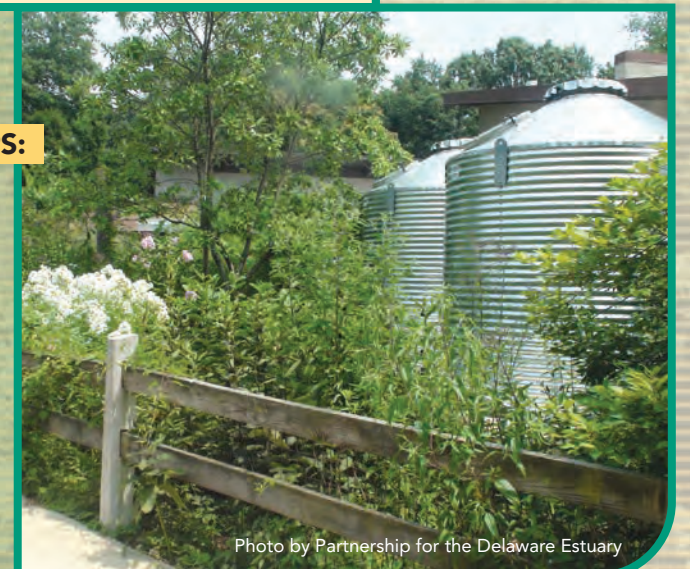


Photo by Partnership for the Delaware Estuary



# GENERAL BMP MAINTENANCE RECOMMENDATIONS

## 1 Monitor the BMP

- Check on BMPs monthly or quarterly (and always after a large storm event), depending on the type of practice, to ensure that they're functioning properly
  - Ask yourself: Do the plants look healthy? Is there debris in the BMP? Is it draining properly? Does it look like it's doing what it was designed to do?
  - Volunteers (local residents, scout groups, environmental organizations, Master Gardeners, etc.) may be able to help with this monitoring to ease the burden on property managers!
  - Photographs taken of the BMP from the same location over time may be helpful in identifying changes and potential problems
- If something looks really wrong, bring in professional help
  - A township engineer, an environmental consulting firm, or other local professional should be able to help you develop a game plan to fix the issue. Structural issues, like broken concrete, cracked pipes, etc., should always be addressed by a qualified professional.

## 2 Keep the BMP free from debris, trash, and excess sediment that may wash into the site

- Hand tools (rakes, claw grabbers, etc.) can be used for smaller debris, while a mini excavator or portable vacuum excavator may be required for large amounts of debris and sediment
- Be sure to follow all relevant local, state, and federal requirements for the proper disposal of all debris and excess sediment



Photo by Partnership for the Delaware Estuary

## 3 Minimize vegetation and soil disturbance/compaction

- Avoid using heavy machinery (larger than a mower) in basins and other BMPs as much as possible to protect soils and maintain their ability to filter and infiltrate stormwater
  - Try to avoid mowing on wet soils, since the ground is more easily compacted when wet
- Pay attention to the mowing cycles, and don't feel compelled to mow too often
- If drainage at a BMP becomes a problem (i.e., standing water more than 48 hours after a rain event), compacted soils could be the issue, and it may help to bring in an environmental, civil, or stormwater engineer to determine the best solution

*Keeping BMPs litter free, especially at inlet and outlet sites, is critical for managing stormwater.*

*Phragmites are a common invasive plant in wetter areas*

## 4 Use chemical fertilizer treatments sparingly, if at all

- Using good topsoil and proper site preparation when installing and maintaining BMPs can help reduce the need for future fertilizer applications
- The best time to apply fertilizer is in the early fall
  - Some states, like New Jersey, prohibit fertilizer application between November 15 and March 1
- Soil test kits are inexpensive and can help determine if fertilizer application is necessary
  - This is important because over-fertilizing can actually encourage the growth of problematic and/or invasive species!
- Native plants have adapted to local conditions and are less likely to require fertilizer or additional watering (after the plants get established)



Illustration by Frank McShane

## 5 Manage invasive species

- Know if you have them
  - If one type of plant appears to be dominating a BMP to the detriment of structures or other plants, it may be invasive
    - ▶ In some conditions, particularly areas that have experienced degradation, it may be natural for a certain species to dominate (cattails are a good example) without being invasive. Check local plant guides, like those listed in the resources section, to see if you're actually dealing with a harmful invasive species
- If you identify a problematic species, know how to remove it
  - Mechanical techniques: hand pulling/weeding
  - Chemical techniques (should only be performed by trained licensed professionals during periods of dry weather, not within 24 hours of a prior or expected rain storm, and with minimal or no wind):
    - ▶ Basal bark treatments – use a backpack sprayer to completely wet the lower 1'-1.5' of the stem (works best on woody vegetation with trunks less than 6" in diameter)
    - ▶ Cut stem treatments – an herbicide is applied directly to the stump/stem of a plant after it has been cut down to about 1"-2" above the ground
    - ▶ Foliar treatments – herbicide is applied as a selective treatment directly to the leaves of the plant (most effective on smaller plants)
    - ▶ Pre-emergent treatments – the application of herbicides in areas vulnerable to weedy, invasive plants before the plants begin to grow (usually applied around mid-March and mid-September)



Photo by R. A. Nonenmacher

## 6 Keep records of the monitoring and maintenance done on a project

- Create a log for maintenance work done on each BMP in order to have a running list of when, how, and by whom monitoring or maintenance work was completed

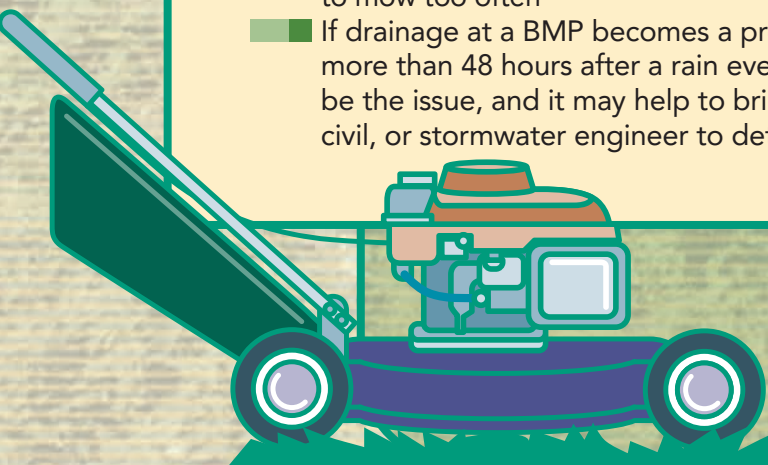


Illustration by Frank McShane



# STORMWATER PRACTICE MAINTENANCE RECOMMENDATIONS:

## 1 Grassed Swales

### MAINTENANCE SCHEDULE

|                  |   |
|------------------|---|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>■ Remove trash and debris, and clear away excess sediment (especially around any drainage structures or inlets)</li> <li>■ Mow turf or cool season grasses around the berms around the edge of the swale during growing seasons (spring and summer)                             <ul style="list-style-type: none"> <li>● Cool season grasses should be mowed no shorter than 3-4"</li> <li>● Remove all grass clippings from the swale</li> </ul> </li> <li>■ Monitor to ensure the swale is functioning properly</li> </ul> |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>■ Inspect and clean any structures that may trap debris</li> </ul>   |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>■ Seed bare areas in spring (March-May) or fall (August-October)</li> <li>■ Remove and compost or dispose of leaves in the fall</li> </ul>   |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>■ Repair any damaged structures                             <ul style="list-style-type: none"> <li>● Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> <li>■ If water ponds in the swale for longer than 48 hours, take steps to assess soil permeability or options for regrading to prevent stagnant water buildup</li> </ul>   |

### THINGS TO AVOID:

- Mowing too frequently
- Cutting the grass too short
- Using heavy equipment (like tractors) after a rain event



Photo by Partnership for the Delaware Estuary

## ENHANCED PRACTICE:

## 2 Rain Gardens

### MAINTENANCE SCHEDULE

|                  |  |
|------------------|--|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>■ Remove trash and debris, and clear away excess sediment (especially around any drainage structures or inlets)</li> <li>■ Water plants and shrubs for first two years after planting (after that, they should be able to take care of themselves, except in cases of drought)                             <ul style="list-style-type: none"> <li>● Water roughly once a week from April – October (unless there is a rain event during the week)</li> </ul> </li> <li>■ If there has been no rain for more than two weeks during the summer, supplemental watering may be needed, even outside of the first two years</li> </ul> |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>■ Monitor for functionality, plant health, and proper drainage (no standing water should remain 48 hours after a storm event)</li> <li>■ Keep an eye out for invasive species – if a single type of plant looks like it's taking over the area, it may be invasive and removal may be needed</li> <li>■ Inspect and clean any structures that may trap debris</li> </ul>  |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>■ Seed bare areas/replace dead plants in spring (March-May) or fall (August-October)</li> <li>■ Remove and dispose of leaves and cut back woody debris in the fall</li> </ul>   |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>■ Repair any damaged structures                             <ul style="list-style-type: none"> <li>● Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> <li>■ If water ponds in the rain garden for longer than 48 hours, take steps to assess soil permeability or options for regrading to prevent stagnant water buildup</li> <li>■ Replace and regrade soil in the event of significant erosion</li> </ul>  |

### WHY IT'S ENHANCED:

- Native plants can reduce mowing and provide habitat for pollinators and other wildlife
- Better infiltration of stormwater
- Better filtration of pollutants



Photo by Philadelphia Water Department



# STORMWATER PRACTICE MAINTENANCE RECOMMENDATIONS:

## 3 Detention Basins (Dry Ponds)

### MAINTENANCE SCHEDULE

|                  |   |
|------------------|---|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Remove trash and debris, and clear away excess sediment (especially around any drainage structures or inlets)</li> <li>Monitor for functionality and proper drainage after storms</li> </ul>   |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Mow turf or cool season grasses at least twice annually (during the growing season)                             <ul style="list-style-type: none"> <li>Cool season grasses should be mowed no shorter than 3-4"</li> <li>Remove all grass clippings from the basin</li> </ul> </li> <li>Inspect and clean any structures that may trap debris</li> <li>Remove trees/woody debris from the basin dam area at least twice per year</li> <li>Monitor erosion and stabilize areas vulnerable to erosion using vegetation or rock formations</li> </ul>                                       |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Seed bare areas in spring (March-May) or fall (August-October)</li> <li>Clean debris and sediment from concrete low flow channels</li> <li>Remove and compost or dispose of leaves in the fall</li> <li>Remove dead and/or invasive species</li> </ul>   |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Repair any damaged structures, including grates, outflow pipes, etc.                             <ul style="list-style-type: none"> <li>Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> <li>If water ponds in the basin for longer than 48 hours, take steps to assess soil permeability or options for regrading to prevent stagnant water buildup</li> <li>Minimize the presence of Canadian geese, whose feces contain bacteria that can be washed into local waterways, by setting up swan or dog decoys</li> </ul> |

### THINGS TO AVOID:

- Applying fertilizer or pesticides in the basin area
- Cutting the grass too short
- Using heavy equipment (like tractors) after rain
- Allowing Canadian geese to congregate frequently



Photo by Stormwater PA



Photo by Partnership for the Delaware Estuary

### ENHANCED PRACTICE:

## 4 Naturalized Basins

### MAINTENANCE SCHEDULE

|                  |   |
|------------------|---|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Remove trash and debris, and clear away excess sediment (especially around any drainage structures or inlets)</li> <li>Water plants and shrubs for first two years after planting (after that, they should be able to take care of themselves)                             <ul style="list-style-type: none"> <li>Water roughly once a week from April – October (unless there is a rain event during the week)</li> </ul> </li> </ul> |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Monitor for functionality, plant health, and proper drainage (no standing water should remain 48 hours after a storm event)</li> <li>Keep an eye out for invasive species — if a single type of plant looks like it's taking over the area, it may be invasive and removal may be needed</li> <li>Inspect and clean any structures that may trap debris</li> </ul>   |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Seed bare areas/replace dead plants in spring (March-May) or fall (August-October)</li> <li>Remove and dispose of leaves and cut back woody debris in the fall</li> </ul>  |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Repair any damaged structures, including grates, outflow pipes, etc.                             <ul style="list-style-type: none"> <li>Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> <li>If water ponds in the basin for longer than 48 hours, take steps to assess soil permeability or options for regrading to prevent stagnant water buildup</li> </ul>        |

### WHY IT'S ENHANCED:

- Native plants reduce/eliminate mowing and provide habitat for pollinators and other wildlife
- Better infiltration of stormwater
- Better filtration of pollutants
- Less attractive habitat for Canada geese



# STORMWATER PRACTICE MAINTENANCE RECOMMENDATIONS:

## 5 Retention Basins/Stormwater Ponds

### MAINTENANCE SCHEDULE

|                  |  |
|------------------|--|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Remove trash and debris (especially around inlets/outlets)</li> <li>Monitor for functionality and acceptable water levels</li> </ul>  |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Mow turf or cool season grasses at least twice annually around the pond area (during the growing season)                             <ul style="list-style-type: none"> <li>Cool season grasses should be mowed no shorter than 3-4"</li> <li>Remove all grass clippings from the basin</li> </ul> </li> <li>Inspect and clean any structures that may trap debris</li> <li>Monitor erosion and stabilize areas on the banks vulnerable to erosion using vegetation or rock formations</li> </ul> |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Monitor algae and insect populations (including mosquito larvae) and consult a professional in the event of nuisance issues                             <ul style="list-style-type: none"> <li>Local mosquito control commissions can help inspect for mosquito larvae and treat if needed</li> </ul> </li> <li>Remove excess sediment from the inlet and outlet pipes</li> </ul>   |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Repair any damaged structures, including grates, outflow pipes, etc.                             <ul style="list-style-type: none"> <li>Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> <li>Minimize the presence of Canada geese, whose feces contain bacteria that can be washed into local waterways, by setting up swan or dog decoys</li> </ul>   |



Photo by Corey Coyle

### THINGS TO AVOID:

- Applying fertilizer or pesticides near the pond area
- Cutting the grass too short around the pond
- Allowing Canadian geese to congregate frequently on the banks



### WHY IT'S ENHANCED:

- Native grassed buffer reduces mowing requirement and provides wildlife habitat for pollinators and other wildlife
- Better filtration of pollutants that can lead to algae blooms
- Less attractive habitat for Canada geese

Photo by Shaun Bailey

### ENHANCED PRACTICE:

## 6 Buffered Retention Ponds

### MAINTENANCE SCHEDULE

|                  |  |
|------------------|--|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Remove trash and debris from around pond, buffer, and inlets/outlets</li> </ul>   |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Monitor for functionality (appropriate water levels, etc.) in the pond, plant health in the buffer, and erosion within or near the buffer                             <ul style="list-style-type: none"> <li>Inspect the buffer to see if geese have created pathways through the vegetation and, if so, eliminate them</li> </ul> </li> <li>Keep an eye out for invasive species – if a single type of plant becomes problematic in the buffer, it may be invasive and removal may be needed</li> <li>Inspect and clean any structures that may trap debris</li> </ul> |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Monitor algae and insect populations and consult a professional in the event of nuisance issues</li> <li>Remove excess sediment from the inlet and outlet pipes</li> <li>Mow grassed buffer once in the spring before April 15th unless it's too wet (but not after that date, to protect ground nesting bird species) and once in the fall</li> <li>Cut back any existing woody debris once in the fall</li> </ul>   |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Repair any damaged structures, including grates, outflow pipes, etc.                             <ul style="list-style-type: none"> <li>Never enter a confined structure unless you have the proper training and certification to do so</li> </ul> </li> </ul>  |



# STORMWATER PRACTICE MAINTENANCE RECOMMENDATIONS:

## 7 Traditional Paved Areas

### MAINTENANCE SCHEDULE

|                  |   |
|------------------|---|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Remove trash and debris through lot sweeping or maintenance crew cleanups for commercial, public, or other heavily trafficked areas, as debris on parking lots is easily washed into waterways during storms</li> <li>Keep any catch basins or storm drains free from trash and debris</li> </ul>  |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Apply sealant or crack filler to prevent damage to paving surface (particularly asphalt) associated with water infiltration, freeze/thaw, etc.</li> </ul>  |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Repair any major cracks or potholes in surface to protect public safety and to minimize the transfer of asphalt debris from the parking lot into waterways</li> </ul>  |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Minimize heavy vehicle traffic over adjacent non-paved areas (like overflow parking on grass) to prevent compacting those soils, as compacted soils can create similar challenges for waterways as paved ones</li> <li>Apply rock salt or brine before winter storms to prevent black ice and hazardous conditions                             <ul style="list-style-type: none"> <li>Use salt only where absolutely necessary — focus on places where foot traffic is heaviest to avoid unnecessary salting that can contaminate local waterways</li> </ul> </li> <li>When major re-paving is required, consider porous pavement options and/or adjacent water recharge features, like regrading surfaces to drain to subsurface storage (ex., gravel infiltration pits)</li> </ul> |

### THINGS TO AVOID:

- Over-salting during the winter, as salt can degrade local waterways
- Washing cars, changing oil, or other practices that could result in chemical leaks on paved surfaces



Photo by Partnership for the Delaware Estuary

### WHY IT'S ENHANCED:

- Porous pavement/pavers allow rain to pass through and sink into the ground, minimizing runoff
- Some research\* has shown that porous pavement may require significantly less de-icing than traditional asphalt



A pervious asphalt basketball court in Philadelphia

Photo by Louis Cook, Phila. Water Dept.

### ENHANCED PRACTICE:

## 8 Porous Pavement/Pavers

### MAINTENANCE SCHEDULE

|                  |   |
|------------------|---|
| <b>MONTHLY</b>   | <ul style="list-style-type: none"> <li>Inspect the porous surface after storms to ensure water is properly draining through</li> <li>Manually remove trash from the surface</li> </ul>  |
| <b>QUARTERLY</b> | <ul style="list-style-type: none"> <li>Pressure wash and/or use a vacuum sweeper on the surface in order to prevent the pores from filling up                             <ul style="list-style-type: none"> <li>For interlocking pavers, the layer of stones between paver joints may need to be refilled after cleaning</li> </ul> </li> </ul>  |
| <b>ANNUALLY</b>  | <ul style="list-style-type: none"> <li>Remove leaves and any other plant material from the surface in the fall</li> <li>For pavers, manage small plant growth between the pavers as desired                             <ul style="list-style-type: none"> <li>Remove large and/or woody plant growth that grows between pavers, as it can eventually buckle them</li> </ul> </li> </ul>  |
| <b>AS NEEDED</b> | <ul style="list-style-type: none"> <li>Apply de-icing brine as needed before winter storms                             <ul style="list-style-type: none"> <li>Avoid using rock salt, and never use sand or other fine material as this can clog surface pores</li> </ul> </li> <li>Use a rubber tipped shovel or plow to remove snow                             <ul style="list-style-type: none"> <li>Alternatively, keeping the tip of the plow 1" above the paved surface (the remaining snow will melt and drain through the pores)</li> </ul> </li> </ul> |



## BONUS BMPs MAINTENANCE TIPS:

### Rain Barrels/Cisterns



Photo by Philadelphia Water Department

- Empty and clean/rinse rain barrels or cisterns once a year
- Make sure the downspouts leading to the barrel/cistern are free from clogs and debris
- Keep a very fine mesh (1/16 – 1/8" if possible) on open-top barrels to prevent creating breeding habitat for mosquitoes
- Disconnect downspouts from the barrel/cistern in the winter to prevent freezing and cracking (redirect water over grass)

### Tree Trenches/Boxes

- Water trees during dry periods between April – October for the first three years after planting
- Apply 2-4" of fresh mulch in the spring (but DO NOT pile mulch up around the base of the tree)
- Remove dead or diseased branches and weeds as necessary
- Monitor tree health for signs of disease and stress



Photo by Philadelphia Water Department

### Storm Drains



Photo by Robert Lawton

- Clear away trash and debris from around storm drains monthly
- Keep drains and drain grates free from clogs and debris
- Never allow anything to be dumped down a storm drain
- Consider involving the community in protecting storm drains — anti-dumping educational markers on storm drains, like medallions or artwork, are easy to install, can generate public awareness about stormwater, and even count towards stormwater permit compliance for municipalities.

### Green Roofs

- Conduct roof inspections at least quarterly to ensure functionality and to identify potential issues
- Inspect plants for potential fungal diseases, insect damage, and other issues regularly
- Keep all drainage areas and gutters free of plants and debris
- Water lightly only when necessary – overwatering can not only damage plants, but can also create structural hazards
- Clear away leaves and other dead plant material in the fall



Photo by Philadelphia Water Department

## HELPFUL RESOURCES

For more information on these and other stormwater management techniques, check out these resources:

### State Stormwater BMP Resources

- Pennsylvania's Stormwater PA Program – <http://www.stormwaterpa.org>
- New Jersey Stormwater Program – <http://www.njstormwater.org/>
- Delaware's Sediment and Stormwater Management Program – <http://www.dnrec.delaware.gov/swc/pages/sedimentstormwater.aspx>

### Stormwater BMP Guides & Tools

- Partnership for the Delaware Estuary's "Green Guide for Property Management" – [https://s3.amazonaws.com/delawareestuary/pdf/green\\_guide.pdf](https://s3.amazonaws.com/delawareestuary/pdf/green_guide.pdf)
- Rutgers Cooperative Extension Water Resources Program's "Green Infrastructure Guidance Manual for NJ" – [http://water.rutgers.edu/Green\\_Infrastructure\\_Guidance\\_Manual/2015-03-31\\_Manual.compressed.pdf](http://water.rutgers.edu/Green_Infrastructure_Guidance_Manual/2015-03-31_Manual.compressed.pdf)
- Delaware Department of Natural Resources and Environmental Control's "Green Infrastructure Primer" – [http://www.dnrec.delaware.gov/GI/Documents/Green%20Infrastructure/Green\\_Infra\\_Primer2016\\_FINAL%20web%20version.pdf](http://www.dnrec.delaware.gov/GI/Documents/Green%20Infrastructure/Green_Infra_Primer2016_FINAL%20web%20version.pdf)
- Pennsylvania Environmental Council's Stormwater Resources Page – <http://pecpa.org/program/stormwater/>
- Washington State Department of Ecology's YouTube videos (search their page for "stormwater maintenance") – <https://www.youtube.com/user/EcologyWA>

### Invasive Species Guidance

- New Jersey Invasive Species Strike Team – <http://www.njisst.org/>
- U.S. Dept. of Agriculture National Invasive Species Information Center – <https://www.invasivespeciesinfo.gov/>

### Other Helpful Contacts

- Local County Conservation Districts
- Township/County Engineer
- Local Environmental/Watershed Organizations
- Original BMP Installation Contractor

### TIP:

When creating a maintenance log, it can be helpful to list the contact information for these professionals in the front of the log!