# Stormwater BMP Maintenance General Guidelines

## The Importance of Maintaining BMPs

Stormwater Best Management Practices (BMPs) are various devices designed to control and treat stormwater runoff. They are crucial in protecting water quality from the impacts of development projects. If designed correctly, BMPs can also be an aesthetic asset to the development. However, no matter how well they are designed and constructed, BMPs will not function correctly nor look attractive unless they are properly maintained. Most maintenance problems with BMPs are less costly to correct when they are caught early – as the old adage goes, "an ounce of prevention is worth a pound of cure."

Regular inspection and maintenance is an ongoing legal requirement after the BMP is constructed.

### Maintenance Responsibilities

Maintenance is usually the responsibility of the owner, which in most cases is a private individual, corporation, or homeowners associations. Simple maintenance items such as minor landscaping task, litter removal, and mowing can be done by, or can **be incorporated in professional grounds maintenance contracts for the entire property, which is strongly recommended**. Maintenance needs will often be identified by a physical inspection of the BMP. See Table 1.

**Table 1**
**Required Inspection Frequency for BMPs**

| Inspections Frequency | BMPs |
|---|---|
| Monthly and within 24 hours after every rain fall greater than 1.0 inch. | Stormwater wetlands<br>Wet detention basins<br>Bioretention cells |
| Quarterly and within 24 hours after every rain fall greater than 1.0 inch. | Level spreaders<br>Infiltration devices<br>Sand filters<br>Extended dry detention basins<br>Permeable pavement<br>Rooftop runoff management<br>Filter strips*<br>Grassed swales*<br>Restored riparian buffers* |

* Although these devices require quarterly inspection, mowing will usually be done at more frequent intervals during the growing season.

To summarize Table 1, devices that include vegetation in a highly engineered system require inspection monthly and after large storm events to catch any problems with flow conveyance or vegetative health before they become serious.

All other BMPs should be inspected quarterly and after large storm events.

Although a nonprofessional can undertake many maintenance tasks effectively, a professional should be consulted periodically to ensure that all needs of the BMP facility are met. Some elements that can need professional judgment include structures, outlets, and embankments/dams by a professional engineer, as well as plant system health by an appropriate plant professional. Some developing problems may not be obvious to the untrained eye.

In addition, it is advisable to have professionals do the more difficult or specialized work. Filling eroded areas and soil-disturbing activities, such as re-sodding or replanting vegetation, are tasks that are best assigned to a professional landscaping firm. If the work is not done properly the first time, not only will the effort have been wasted, but also the facility may have been damaged by excessive erosion.

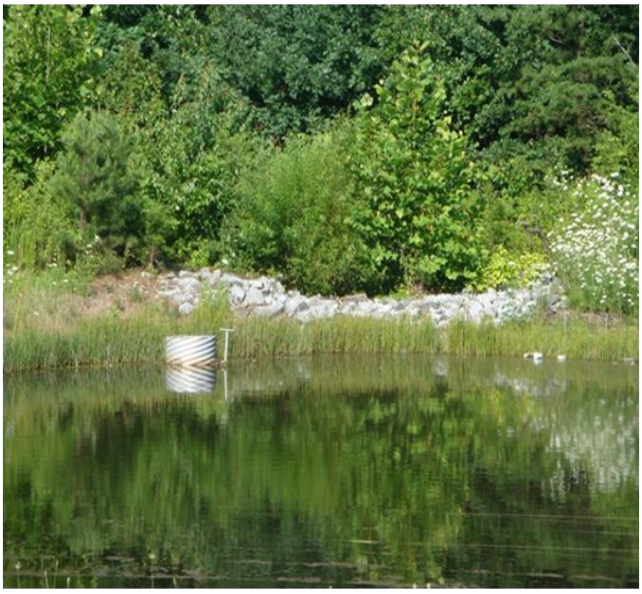
Grading and sediment removal are best left to professionals. Appropriate professionals (e.g. BMP maintenance specialists, aquatic plant specialists, etc.) should be hired for specialized tasks such as inspections of vegetation and structures.

## Summary of BMP Maintenance Tasks

### Emergency Maintenance

Maintenance after floods and other emergencies requires immediate mobilization. It can include replanting and repairs to structures. Living systems are likely to need at least minor repairs after emergencies. Following an emergency such as a flood, standing water may pose health risks because of mosquitoes. Mosquito control should be considered if this becomes a problem.

For all installations obstructions and debris deposited during storm events should be removed immediately. (Exceptions include debris that provides habitat and does not damage vegetation or divert currents to, from, or in the BMP. In fact, because of the high quality habitat that can be found in woody debris, careful re-positioning rather than complete removal may be desirable. There may be instances where debris is even added. Such locations should be noted so that this debris is not accidentally removed. Educating adjacent property owners about the habitat benefits of debris and vegetation can decrease requests for removal.)



Non-compliant pond due to vegetation growing in emergency spillway.

### Debris and Litter Removal

Regularly removing debris and litter is well worth the effort and can be expected to help in the following ways:

- Reduce the chance of clogging in outlet structures, trash racks, and other facility components.
- Prevent damage to vegetated areas.

### Sediment Removal and Disposal

Sediment gradually accumulates in many BMPs. For most BMPs, accumulated sediment must eventually be removed. However, removal intervals vary so dramatically among facilities that no “rules of thumb” are applicable. The specific setting of a BMP is important in determining how often sediment must be removed. Important factors that determine rates of sedimentation include the current and future land uses upstream and the presence of other sediment-trapping BMPs upstream.

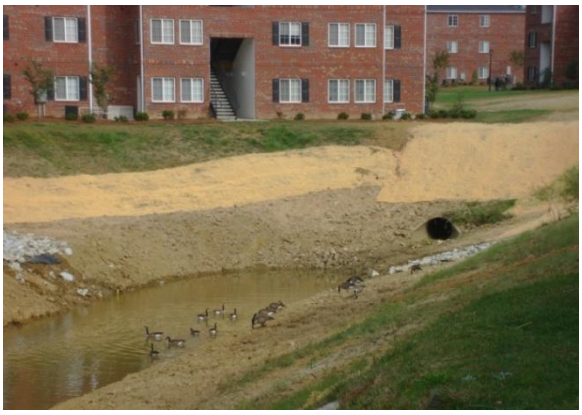
Before installing a BMP, designers should estimate the lifetime sediment accumulation that the BMP will have to handle. Several time periods may be considered, representing expected changes in land use in the watershed. To estimate sediment accumulation, first, an estimate of the long term sediment load from upstream is needed, then an

estimate of BMP sediment removal efficiency. The analysis of watershed sediment loss and BMP efficiency can be expedited by using a sediment delivery computer model.

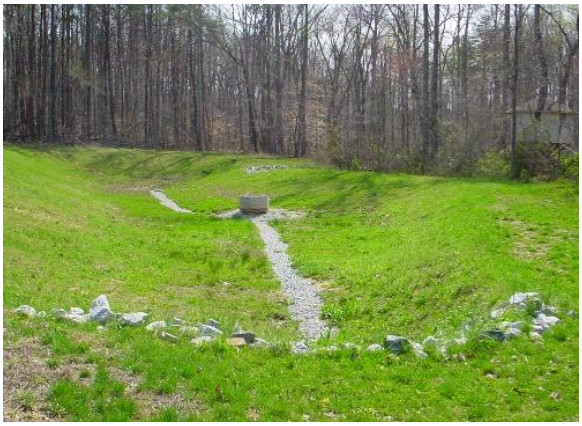
The frequency of sediment removal is then based on the sediment accumulation rate described above versus the amount of sediment storage volume that is inherently provided in the BMP without affecting treatment efficiency or stormwater storage volume. Again, the frequency of sediment removal is BMP and site specific, and could be as frequent as every couple years, or as long as 15-25 years. The volume of sediment needing to be removed and disposed of per dredging cycle is the volume calculated above multiplied by any density or dewatering factors, as appropriate.

Wet sediment is more difficult and expensive to remove than dry sediment. Ideally, the entire facility can be drained and allowed to dry sufficiently so that heavy equipment can operate on the bottom. Provisions for draining permanent pools should be incorporated in the design of water impoundments where feasible. Also, low flow channels and outlets should be included in all BMPs to bypass stormwater flow during maintenance. However, in many impoundments periodic rainfall keeps the sediment soft, preventing access by heavy equipment. In these cases, sediment may have to be removed from the shoreline by using backhoes, grade-alls, or similar equipment. Proper disposal of the sediment removed from a BMP is required. It is least expensive if an onsite area or a nearby site has been set aside for the sediment. This area must be located outside of the floodplain. If such a disposal area is not set aside, transportation and landfill tipping fees can greatly increase the cost of the BMP, especially where disposal of wet sediment is not allowed in the local landfill.

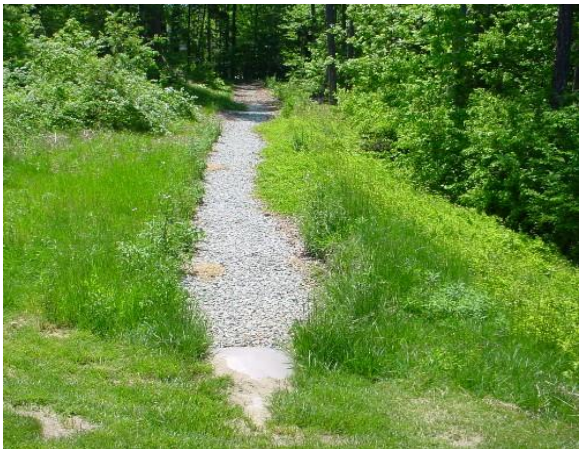
Often, the material must be dewatered before disposal, which again adds more cost and requires land area where wet material can be temporarily placed to dry.



Pond bank stabilized with erosion control matting.



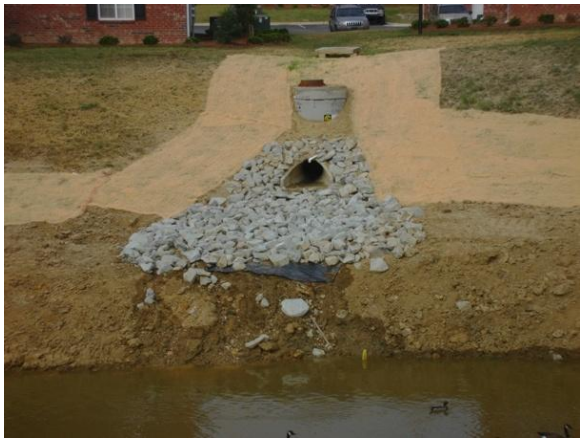
Dry detention with gravel filter strip.



Infiltration trench.

Sediment removal is usually the largest single cost of maintaining a BMP facility, so the necessary funds should be allocated in advance. Since sediment removal costs are so site specific and dependent on disposal plans, it is difficult to provide good estimates. Actual estimates should be obtained during the design phase of the BMP from sediment

removal contractors based on the planned situation. The estimates should include: mobilization expenses, sediment removal expenses, material transport expenses (if applicable), and disposal expenses (if applicable).



Erosion control measures at pond inlet.

**Stability and Erosion Control**

The best way to promote soil stability and erosion control is to maintain a healthy ground cover in and around BMPs. Areas of bare soil quickly erode, potentially clogging the facility with soil and threatening its integrity. Therefore, bare areas must be restabilized as quickly as possible. Newly seeded areas should be protected with mulch and/or an erosion mat that is securely staked. For BMP's that rely on filtration, such as bioretention facilities, it is critical that adjacent soils do not contaminate the selected media during or after construction. If the site is not permanently stabilized with vegetation when the filter media is installed, the best design practice is to specify sod or other robust erosion control practices for all slopes in and immediately around the BMP. Erosion is quite common in or around the inlet and outlet of the BMP facility and should be repaired as soon as possible. Erosion control activities should also extend to areas immediately downstream of the BMP.

The roots of woody growth such as young trees and bushes in embankments are destabilizing. Consistent mowing of the embankment controls stray seedlings that take root. Woody growth, such as trees and bushes, further away from the embankment should not pose a threat to the stability of the embankment and can provide important runoff filtering benefits. Trees and bushes should be planted outside maintenance and access areas.

Animal burrows also diminish the structural integrity of an embankment. Muskrats, in particular, burrow tunnels up to 6 inches in diameter. Efforts should be made to control animal burrowing. Burrows should be filled as soon as possible.

**Maintenance of Mechanical Components**

Each type of BMP may have mechanical components that need periodic attention. For example, valves, sluice gates, fence gates, locks, and access hatches should be functional at all times. The routine inspection, exercising, and preventive maintenance on such mechanical components should be included on a routine inspection/maintenance checklist.

**Vegetation Maintenance**

Vegetation maintenance is an important component of any maintenance program. The grasses and plants in all BMPs, but particularly in vegetative BMPs such as filter strips, grass swales, restored riparian buffers, bioretention facilities, and stormwater wetlands, require regular attention. The development of distressed vegetation, bare spots, and rills indicates that a BMP is not functioning properly. Problems can have many sources, such as:

- Excessive sediment accumulation, which clogs the soil pores and produces anaerobic conditions.
- Nutrient deficiencies or imbalances, including pH and potassium.
- Water-logged conditions caused by reduced soil drainage or high seasonal water table.
- Invasive weeds.

The soil in vegetated areas should be tested every other year and adjustments made to sustain vigorous plant growth with deep, well-developed root systems. Aeration of soils is recommended for filter strips and grassed swales where sediment accumulation rates are high. Ideally, vegetative covers should be mowed infrequently, allowing them to develop thick stands of tall grass and other plant vegetation. Also, trampling from pedestrian traffic should be prevented.

Areas immediately up- and downstream of some BMP plant installations often experience increased erosion. Although properly designed, located, and transitioned installations experience this effect to only a minor degree, all erosion should be repaired immediately to prevent spreading. Live stakes, live fascines, and other soil bioengineering techniques, possibly in combination with 3-D geotextiles, can be applied to erosion in natural drainage ways with minor grading.

It is important to note that the NC Division Of Water Quality has some specific requirements related to some management practices, such as those performed within buffers, that must be followed. In addition, any vegetation that poses threats to human safety, buildings, fences, and other important structures should be removed. Finally, vegetation maintenance activities naturally change as the project ages from construction, when the vegetation is still getting established, to a mature state.

**Maintenance of the Aquatic Environment**

An important yet often overlooked aspect of non-routine maintenance of BMPs that maintain a permanent pool of water is the need to regularly monitor and manage conditions to promote a healthy aquatic environment. An indicator of excess nutrients (a common problem) is excessive algae growth in the permanent pool of water. In most cases, these problems can be addressed by encouraging the growth of more desirable aquatic and semi-aquatic vegetation in and around the permanent pool. The plants selected should be tolerant of varying water levels and have a high capacity to incorporate the specific nutrients associated with the problem. If algae proliferation is not addressed, algae-laden water will be washed downstream during rain events and may contribute to nuisance odors and stresses in downstream aquatic habitat.

Non-compliant pond with failed riser.

**Insect Control**

Ponded water can function as breeding grounds for mosquitoes and other insects. Mosquito problems can be minimized through proper design and maintenance. The best control technique for BMPs that maintain a permanent pool of water is to ensure that it does not develop stagnant areas. BMPs with permanent pools should include a source of steady dry-weather flow. Promptly removing floatable debris helps eliminate areas where water can collect and then stagnate. In larger basins, fish that feed on mosquito larvae can be stocked. Additionally, splash aerators can be employed to prevent stagnant water; however, this requires electricity at the site, increases maintenance costs, and must be properly designed so as to not decrease the settling efficiency of the BMP.

**City of High Point Contact Information**

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|---|---|
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| Stormwater Services Division | (336) 883-3455 |
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Note: The information in this brochure was taken, with modification, from the North Carolina Division of Water Quality's *Stormwater Best Management Practices*.