



**PDHonline Course C316 (4 PDH)**

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# **Designing Bioretention Facilities**

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## Chapter 5 Environmental Outreach



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## Environmental Outreach

### Acceptance and Maintenance of Bioretention

#### 5.1 Introduction

In the preceding chapters, planning, design, construction and landscaping for bioretention were explored and defined. Proper implementation of these phases will ensure a successfully completed bioretention facility. However, even when these steps are performed exceptionally well, lack of care or knowledge about the facility after installation can render all this work fruitless. Helping developers, builders, homeowners, and property managers understand the importance of environmental outreach with respect to bioretention will alleviate this concern.

Successful bioretention depends upon proper maintenance. Unless the plants are in good health and the mulch layer is regularly replenished, the bioretention facility will not function as designed and the longevity will be diminished. Therefore, it is crucial that the homeowners and property managers ultimately responsible for this maintenance understand their stewardship responsibility. Fortunately, the maintenance requirements for bioretention facilities are both simple and inexpensive.

This chapter (together with Appendix C) provides the strategy, process and educational materials needed to ensure that maintenance responsibility and pollution prevention activities are clearly defined and communicated throughout the life of the facility. The Chapter is organized to follow the “stewardship chain” from initial site preparation through long-term maintenance. Each section delineates the necessary maintenance and communication tasks and identifies the responsible parties in addition to containing useful tips and strategies. Responsibilities are outlined for each of the parties identified below:

**Developer/Builder**

**Landscape Designer**

**Landscaper**

**Inspector**

**Salesperson/Real Estate Agent**

**Homeowner/Property Manager**

**Homeowner Association/Condominium Association**

#### 5.2 Property Development

**Developer/Builder:** Bioretention facilities are often installed during the final phase of construction (or building completion of each lot). Therefore, the builder’s first maintenance responsibility is to protect any soils that will be used for bioretention from

compaction or unnecessary disturbance. Areas where pre-existing grading is to be preserved or where existing vegetation is to be saved will also require special care. Because "*micro-grading*" is so important for successful bioretention, the developer/builder needs to clearly communicate with the contractor to ensure the desired result.

Sometimes, the bioretention area is used for sediment and erosion control or even sediment traps. When is this the case, see Chapter 4 for important contamination control and bioretention area preparation for conversion to the final facility.

**Landscape Designer:** Bioretention IMPs with naturalistic designs will be more densely planted than conventional landscapes. Plants will be in drifts or clumps rather than formal beds. Meadow seeding requires specialized techniques. The designer is responsible for communicating these requirements to the installer. Since mulch forms an important treatment component of bioretention, the designer needs to clearly communicate with the contractor to ensure the desired result.

**Landscaper:** The landscaper is responsible for plant maintenance during IMP construction.

### 5.3 Completion of Facility Construction

**Landscape Designer & Inspector:** A post-construction bioretention checklist follows:

- Storm water is flowing correctly; neither bypassing nor overwhelming the facility; runoff flows onto the whole facility;
- Water ponds in the facility, and the ponding depth is between 3-6 inches;
- Ponding lasts from 4-6 hours or less;
- Plants are correctly installed and in good condition; areas with plugs or seeds have been stabilized; and
- There is a 2-3 inch deep mulch layer except in areas that have been seeded or plugged; mulch is not heaped around the base of plants.

### 5.4 Sale of Property

**Developer/Builder:** Until the property is sold, the developer/ builder is responsible for providing *day-to-day* maintenance of the bioretention facility or contracting with a **Landscaper** for maintenance as outlined below.

**Real Estate/Salesperson:** The salesperson is responsible for informing the potential home purchaser about the bioretention facility. Informational brochures are available through the Department of Environmental Resources at no charge. These brochures are intended to be distributed to potential buyers. During closing of a property, the homeowner documents must include legal documents concerning the bioretention facility.

### 5.4.1 Maintenance Checklist for Bioretention Facilities

- ✓ **Weeding-** As with any garden, bioretention requires weeding of unwanted plant materials. Mulching helps to reduce weed growth and retain moisture in the soil. Weeding should be accomplished routinely and at least monthly.
- ✓ **Watering-** If plants wilt during the heat of the day, but recover in the evening, watering is not necessary. The plants are simply conserving moisture. If they do not recover, watering is indicated. Another good rule of thumb is to stick a pencil or screwdriver about four inches into the soil. If the soil is moist at that depth, watering is not needed. If the soil is dry, and the shrubs or trees were planted within the last three years, watering is necessary.
- ✓ **Fertilization-** In traditional, intensively cropped landscapes, soil fertility (and especially the level of available nitrogen) is considered the limiting factor to plant growth. By design, however, bioretention facilities are located in areas where nutrients (especially nitrogen) are significantly elevated above natural levels. Therefore, it is unlikely that soil fertility will be the limiting factor in plant growth, and thus fertilization would be unnecessary. Excess fertilization, (besides compromising the facility's pollutant reduction effectiveness) leads to weak plant growth, promotes disease and pest outbreaks, and inhibits soil life.

If soil fertility is in doubt, a simple soil test can resolve the question. If fertilization should become necessary, an organic fertilizer will provide nutrients as needed without disrupting soil life.

- ✓ **Mulching-** The mulch materials placed in the facility will decompose and blend with the soil medium over time. Typically, mulch material should be re-applied once every six months. The depth of the mulch layer should be no more than 3". Mulch applied any deeper than three inches reduces proper oxygen and carbon dioxide cycling between the soil and the atmosphere, and keeps plant roots from making good contact with the soil. The mulch layer provides an important role in the bioretention physical properties for



**Fig 5.1: Even in the winter months, bioretention is effective for treating stormwater while providing visual interest.**

removing heavy metals from the system.

- ✓ **Dividing & Replanting-** The properly designed facility should thrive and allow planting materials to expand and propagate, eventually becoming overcrowded. If this occurs, perennial plants should be divided in spring or fall. Plants that do not perform well, or die, should also be replaced.
- ✓ **Trimming and Harvesting-** Current practice is to leave ornamental grasses and perennial seed heads standing to provide winter interest, wildlife forage, and homes for beneficial insects. Plants should not be cut back until spring when new growth commences, and even then it is only done for neatness, it does not impact growth. Plants may be pinched, pruned, sheared or dead-headed during the growing season to encourage more flowering, a bushier plant, or a fresh set of leaves. Diseased or damaged plant parts should be pruned as they occur, and if a plant is pest-infested, then perform cleanup in fall to deny the pest a winter home. Trees and shrubs may be pruned for shape or to maximize fruit production. Consult Cooperative Extension's Home and Garden Information Center (1-800-342-2507) for the best time to prune particular species.
- ✓ **Standing Water Problems-** Bioretention facilities are designed to have water standing for up to four hours. If this period is routinely exceeded, the facility may not be functioning properly. Should standing or pooling water become a maintenance burden, minor corrective action can usually correct it. Pooling water is usually caused by clogging or blockage of either the surface layer or fines obstructing the filter fabric used between the gravel bed/underdrain and the surrounding planting soil. The surface blockage problem may be corrected by removing the mulch layer and raking the surface. For blocked filter fabric, use lengths of small reinforcing bar (2'-3' #4 rebar) to puncture the fabric with holes every 1' on center. If the soils themselves are causing the problem, punch holes in the soil or optionally, install a "sand window" at least 1 foot wide running vertically to the underdrain system elevation. In a worst case scenario, the entire facility may need to be re-installed. In any case, contact the Department of Environmental Resources for an evaluation of the facility and recommendations on how to correct the situation.
- ✓ **Trash and Debris-** Runoff flowing into bioretention facilities may carry trash and debris with it, particularly in commercial settings. Trash and debris should be removed regularly both to ensure that inlets do not become blocked and to keep the area from becoming unsightly. For more information on litter control and volunteer cleanup programs contact Citizens Concerned for a Cleaner County (CCCC) and DER's Office of Recycling.
- ✓ **Pet Waste-** Prince George's County has a "pooper scooper" ordinance. Pet waste should not be left to decay in bioretention facilities because of the danger of

disease-causing organisms. EPA estimates that the droppings from 100 dogs over 2-3 days can contribute enough bacteria to a small lake or bay's watershed to temporarily render the water unsafe for swimming. Seattle estimates that the city's dogs and cats generate as much waste as a city of 50,000 people.

#### 5.4.2 Maintenance Schedule for Bioretention

Table 5.1 is provided for guidance with respect to bioretention facility operation (see page 5-8). The schedule should be used as a guide only. The combination of diligent maintenance and simple pollution prevention practices will provide a superior system of water quality protection over conventional approaches.

#### 5.4.3 Property Owner Notification Concerning Bioretention Practices

**Salesperson/Real Estate Agent:** The salesperson has the critical responsibility of introducing the buyer to the concept of bioretention and acquainting the prospective homeowner with his or her maintenance responsibilities. DER has appropriate educational materials, which are available in bulk for distribution. These materials will explain what pollution prevention measures can be taken and where to seek technical assistance from County or State agencies. Companies, of course, may also wish to create their own materials that emphasize rain gardens as a selling point. If the educational material is custom-designed, it should contain the same basic guidance to the property owner that is provided in the County's brochures.

DER can also direct salespeople to supplemental resources on pollution prevention and environmentally sound yard care such as the BayScapes program, Cooperative Extension, *Better Backyard* and our Rain Garden Rainbows Program. Pollution prevention can simply be stated as the proper use, handling and disposal of chemicals and materials to reduce the introduction of pollutants into the environment. Prevention usually means reducing the quantity and the frequency of use of potential pollutants: For example, lawn care practices that promote the use of less fertilizer, applied only once a year (in the fall) and recommend the use of pesticides when there is a known problem (avoid preventative applications). This approach translates into saving both time and money for the property owner/manager.

There are also two more formal notification mechanisms. First and most common, is the individual property maintenance agreement. This document will "run with the land" to ensure that the current (and all future) property owners will be aware of their bioretention maintenance responsibilities. Second, is the homeowner association covenants. These covenants will explain the HOA's obligation for maintenance of common open space and its role in community education and enforcement of community standards.



### Bioretention Maintenance Schedule

<b>Table 5.1: Example Maintenance Schedule for Bioretention Areas</b>			
Description	Method	Frequency	Time of the year
<b>SOIL</b>			
Inspect and Repair Erosion	Visual	Monthly	Monthly
<b>ORGANIC LAYER</b>			
Re-mulch any void areas	By hand	Whenever needed	Whenever needed
Remove previous mulch layer before applying new layer (optional)	By hand	Once every two to three years	Spring
Add fresh mulch layer	By hand	Every six months	Spring and Fall
<b>PLANTS</b>			
Removal and replacement of all dead and diseased vegetation considered beyond treatment	See planting specs.	Twice a year	3/15 to 4/30 and 10/1 to 11/30
Inspect for disease/pest problems	Visual	Once a month (average)	Inspect more frequently in warmer months
Determine if treatment is warranted; use least toxic treatment approach.	By hand	N/A	Varies, depends on disease or insect infestation
Watering of plant material shall take place for fourteen consecutive days after planting has been completed unless there is sufficient natural rainfall.	By hand	Immediately after completion of project	N/A
Remove stakes and wires after 6 months	By hand	After trees have taken root	Remove stakes and wires when possible, but at least by six months time
Remove Tags	By hand	At end of warrantee period	



**Fig 5.2:**  
**Handy**  
**brochures**  
**help explain**  
**bioretention**

Each development is different. Developments may need to have their own unique blend of educational materials, agreement conditions and pollution prevention programs depending on the type of bioretention practice used. The educational requirements and approach of each development for maintenance and pollution prevention will be determined during the preliminary approval stages of the subdivision, roadway and stormwater management plans. The final form and the specific conditions for the maintenance agreement can not be determined until such time as all public/private infrastructure maintenance issues have been agreed upon. At that time, the

responsibilities will be clear and then must be codified in writing through the various agreements and HOA covenants described in this chapter.

For residential developments the builder/developer must distribute the public educational materials by keeping them on display at the sales office and available for inspection by perspective purchasers. The builder/developer must provide all purchasers a package containing the maintenance agreements and educational materials at settlement or shortly thereafter. These materials may include (but are not limited to) the following:

- Site plans showing bioretention areas
- Easements (if any)
- Bioretention design manual
- Bioretention development brochure
- Homeowner rain garden maintenance manual
- Car care brochure
- Yard Care brochure
- Reporting pollution problems fact sheet
- County information services numbers

## 5.5 Easement Documentation Requirements

When bioretention facilities are located on private residential lots, serving drainage originating from that same lot, no easements or surface drainage easement are required.

If drainage originates from another lot, then *surface drainage easements* will be required. The surface drainage easement shall extend to, and encompass the bioretention IMP area. Surface drainage easements are only required whenever there is cross-lot drainage. This is true for conventional grading as well as LID grading practices.

In all cases where bioretention is located on a private lot, no *storm drainage easements* are required.

## 5.6 Responsibility for Facilities Transferred to Property Owners and HOAs

### 5.6.1 Maintenance Agreements and Conditions: Single Family Residential Property Owner Agreement

**Homeowner:** The Property Owner Agreement notifies the property owner and enumerates his/her maintenance responsibilities for all bioretention practices on their property and where applicable within the public right-of-way or easements. All single family homeowner agreements must be recorded in the Land Records. This is to ensure that there is a notification mechanism for future property owners. The list of conditions shown below is illustrative and should not be considered as an all-inclusive menu of conditions. Not all conditions will be applicable for all types of residential developments, as there could be any number of ways to share maintenance burdens between the property owner, homeowner associations and the local government. The specific conditions will be developed during the review and approval process of each development site. The conditions may include:

- Keep open swales and drainage easements free of trash and debris.
- Repair any erosion of the swales.
- Repair erosion, ruts or bare spots on the grassed shoulder of the road and on your property.
- Keep culverts and appurtenance free of debris blockages to maintain unobstructed flow.
- Do not obstruct the flow of runoff through the property within swales or drainage easements with fill or structural improvements.
- Do not cause alterations of the flow of water onto adjacent properties in a manner that would damage adjacent properties.
- Maintain all landscaped areas in accordance with County (or others) guidelines.
- Adopt reasonable and practicable pollution prevention measures in accordance with County programs.

For general bioretention maintenance guidance see sections 5.4.2-3 in this chapter.

### 5.6.2 The HOA Agreement, Covenants and Responsibilities

**Homeowner Associations:** The HOA would be responsible for maintenance of all bioretention practices within common areas or areas under their control. The HOA will

act as primary enforcer to ensure that bioretention practices are maintained in common areas and that property owners are encouraged to properly maintain any private bioretention area and meet the conditions of the homeowner agreements. The HOA will determine its own approach to encourage property owners to adhere to bioretention maintenance and pollution prevention practices and develop community standards to be used.

As a guide, the HOA covenants should address the following:

Establish an environmental committee to provide education programs in cooperation with the County or other agencies; establish community standards for maintenance of bioretention practices and other environmental features; develop strategies to ensure proper maintenance of bioretention practices; promote pollution prevention measures and educate new residents on bioretention responsibilities. The environmental committee will help foster stewardship of the bioretention facility and accomplish the following:

1. The HOA environmental committee will help identify the maintenance needs of individual bioretention facilities and assist homeowners with determining appropriate maintenance activities that should be performed.
2. HOA may want to provide for more proactive steps for enforcement of bioretention practices through special powers to assess fees or fines to ensure compliance. Chiefly, however, the HOA environmental committee authority should be administered on a cooperative level.
3. Provisions for proper maintenance of all bioretention practices under the HOA's purview can be included in the homeowner agreement once the bioretention maintenance practices have been approved.
4. The Department of Environmental Resources will provide assistance in the form of education of the committee members about the environmental concerns. DER can provide various documents and conduct presentations about not only bioretention, but also many other activities associated with common yard care practices.

### 5.6.3 Commercial/Industrial Development

**Home Owner/Property Manager:** In general, it has been a long-standing requirement to have a maintenance agreement for on-site stormwater management for commercial/industrial properties. The standard on-site facility maintenance agreements will be used for bioretention practices with modifications as necessary. The major change will be with the educational program to promote pollution prevention and to ensure the owner/property manager is aware of the proper maintenance procedures for the bioretention practices. The following information should be supplied to the property owner/manager:

- Fact sheets on bioretention maintenance.
- Fact sheets on pollution prevention.

- Fact sheets on the NPDES stormwater discharge requirements.
- Copy of the County's pollution laws.

## 5.7 Enforcement Of Property Owner Responsibilities



**Fig. 5.3: Most homeowners are pleased to help the Bay by maintaining their bioretention facility**

It is not the County's intent to routinely regulate property owners' activities to ensure proper maintenance of bioretention practices and adoption of pollution prevention measures. Instead, the County requires an effective education program to ensure that all parties have an adequate understanding of maintenance responsibilities and pollution prevention measures.

County enforcement actions would only be taken in extreme situations where public, health, safety and welfare were jeopardized- for example, the illicit use of banned chemicals, illegal discharges or dumping. In some cases, it may be necessary for the County to take action where a property owner has totally failed to keep up their property. In such instances, the County has sufficient authority under existing regulations to force property owners to share in the cost of corrective measures. It is anticipated, however, that community self-regulation through a homeowners association and the economic and environmental incentives the bioretention approach offers will motivate the property owner to perform the required maintenance and adopt pollution prevention measures.

## 5.8 Maintenance Covenants for Bioretention

While an easement is not always required for bioretention facilities located on private lots, maintenance covenants *are* required. A sample maintenance covenant document for use with bioretention and other LID IMP's is provided in Appendix B.

## 5.9 Health, Safety, and Welfare with Respect to Bioretention

With all stormwater practices, misconceptions abound concerning cost, performance, nuisance pests, etc. The bioretention IMP is no exception. To clarify these concerns, the following bulleted items have been researched and presented here:

1. Bioretention areas are **not** ponds. Bioretention is designed to store water *temporarily* (usually less than 4 hours) before the water infiltrates into the ground.

2. Bioretention areas will not provide a convenient breeding ground for mosquitoes. Mosquitoes need at least 4 days of standing water to develop as larva.
3. Bioretention does not encourage nuisance pests to inhabit the property anymore than regular landscape features and flower gardens. In fact, bioretention can be designed to attract preferred creatures such as butterflies.
4. Bioretention does not present a safety hazard. Unlike stormwater management ponds, bioretention has minimal safety and liability issues.
5. Maintenance costs associated with bioretention are lower than conventional stormwater management. This is chiefly due to the facilities being located at the source rather than at the end of pipe. The smaller drainage area means that the facility is much smaller as well, therefore, maintenance is easier to perform. In addition, bioretention facilities are non-structural IMP's, reducing costs associated with structural components.

### **5.10 Related Environmental Programs and Funding Opportunities**

Homeowners and HOA's interested in mitigating environmental impacts from their community may consider other available programs. These programs offer limited funding opportunities and technical guidance to help the homeowner achieve an aesthetically pleasing, low maintenance, environmentally friendly landscape.

There are a number of programs at the State, Federal and Local level that can dovetail nicely with the use of bioretention. The USEPA, Maryland Department of the Environment, and the Prince George's County Government have recognized Bioretention as a viable stormwater management IMP. Furthermore, bioretention may be integrated seamlessly into the following programs:

➤ Backyard Conservation Program

Contact: Maryland State Natural Resource Conservation service Office  
(410) 757-0860

➤ Backyard Wildlife Habitat Program

Contact: National Wildlife Federation  
(703) 790-4434

➤ BayScapes

Contact: U.S. Fish and Wildlife Service, Chesapeake Bay Field Office  
(410) 573-4500

➤ Wildlife Habitat Incentives Program

Contact: Maryland State Natural Resource Conservation Service Office  
(410) 757-0860

➤ Wild Acres

Contact: Maryland Department of Natural Resources- FSSEC  
(410) 260-8522



**Fig 5.4: Paul Desousa explaining the principles of bioretention in one of many workshops conducted by DER.**



**Fig. 5.5: Students Planting a Rain Garden**



**Fig 5.6 Sharon Meigs helps students become environmental stewards**