

Stream Restoration Monitoring Protocol:

The District's Department of Energy and Environment (DOEE) proposes the following stream restoration monitoring protocol in order to ensure the success of stream restoration projects. DOEE believes that this protocol can be implemented in a timely and cost effective manner.

The protocol focuses on assessing the stability of the restoration project, specifically stream banks, where the large loads of nitrogen (N), phosphorus (P), and total suspended solids (TSS) come from in urban watershed and stream systems. By developing a protocol that focuses on bank stability, vegetative cover, and in-stream structural integrity a clear picture will be developed as to whether or not the restoration project is meeting its aimed goals.

This general protocol allows for local agencies to amend and adapt this protocol per stream. The protocol should be seen as a baseline guide for what would be required to ensure projects are functioning properly localities should also monitor for other parameters when time and money allows within the stream system such as water quality, fish populations, and macroinvertebrates.

- I. Pre-Project Assessment
 - a. Photo survey of gully and stream conditions (with stations noted for each photo)
 - b. Detailed survey of existing conditions
 - c. Permitted Plans (existing and proposed conditions)
- II. Post-Implementation Geomorphic Assessments
 - a. As-built Drawings
 - b. Annual Longitudinal Profile for Regimented Reaches (for 5 years)
 - i. Profiles should be overlaid with each other on successive years
 - c. Annual Regimented Cross Sectional Profiles (for 5 years)
 - i. Profiles should be overlaid with each other on successive years
- III. Post-Implementation Photographic Survey (for photo survey example see Appendix A)
 - a. Year One: Photograph Features Every 3 Months
 - i. Field notes on key features (in-stream structures, stream banks, vegetation, etc.), potential weak points, and corrective actions needed
 - b. Year Two-Five: Photograph Annually

- i. Field notes on key features (in-stream structures, stream banks, vegetation, etc.), potential weak points, corrective actions needed, and signs of progressive development

Photo Documentation Guide

General Notes and Comments: Urban stream restoration aims to restore a degraded stream often with issues related to stream bank erosion and loss of habitat conditions. The early years of these projects are when the systems are most vulnerable. More frequent monitoring is thus needed in the early years to identify any unforeseen changes to the restored system could cause instability and threaten the success of the project.

Photo documentation Protocol:

A. Pre-restoration Photo Survey

B. Initial Post-Restoration Photo Survey

1. Layout a tape measure down the thalweg of the stream.
2. Take photos of each key feature and mark the station where the photo was taken for each feature
3. Take notes about key characteristics for each feature (appearance, stability, vegetation)
4. Identify potential needs for further observation or corrective action
5. Fill out spreadsheet and add photos to field notes document

C. Subsequent Photo Survey Visits





1. Bring a printed copy of initial survey sheet with photos
2. Layout tape measure along same stream bank
3. Take photos at same stations as in initial survey (look at previous survey photo from each station to ensure photo is at appropriate angle)
4. Document observations at key features; identify changes/adjustments; and propose corrective actions needed (if necessary)
5. Update spreadsheet with photos from previous site visit lined up side-by-side





D. Annual Report

1. Compare start of year to end of year
2. Document key feature changes and corrective actions taken
3. Select several photos from locations that appropriately convey the stability or adjustments over the course of the year

What to Photo Document & Take Note of:

- **Pools:** Pools throughout the project area vary in area and depth and will undergo a dynamic process with some sedimentation and filling followed by some clearing of the pools. It is important to document such changes because there is no upstream sediment source and if the weirs and pools have any “blow-outs” it could cause project failure. Pools are also prime habitat areas so it’s important to look for aquatic species.
- **Weirs:** The weirs consist of large boulders, cobble, and sand and should be monitored for stability. Should the boulders or cobble shift or migrate too much it could threaten the stability of the system. The weirs function to hold water creating pools and allowing both slow seepage of water from upstream to downstream pools through the weirs and over the weirs in high flow or if the water table is elevated. Photo documenting the weirs is extremely important as the boulders and cobbles hold the system together, create relative roughness, and help dissipate stream energy.
- **Sediment:** Over the first few years of these systems sediment in the form of sand will shift around. The weirs do have filter fabric on the upstream side to prevent sand getting washed through and overtime the sand will settle and will be held steady by the expanding root structure of the trees and shrubs. However if too much sand migrates downstream the pools would fill and/or the integrity of the system can be compromised.
- **Vegetation:** An important component of all restoration projects is the vegetation in the riparian corridor. Underground the root system should become connected to the water table which will allow for both sustained growth and nutrient uptake. The trees and shrubs will also provide canopy cover over the stream reach helping to keep the water cool for better water quality conditions. Without the ability to water plants it is important to monitor vegetation to ensure that the trees have enough water to grow and that deer browse does not threaten their survival.
- **Flow:** RSCs are designed with one of their objectives to elevate the water table over time. While some RSCs are meant to be ephemeral systems others can become perennial streams. It’s important to note rain events that occur in between monitoring visits to get a better sense of whether the RSC system is ephemeral or if it transitions into a perennial stream. Additionally, observations should be made as to where the flow is passing over the weirs. Flow is supposed to either seep through the weirs in dry times or pass over the center part of the weirs during high flow events. Should flow seem to be headed in a different direction this should be cause for concern because if flow migrates around a weir it could cause scouring and compromise the weir or divert the flow around the system as a whole.

Station	Feature	Comments	Corrective Action Needed		
				March 2012	August 2012
0+10	Pool #1	<ul style="list-style-type: none"> • Deep wide pool • Water lily • Aquatic grasses appear healthy • Clear water 	None		
0+24	Weir #1	<ul style="list-style-type: none"> • Large stable boulders • Good riffle cascade into downstream pool • New large woody debris • New lily vegetation • Healthy riparian growth 	None; monitor vegetative groundcover to ensure plant growth		

	Pool #2	<ul style="list-style-type: none"> • Good stable pool • Vegetation within and outside • Clear water 	None; monitor vegetation		
	Weir #2	<ul style="list-style-type: none"> • Good stable condition • Low to no flow over weir 	None; monitor vegetation		

GOVERNMENT OF THE DISTRICT OF COLUMBIA
Department of Energy and Environment



Bioretention/Planters Maintenance Inspection Report		
Name/Facility Address:		File/Plan no.
Owner/Agent:		Ward:
Mailing Address:		
Phone/Email		
Date/Weather		
Maintenance Item	Yes/No/N/A	Comments
1. Inlets and Drainage Area		
Inlet type(s)		
Inlet repair needed		
Pre-treatment clear of debris/sediment		
Evidence of erosion in drainage area		
Drainage area clear of trash/debris/clippings		
Stone weir sediment accumulation		
2. Bioretention Facility		
Sediments and trash accumulation		
Filter surface clogging		
Overflow clear of debris		
Erosion in facility		
Inadequate mulch thickness		
Outlets in good condition		
Outlets repair needed		
Underdrains/Observation wells/Clean-outs		
Dewaters between storms within 48 hours		
3. Vegetation		
Dead or diseased plants		
Stakes and wires		
Inadequate watering		

Actions to be Taken:

RiverSmart Homes

Clean Water Starts in Your Yard

Tree Inspection Report

Site Address: _____

Name of Inspector: _____

Type of Installation: _____

Date of Site Visit: _____

Photo

Check if completed:

Tree is alive and thriving, appears free of disease.

Notes: _____

Area around tree is mulched and weeded.

Notes: _____

A water bag is present around the base of the tree.

Notes: _____

Tree is 10" from the foundation of a house.

Notes: _____

Comments: _____

Circle appropriate ranking below

0	No tree present at specified location or tree has died.
1	0-25% or less of the plant material is alive. Tree is badly in need of water, weeding, and/or mulching.
2	26- 50% of plant material looks alive. Tree is in need of water, weeding, and/or mulching.
3	51-75% of plant material or tree appears alive.
4	More than 75% of plant material is alive, but could use some light mulching or weeding.
5	Tree thriving.

Rain Barrel Inspection Report

Site Address: _____

Name of Inspector: _____

Number of Barrels: _____

Date of Site Visit: _____

Photo

Installation Site

Rain barrel is elevated and level.

Notes: _____

Rain barrel is located near vegetation.

Notes: _____

Rain barrel is oriented so homeowner can easily remove diverter to clean filter.

Notes: _____

Inlet

Downspout is connected and aligned properly to rain barrel inlet.

Notes: _____

The inlet is clean and clear of obstructions and debris (leaves, etc.)

Notes: _____

Overflow

Rain barrel's overflow is secure and routed away from the house's foundation.

Notes: _____

The overflow is clear and unobstructed.

Notes: _____

Filter

A filter is present on the inlet.

Notes: _____

The filter is clean and clear of debris (leaves, etc.)

Notes: _____

Comments: _____

Circle appropriate ranking below

0	No hose, no downspout disconnect, overflow is not directed away from house, no vegetation nearby, barrel is not level/elevated
1	Filter has not been cleaned, barrel appears unused
2	
3	Filter moderately clean. Vegetation within reach of hose, but further than 15' away.
4	
5	Elevated and level, downspout connection secure, overflow is directed away from house/structure, vegetation nearby, filter clean, hose attached.

Rain Garden Inspection Report

Site Address: _____

Name of Inspector: _____

Contractor: _____

Date of Site Visit: _____

Installation Photo (can be acquired from ACB)

Site Visit Photo

Placement

Rain garden is a minimum of 10 feet away from any existing foundation or retaining wall.

Notes: _____

Downspout is extended into rain garden at a 2% grade down and away from the house.

Notes: _____

Content

Bioretention soil mix ratio is 50% sand, 25% topsoil, 25% compost/leaf mulch.

Notes: _____

Rain garden is at least 18-24" deep.

Notes: _____

Rain garden has a 2-3" hardwood mulch layer.

Notes: _____

Downspout outfall into the garden is protected (i.e. covered with river rock).

Notes: _____

Plants native to the Chesapeake Bay were used.

Notes: _____

Plant material totals at least 22 gallons (size of perennials can be substituted at a 2 quart: 1 gallon equivalency). Each rain garden must have a minimum of 2-3 shrubs at 3 gallons each.

Notes: _____

A 3-6" berm is present on the downslope side of the garden.

Notes: _____

Garden has at least 6" of ponding depth. If garden location is flat, ponding depth is greater than 6".

Notes: _____

Maintenance

Inflow is covered with river rocks to disperse water (but not block it from entering the garden)

Notes: _____

Connection at downspout is secure

Notes: _____

Garden is free of weeds

Notes: _____

Plants are alive and thriving.

Notes: _____

Comments: _____

Circle the appropriate ranking below	
0	This task has not been completed, plant material has died or feature has been removed. Signs of significant erosion. Weeds have taken over garden.
1	0-25% or less of the plant material is alive. Garden is badly in need of water, weeding, and/or mulching.
2	26- 50% of plant material looks alive. Garden is in need of water, weeding, and/or mulching.
3	51-75% of plant material or tree appears alive. Garden could use moderate mulching or weeding.

4	More than 75% of plant material is alive, but could use some light mulching or weeding.
5	Garden is thriving: it looks healthy and alive, mulch is at least 3" deep, few or no weeds present.

Impervious Surface Removal & Replacement Project Inspection Report

Site Address: _____

Name of Inspector: _____

Contractor: _____

Date of Site Visit: _____

- Installation Photo (can be acquired from ACB)**
- Site Visit Photo**

Check if completed:

- Final installed product is pervious (either pervious pavers or planting beds/grass).

Notes: _____

- Permeable paver system is not sloped towards house.

Notes: _____

- Downspout piping is not perforated within 10 feet of house.

Notes: _____

- If a downspout is routed into the permeable paver system, a filter is installed on that downspout.

Notes: _____

Comments: _____

Circle the appropriate ranking below

0	This task has not been completed, or feature has been removed. Permeable pavement clogged with sediment.
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1	
2	Pavement has not been maintained, potential for permeable pavement to clog apparent.
3	Signs of clogging in the permeable pavement.
4	
5	Permeable pavement is clean and functioning/area is re-vegetated.

BayScaping Inspection Report

Site Address: _____

Name of Inspector: _____

Contractor: _____

Date of Site Visit: _____

Installation Photo (can be acquired from ACB)

Site Visit Photo

Check if completed:

BayScape garden replaced existing lawn area and encompasses a minimum of 120 square feet.

Notes: _____

Plants native to the Chesapeake Bay region were used in the BayScape garden.

Notes: _____

Plant material totals 34 gallons for 120 square feet (size of perennials can be substituted at a 2 quart: 1 gallon equivalency).

Notes: _____

BayScape garden has a minimum 2-3" hardwood mulch layer.

Notes: _____

Garden is clear of weeds and there is no other encroaching vegetation (turf, English Ivy, etc.).

Notes: _____

Plants are alive and thriving.

Notes: _____

Circle the appropriate ranking below

0	This task has not been completed, plant material has died or feature has been removed. Signs of significant erosion. Weeds have taken over garden.
1	0-25% or less of the plant material is alive. Garden or tree is badly in need of water, weeding, and/or mulching.
2	26- 50% of plant material looks alive. Garden is in need of water, weeding, and/or mulching.
3	51-75% of plant material or tree appears alive. Garden could use moderate mulching or weeding.
4	More than 75% of plant material is alive, but could use some light mulching or weeding.
5	Garden is thriving. Feature looks healthy and alive, mulch is at least 3" deep. Few or no weeds present.