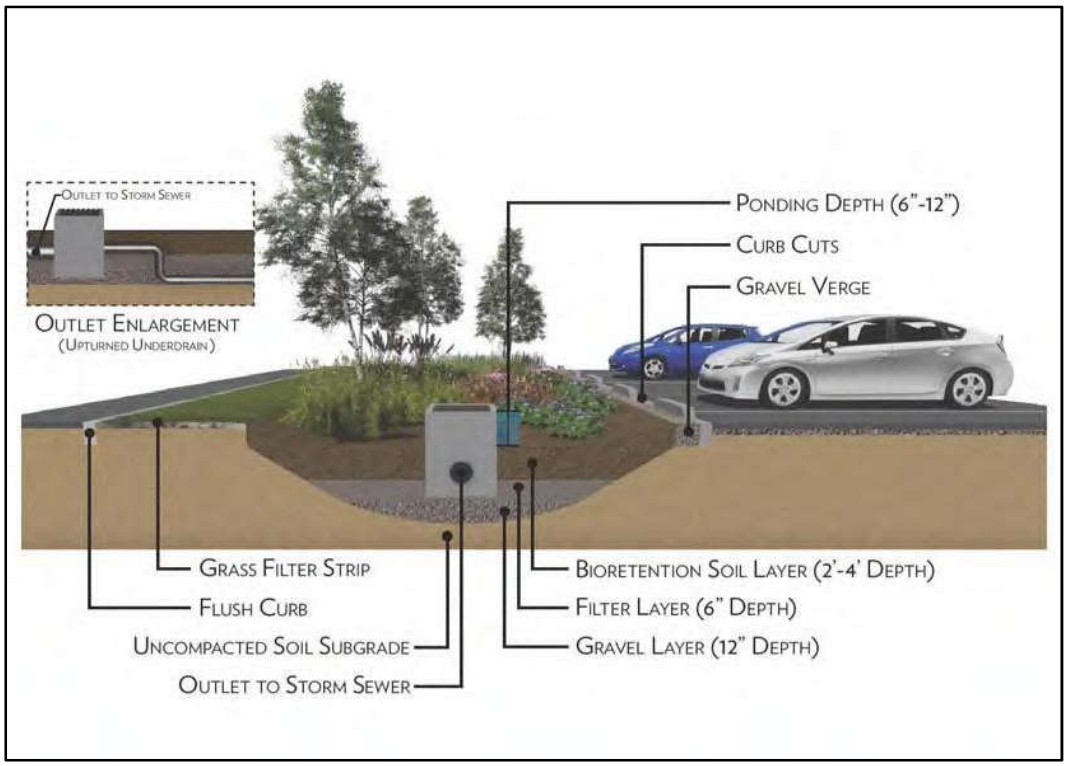
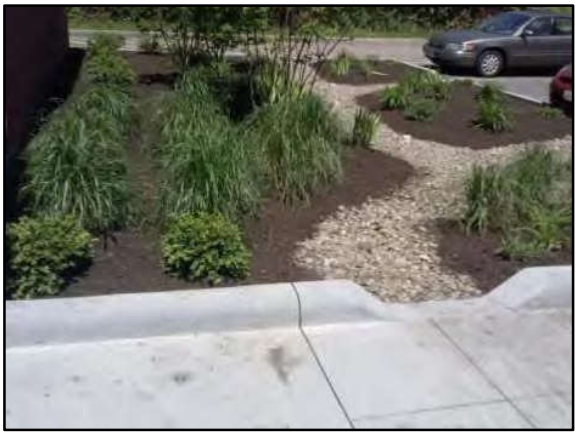
Bioretention Area

Bioretention areas are depressed areas that allow shallow ponding of stormwater runoff that utilize specified soil media, mulch and vegetation to capture and treat stormwater runoff from impervious surfaces such as parking lots and rooftops. The soil media, mulch and vegetation filter pollutants to improve water quality within urban environments. The specified soil media, composed of sand, is placed over layers of sand, pea gravel and gravel within the depression which enables ponded stormwater runoff to be treated and filtered and before either soaking into the underlying soils or leaving through an underdrain pipe. Underdrains may be installed to drain the bioretention area to local sewers or appropriate outlet. Bioretention areas are planted with specific types of plant material that can withstand both wet and dry weather conditions. Recommended plant material information for Bioretention Areas can be found in Appendix 5.



Typical bioretention area cross-section view. Credit: Chagrin River Watershed Partners, Inc.



*Planted bioretention area with **sidewalk curb cut** in foreground. Stormwater runoff is conveyed through gravel to shallow depression of bioretention area. Credit: Northeast Ohio Regional Sewer District*

***Weeds and untrimmed plantings** prevent stormwater runoff from entering the bioretention area from the curb cut. Credit: Northeast Ohio Regional Sewer District*

*Stormwater flow will be blocked by the dead vegetation on the outlet **catch basin grate**. Credit: Chagrin River Watershed Partners*

*Erosion of side slopes and subsequent **sediment accumulation** within bioretention area and contribute to clogging issues. Credit: Summit Soil & Water Conservation District*

MAINTENANCE REQUIRED WHEN:

- Standing water is visible 48 hours after a rain event.
- Erosion is visible within the bioretention area, or on the slopes and inlets leading into the bioretention area.
- Vegetation, sediment or debris is blocking inlets or outlets.
- Vegetation is wilting, discolored, or dying.
- Foul odors present.
- Sediment has accumulated over the mulch or soil media.

Recommendations for Routine and Non-Routine Maintenance

The following section lists general recommendations for routine and non-routine maintenance items. Some routine maintenance items are completed on a seasonal basis, others require greater frequency. Non-routine maintenance items often require professional expertise and assistance before appropriate corrective measures can be determined. Resources for professional assistance are listed in Appendix 3.

Bioretention Area

Routine Maintenance:

- Sediment and Debris: Remove gross accumulated sediment and debris from the mulch or grass surface area of the bioretention area.
- Outlet Structure: Keep outlets of bioretention area free from blockage by sediment, debris, trash, mulch or plant material.
- Erosion and Scour: Repair soil erosion or scouring within the bioretention area, side slopes or inlets leading into the bioretention area.
- Mulch: Maintain a 2 to 3 inch depth of hardwood bark mulch layer within the planted area of the bioretention area. If an excessive depth of mulch exists, remove mulch until the mulch layer is 2 to 3 inches in depth.
- Curb Cuts: Keep curb cuts to bioretention area free from blockage by sediment, debris and trash.
- Weeds: Remove weeds and invasive plants from bioretention area.
- Vegetation Management: Inspect plant health seasonally to ensure vigorous growth. Prune plants, particularly shrubs and trees, during the dormant season (fall to early spring).
- Snow Removal: Do not pile or store snow within the bioretention area as this will compact the specialized soils and add sediments that may lead to clogging.

Non-Routine Maintenance:

- Plant Replacement: Replace diseased or dying plants.
- Water Ponding Period: When ponding continues beyond a 48 hour period or the designed ponding duration, there may be construction, or design issues that need to

be corrected. Contact your local community stormwater manager, state technical assistance staff and the designer for further consultation.

- Specialized Soil Replacement: Clogging of the specialized soil by fine sediments may require complete replacement of the specialized soil, mulch and plant materials.

Dry Pond or Dry Extended Detention Basin

Routine Maintenance:

- Outlet Structures: Keep outlets such as principle spillway pipe, water quality orifice pipe and emergency spillway free from blockage by sediment, debris, or trash.
- Dam/Embankment: Mow grassed dam and embankment of dry pond to prevent establishment of woody vegetation.
- Erosion and Scour: Repair soil erosion or scouring on the side slopes leading into the dry pond or within the bottom or forebay of the dry pond.
- Vegetation Management: Remove woody vegetation from ponding area of dry pond.
- Sediment and Debris: Remove accumulated sediment, debris and trash from the dry pond forebay, low flow channel and ponding area. Remove sediments when accumulation reaches 6 inches in depth.

Non-Routine Maintenance:

- Excessive Sediment: Remove sediment accumulation from the ponding area prior to 25 percent of the ponding storage volume being lost within the dry pond.
- Invasive Vegetation: Treat and remove invasive vegetation from ponding area, side slopes and emergency spillway.
- Outlet Structure: Repair or replace damaged outlet structure.
- Erosion Protection: Repair or replace riprap or stone protection at pipe inlets, pipe outlets or emergency spillway.
- Dam/Embankment: Seek professional consultation if seepage or leaks appear during ponding or erosion is discovered on the dam or embankment of the dry pond.

Bioretention Area Inspection and Maintenance Checklist

Facility:			
Location/Address:			
Date:	**Time:**	**Weather Conditions:**	**Date of Last Inspection:**
Inspector:		**Title:**	
Rain in Last 48 Hours □ **Yes** □ **No**		**If yes, list amount and timing:**	
Pretreatment: □ **vegetated filter strip** □ **swale** □ **turf grass** □ **forebay** □ **other, specify:**			□ **none**
Site Plan or As-Built Plan Available: □ **Yes** □ **No**			

Inspection Item		Comment	Action Needed
1. PRETREATMENT			
Sediment has accumulated.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Trash and debris have accumulated.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
2. DEWATERING			
Standing water is present after 24 hours. If yes, describe sheen, color, or smell.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
3. INLETS			
Inlets are in poor structural condition.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sediment has accumulated and/or is blocking the inlets.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Erosion is occurring around the inlets.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
3. VEGETATION			
Vegetation is wilting, discolored, or dying due to disease or stress.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Vegetation needs to be controlled through mowing or manual removal.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
4. BIORETENTION MAIN INFILTRATION AREA			
Trash and debris have accumulated.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sediment has accumulated at the surface.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Topmost layer is caked or crusted over with sediment.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Erosion is evident.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Mulch is compacted.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sinkholes or animal borrows are present.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
5. SIDE SLOPES AND EMBANKMENT			
Erosion is evident.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sinkholes or instability is evident.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
6. OUTLETS AND OVERFLOW STRUCTURE (i.e., catch basin)			
Outlets or overflow structures in poor structural condition.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Sediment, trash or debris is blocking the outlets or overflow structure.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Erosion is occurring around the outlets or overflow structure.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**
Height from surface of practice to top of overflow structure is insufficient to allow for ponding during rain events.	☐**Yes** ☐**No** ☐**N/A**		☐**Yes** ☐**No**

Additional Notes
Wet weather inspection needed □ **Yes** □ **No**

Site Sketch:

SHRUBS FOR BIORETENTION & RAIN GARDENS					
Genus	**Species**	**Cultivar**	**Common Name**	**Height**	**Spread**
Aesculus	*parviflora*		Bottlebrush Buckeye	8-12'	8-15'
Aesculus	*pavia*		Red Buckeye		
Aronia	*arbutifolia*	Brilliantissima	Red Chokeberry	6-9'	6-8'
Aronia	*melanocarpa*	Autumn Magic	Black Chokeberry	4'	
Cephalanthus	*occidentalis*		Buttonbush	3-6'	3-6'
Clethra	*alnifolia*		Summer Sweet	6-8'	4-6'
Clethra	*alnifolia*	Ruby Spice	Summer Sweet	3-6'	3-6'
Clethra	*alnifolia*	hummingbird	Summer Sweet	30"	4'
Cornus	*amomum*		Silky Dogwood	6-10'	6-10'
Cornus	*racemosa*		Gray Dogwood	10-15'	10-15'
Cornus	*racemosa*	Muskingum	Gray Dogwood	2'	4'
Cornus	*sericea*	Isanti	Compact Redosier Dogwood	5'	5'
Cornus	*sericea*	Silver and Gold	Silver & Gold Dogwood	5-7'	
Cornus	*sericea*	Flavirama	Yellow Twig	7-9'	7-9'
Hamamelis	*vernalis*		Witch Hazel	10-12'	
Ilex	*glabra*	Compacta	Compact Inkberry	3-4'	3-4'
Ilex	*glabra*	Nordic	Nordic Holly	3-4'	3-4'
Ilex	*verticillata*	Afterglow	Afterglow Winterberry	3-6'	
Ilex	*verticillata*	Red Sprite	Red Sprite Winterberry	2-4'	
Itea	*virginica*	Henry's Garnet	Virginia Sweetspire	3-4'	4-5'
Itea	*virginica*	Sarah Eve	Virginia Sweetspire	3-4'	
Magnolia	*virginiana*		Sweetbay Magnolia	15-20'	15-20'
Myrica	*pensylvanica*		Bayberry	5-12'	5-12'
Physocarpus	*opulifolius*	Diablo	ninebark	6-8'	6-8'
Potentilla	*fruticosa*	Goldfinger	Goldfinger Potentilla	2-3'	3-4'
Potentilla	*fruticosa*	Jackmanii	Jackman Potentilla	3-4'	3'
Sambucus	*canadensis*	Laciniata'	Elderberry	5-12'	
Thuja	*occidentalis*		Arborvitae		
Vaccinium	*corymbosum*		Highbush blueberry	4-8'	3-4'
Vaccinium	*hybrid*	Ornablue	Highbush blueberry	3'	3'
Vaccinium	*hybrid*	Tophat	Highbush blueberry	20"	2-3'
Xanthorhiza	*simplicissima*		Yellowroot	2-3'	
TREES FOR BIORETENTION & RAIN GARDENS					
Genus	**Species**		**Common Name**		
Acer	*rubrum*		Red Maple		
Acer	*saccharinum*		Silver Maple		
Amelanchier	*canadensis*		Service Berry		
Betula	*nigra*		River Birch		
Celtis	*occidentalis*		Hackberry		
Gleditsia	*triacanthos var.inermis*		Honey Locust		
Gymnocladus	*dioica*		Kentucky Coffee Tree		
Hamamelis	*vernalis*		Witchhazel		
Liquidambar	*styraciflua*		Sweetgum		
Magnolia	*virginiana*		Sweetbay Magnolia		
Metasequoia	*glyptostroboides*		Dawn Redwood		
Nyssa	*sylvatica*		Tupelo, Blackgum		
Quercus	*bicolor*		Swamp White Oak		
Quercus	*palustris*		Pin Oak		
Salix	*spp.*		Willows		
Taxodium	*distichum*		Bald Cypress		

FORBS FOR BIORETENTION & RAIN GARDENS			
Scientific Name	**Common Name**	**Basin Bottom**	**Basin Side-Slope**
Anemone canadensis	Canada Anemone		x
Anemone virginiana	Thimbleweed		x
Asclepias incarnata	Swamp Milkweed	x	
Asclepias tuberosa	Butterfly Weed		x
Aster dumosus (novi-belgii)	New York Aster		x
Aster laevis	Smooth Aster		x
Aster novae-angliae	New England Aster	x	
Baptisia australis	Blue False Indigo		x
Baptisia leucantha	White False Indigo		x
Boltonia asteroides	Boltonia (false aster)	x	
Chelone glabra	Turtlehead	x	
Coreopsis tripteris	Tall Coreopsis	x	
Eryngium yuccifolium	Rattlesnake Master		x
Eupatorium maculatum	Joe-pye Weed	x	
Eupatorium perfoliatum	Boneset	x	
Geranium maculatum	Wild geranium		x
Heliopsis helianthoides	Ox-eye Sunflower	x	
Iris versicolor	Blue Flag Iris	x	
Liatris pycnostachya	Prairie Blazing Star		x
Liatris spicata	Dense Blazing Star	x	
Lysimachia ciliata	Fringed Loosestrife		x
Monarda fistulosa	Wild Bergamot		x
Oenothera fruticosa	Evening Primrose		x
Physostegia virginiana	False Dragonhead	x	
Pycnanthemum muticum	Mountain Mint		x
Ratibida pinnata	Yellow Coneflower		x
Silphium perfoliatum	Cup Plant	x	
Smilacina stellata	Starry Solomon's Seal		x
Silphium terebinthinaceum	Prairie Dock		x
Solidago rugosa	Rough Goldenrod	x	
Tradescantia ohiensis	Ohio Spiderwort		x
Thalictrum dasycarpum	Meadowrue	x	
Vernonia fasciculata	Ironweed	x	
Veronicastrum virginicum	Culver's Root	x	
Zizia aurea	Golden Alexanders	x	x
GRASSES FOR BIORETENTION & RAIN GARDENS			
Scientific Name	**Common Name**		
Andropogon gerardii	Big Bluestem		
Carex hystericina	Porcupine Sedge		
Carex vulpinoidea	Fox Sedge		
Elymus canadensis	Canada Wild-rye		
Panicum virgatum	Switch Grass		
Spartina pectinata	Prairie Cord Grass		
FERNS FOR BIORETENTION & RAIN GARDENS			
Scientific Name	**Common Name**		
Onoclea sensibilis	Sensitive Fern		
Matteuccia struthiopteris	Ostrich Fern		
Thelypteris noveboracensis	New York Fern		