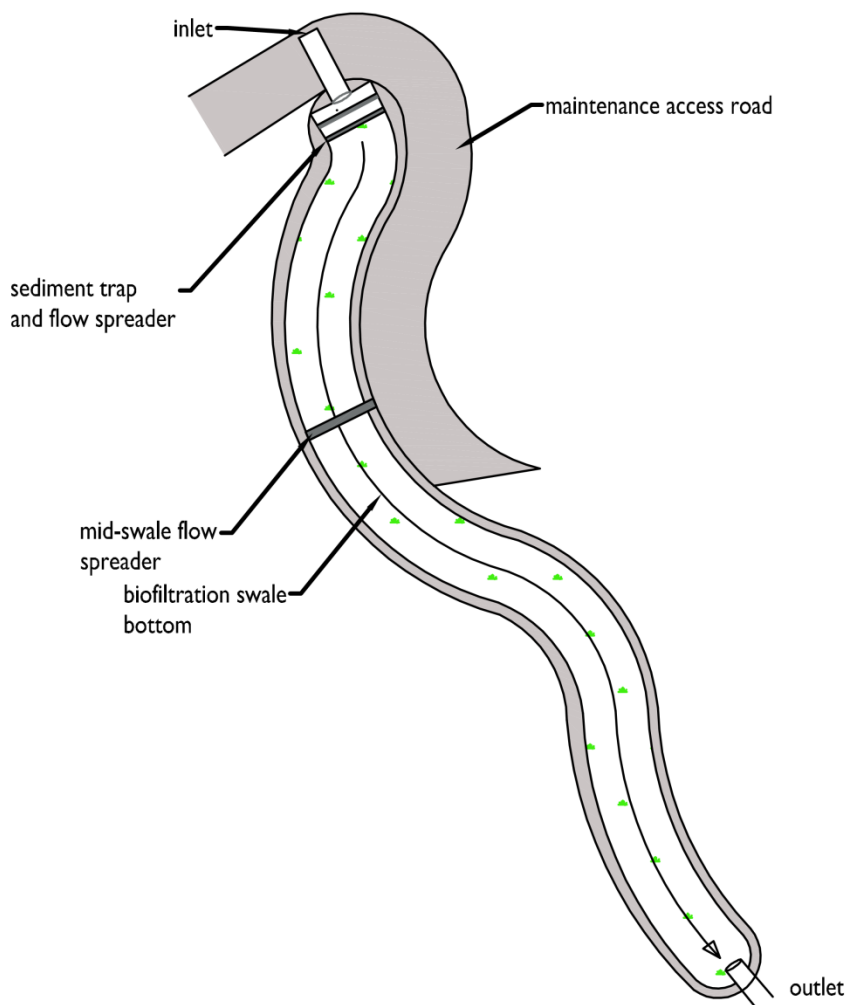


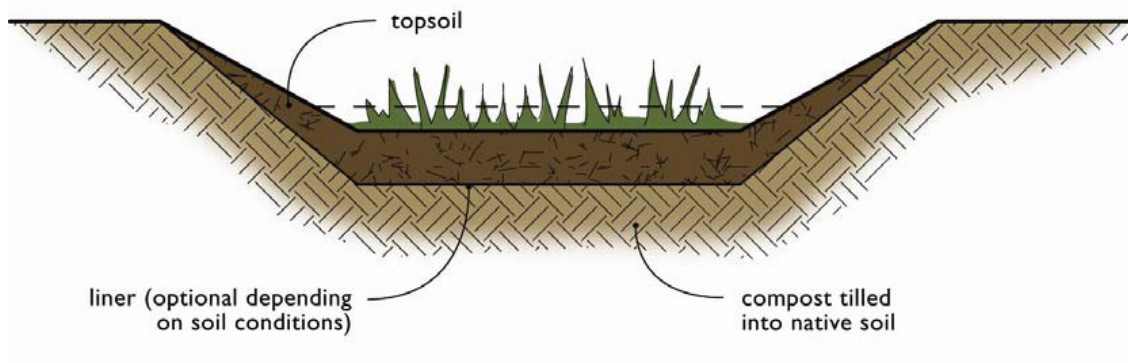
## Basic Biofiltration Swale

A biofiltration swale uses grass or other dense vegetation to filter sediment and oily materials out of stormwater. Usually they look like flat-bottomed channels with grass growing in them. Biofiltration uses vegetation in conjunction with slow and shallow-depth flow for runoff treatment. As runoff passes through the vegetation, pollutants are removed through the combined effects of filtration, infiltration, and settling. These effects are aided by the reduction of the velocity of stormwater as it passes through the swale.

Facility objects that are often associated with a basic biofiltration swale include:

- access road or easement
- fence, gate, and water quality sign
- energy dissipaters
- catch basins/field inlets
- drywell
- infiltration trench
- sediment trap





**Example Typical Biofiltration Swale**



**Example Typical Biofiltration Swale**

## Key Operations and Maintenance Considerations

- Inspect swales at least once every 6 months, preferably during storm events, and also after storm events of > 0.5 inch rainfall/ 24 hours. Maintain adequate grass growth and eliminate bare spots.
- Mow grasses, if needed for good growth (typically maintain at 4 to 9 inches).
- Remove leaves, litter, and oily materials, from swale, inlets, and flow spreaders as needed.
- Prevent scouring and soil erosion. Regrade and reseed the swale, as necessary.
- Maintain access to the inlet, outlet, and for mowing.
- If a swale is equipped with underdrains, avoid vehicular traffic on the swale bottom (other than grass mowing equipment) to prevent damage to the drainpipes.
- The most common tools for maintenance of biofiltration swales are mowers and hand tools to remove built up sediment and debris in the swale and to redistribute media displaced.

## Plant Material

**Table 3: Plant Mixes for Biofiltration Swale Treatment Area**

<b>Bioswale Dry Soil Conditions</b>		
<u>Botanical Name</u>	<u>Common Name</u>	<u>% By Weight</u>
<i>Elymus glaucus</i>	blue wildrye	50.00%
<i>Agrostis exarata</i>	spike bentgrass	10.00%
<i>Bromus carinatus</i>	California brome	10.00%
<i>Festuca idahoensis</i>	Idaho fescue	30.00%
<b>Bioswale Wet or Dry Soil Conditions</b>		
<u>Botanical Name</u>	<u>Common Name</u>	<u>%By Weight</u>
<i>Elymus glaucus</i>	blue wildrye	60.00%
<i>Hordeum brachyantherum</i>	meadow barley	30.00%
<i>Bromus carinatus</i>	California brome	10.00%
<b>Bioswale Wet Soil Conditions</b>		
<u>Botanical Name</u>	<u>Common Name</u>	<u>% By Weight</u>
<i>Agrostis exarata</i>	spike bentgrass	0.50%
<i>Deschampsia cespitosa</i>	tufted hairgrass	2.50%
<i>Glyceria occidentalis</i>	western mannagrass	25.00%
<i>Juncus effusus</i>	soft rush	8.00%
<i>Beckmannia syzigachne</i>	slough grass	4.00%
<i>Alopecurus geniculatus</i>	water foxtail	15.00%
<i>Hordeum brachyantherum</i>	meadow barley	45.00%
Selected plants shall not include any plants from the State of Washington Noxious Weed List. Refer to <a href="http://clark.wa.gov/weed/">clark.wa.gov/weed/</a> for a current list of noxious weeds.		

**Table 4: Groundcovers and Grasses Suitable for Upper Side Slopes of a Swale**

Groundcovers	
<u>Botanical Name</u>	<u>Common Name</u>
<i>Arctostaphylos uva-ursi</i>	kinnikinnick
<i>Fragaria chiloensis</i>	strawberry
<i>Lupinus latifolius</i>	broadleaf lupine
Grasses (drought-tolerant, minimum mowing)	
<u>Botanical Name</u>	<u>Common Name</u>
<i>Festuca</i> spp. (e.g., <i>Many Mustang</i> , <i>Silverado</i> )	dwarf tall fescues
<i>Festuca ovina duriuscula</i> (e.g., <i>Reliant</i> , <i>Aurora</i> )	hard fescue
<i>Festuca amethystine</i>	tufted fescue
<i>Buchloe dactyloides</i>	buffalo grass
<i>Festuca rubra</i>	red fescue
<i>Festuca arundinacea</i>	tall fescue grass
<i>Helictotrichon sempervirens</i>	blue oatgrass
Selected plants shall not include any plants from the State of Washington Noxious Weed List. Refer to <a href="http://clark.wa.gov/weed/">clark.wa.gov/weed/</a> for a current list of noxious weeds.	

Basic Biofiltration Swale			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Note: table spans multiple pages.			
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Grass treatment area of the swale is free of accumulated sediment deposits. Swale bottom is level from side to side and drains freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Water drains from swale per design standards after a storm.  (Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.)
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Spreader is level and clean so that flows are spread evenly over entire filter width.

Basic Biofiltration Swale			
Drainage System Feature	Potential Defect	Conditions When Maintenance Is Needed	Minimum Performance Standard
Note: table spans multiple pages.			
	Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	A low-flow pea-gravel drain the length of the swale has been added or a by-pass created for the baseflow around the swale.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10% of the swale bottom.	Grass coverage has been restored to good condition and facility meets design function.
	Vegetation	When the grass becomes excessively tall (greater than 10 inches); when nuisance weeds and other vegetation starts to take over.	Vegetation is mowed to less 3"-4" height. Nuisance vegetation has been removed such that flow is not impeded. Grass clippings removed from swale.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	Overhanging limbs and brushy vegetation on adjacent slopes has been trimmed back to (extent based on acceptable aesthetics and maintained plant health) to allow adequate sunlight to reach grass in swale.
	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Material has been removed and there is no clogging or blockage in the inlet and outlet area.
	Trash and Debris Accumulation	Trash and debris accumulated in the bio-swale.	Remove trash and debris from bioswale.
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	Eroded/scoured areas have been repaired and facility filters stormwater per design function.  (Ruts or bare areas less than 12 inches wide may be repaired filling damaged portion with crushed gravel; grass will creep in over the rock in time. For large bare areas [generally >12" wide], the swale should be re-graded and re-seeded. For smaller bare areas, over-seed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.)