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fact sheet 16

Filter Media For Raingardens

Guidance for Water Sensitive Provisions of the Great Lakes Development Control Plan

Raingardens are simply soil filters that are used to treat stormwater and rainwater runoff. The soils physically filter out particles and pollution and provide a place for plants to grow. The plants in the gardens support biological communities called biofilms. These biofilms do most of the work, removing dissolved contaminants like heavy metals and using up excess nutrients. Excess nutrients can cause problems with algal blooms and excessive weed growth in creeks and bays downstream.

WHY IS IT IMPORTANT TO GET THE FILTER "MEDIA" RIGHT?

The most important part of installing a raingarden is making sure that the soil filter "media" is correct. The correct filter media will help plants to grow.

- It has the right amount of nutrients so that excess nutrients do not leach into our waterways.
- It is relatively free draining so that water does not pond on the surface too long and "drown" the plants but has enough organic matter to hold moisture to support the plants.

THE FILTER MEDIA – WHAT SHOULD IT CONSIST OF?

There are a few things that the filter media needs to have to make sure it is suitable for the raingarden and won't cause long term problems.

a) Draining rate (Hydraulic Conductivity)

The rate that water passes through the filter media needs to be within a certain range, typically between 100-300 mm/hour. If the media is being purchased through a commercial supplier, they will need to have the hydraulic conductivity properly measured using the standard testing method ASTM F1815-06.

b) Mix of particle sizes (Particle Size Distribution)

If the filter media has the proper mix of different sized sands and loam particles, it should have a good hydraulic conductivity and be free of the very fine particles that may clog up the system. The most important thing is to have less than 3% of total clay and silts, but a good range of particles sizes is also needed to keep the media free draining. The mix should have the following sizes:

Material	Composition in media (%)	Size Range (mm)
Clay and Silt	<3	<0.05
Very Fine Sand	5 - 30	0.05 - 0.15
Fine Sand	10 - 30	0.15 - 0.25
Medium to Coarse Sand	40 - 60	0.25 - 1
Coarse Sand	7 - 10	1 - 2
Fine Gravel	<3	2 – 3.4

c) Nutrients and other properties

The following elements are important to make sure the filter media will help the plants to grow, especially in the early phases. These values are usually measured by testing the soil by the methods in the Australian Standard AS4419-2003 (Soils for Landscaping and Garden Use), but they are shown here so that we know what the soil needs to have in it to start with. Once the raingarden starts getting regular inflows of stormwater, the nutrients in the stormwater itself will help keep the plants growing.

Total Nitrogen (TN) Content –	less than 1000 mg/kg
Orthophosphate (PO_4^{3-}) Content –	less than 80 mg/kg
Organic Matter Content –	at least 3 % (on a weight per weight basis)
pH –	between 5.5 – 7.5 (using 1 part soil in 5 parts water)
Electrical Conductivity (EC) -	less than 1.2 dS/m

MAKING YOUR OWN FILTER MEDIA (ONLY APPLICABLE TO SMALL SCALE DEVELOPMENT)

When making up your own filter media, it is best to start with a material that is already free draining and add in the materials that will make it suitable for plants to grow in. We suggest that you use a washed and well-graded sand with a good mix of particle sizes like the table shown above. The type of sand that is used for building turf profiles such as golf greens is usually the most appropriate, but it needs to be checked to make sure it doesn't contain high levels of salt or high levels of clay or silt.

Large amounts can usually be bought directly from sand suppliers, though garden and landscaping centres may have suitable amounts.

To make the filter material, use the following method:

Initial Layer	After adding in the drainage pipes, drainage gravel and transition layer, for a 500mm deep filter add 400mm of washed, well graded sand	
Compaction	Compact this layer lightly with either a single pass of a vibrating plate or a drum lawn roller	
Secondary Layer	Add in more washed, well graded sand until the filter media is level with the bottom of the temporary ponding area	
Additional Nutrients to Secondary Layer (Note: these numbers are based on a $1m^2$ water quality garden. For larger gardens multiply these numbers by common factor eg. a $5m^2$ garden requires 5 times each nutrient)	500g	Granulated poultry manure fines
	20g	Superphosphate
	30g	Magnesium sulfate
	20g	Potassium sulfate
	10g	Trace element mix
	40g	Fertiliser (with an N:P:K ration of 16:4:14 or thereabouts)
	200g	Lime
Mixing	Mix in well in the top layer only. Another light pass of a drum roller may be beneficial but not necessary	
Final	You are ready for planting!	

This level of nutrients and trace elements is designed to last around 4 weeks, as after this the nutrients from the stormwater runoff should contain enough nutrients to sustain the plants.

Ideally, the system would now be tested to make sure it is free draining as per the ASTM F1815-06 method so that the hydraulic conductivity is between 100-300 mm/hr. Where this cannot be done, simply hosing the area for a short period and then checking that the water drains away gives an indication that all is functioning, but this isn't a guarantee that it will stay that way as some compaction and migration of fine material might still occur.

Acknowledgement

This fact sheet has been prepared by adapting the Facility for Advancing Water Biofiltration's "Guidelines for Filter Media in Biofiltrations Systems" Version 3.01, June 2009. The information in this fact sheet is given as guidance only and for more detailed information, please download the Adoption Guidelines for Stormwater Biofiltration Systems, Facility for Advancing Water Biofiltration, Monash University, June 2009 available through the FAWB website at http://www.monash.edu.au/fawb/ (last accessed 1/5/2012)