WATER SENSITIVE URBAN DESIGN
BIOFILTERS AND RAINGARDENS

HORNSBY SHIRE COUNCIL

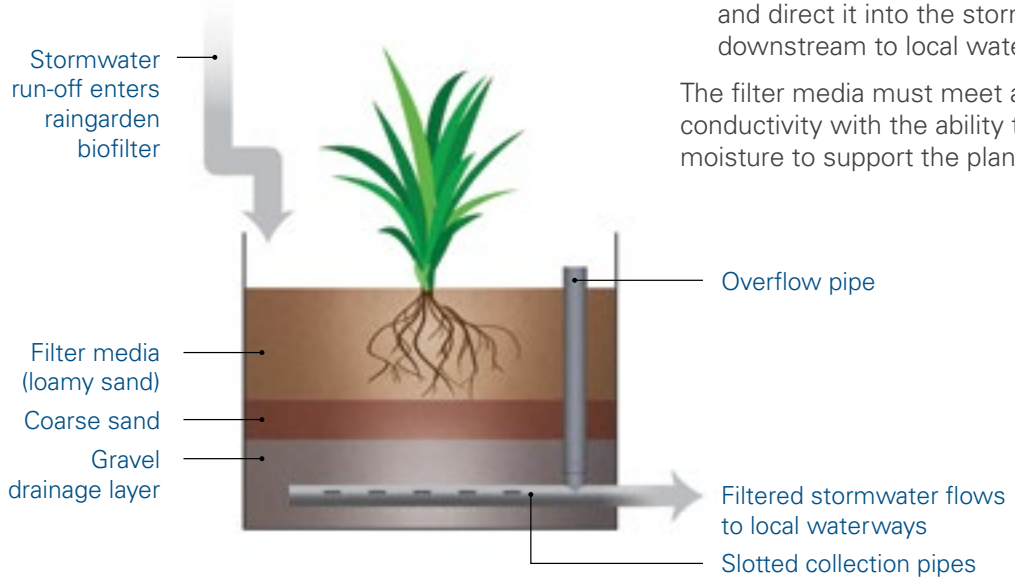
Raingardens and biofilters are self-watering, low maintenance gardens designed to protect our creeks and rivers by capturing and treating stormwater which runs off hard surfaces after it rains.

Stormwater biofiltration systems (also known as biofilters, biofiltration basins, bioretention basins and raingardens) are just one facet of a range of accepted Water Sensitive Urban Design (WSUD) elements. They are a low energy treatment technology that slow stormwater runoff to gain natural filtration, on-site detention and infiltration. They provide both water quality and quantity benefits and offer an alternative to the traditional transport-by-pipe approach to stormwater management.

TRAPPING STORMWATER POLLUTANTS

Stormwater run-off generally undergoes three treatment processes within a biofilter:

1. Capture of litter, sediment and large pollutants on the surface of the garden
2. Removal of small and fine pollutants by filtration
3. Chemical and biological uptake of dissolved pollutants via soil, plants, roots, biofilms and microbes.



HOW DO BIOFILTERS WORK?

Biofilters are designed to filter pollutants from frequent low intensity showers (catering for 95% of all stormwater runoff). Stormwater runoff is directed into the raingarden where it ideally disperses evenly over its surface maximising the volume of runoff to be treated.

Litter, leaves and sediment are trapped on the surface, whilst the special soil filter media (in combination with the plants root system) helps to filter and breakdown microscopic pollutants such as nutrients, heavy metals and hydrocarbons. Native grasses, shrubs and trees are densely planted and selected on their capacity to absorb pollutants and tolerate inundation and extended dry periods. Nutrients dissolved in the stormwater are utilised by the plants and toxins stick to the soil.

Runoff is filtered as it percolates through a layered filter media profile made up of (see diagram):

- up to a metre of loamy sand
- a coarse sand transition layer
- a gravel drainage layer
- slotted drainage pipes to collect the filtered water and direct it into the stormwater drainage system or downstream to local waterways.

The filter media must meet a certain level of hydraulic conductivity with the ability to hold adequate soil moisture to support the plants.

*Stormwater runoff carries with it a range of pollutants – including litter, cigarette butts, fertilisers, dog poo, chemicals, tyre rubber, heavy metals and sediment which washes from our roads, roofs, properties, parks, gardens and footpaths into stormwater drains and affects the health of local creeks, rivers and estuaries.

WHAT IS A RAINGARDEN?

A raingarden is basically a small scale biofiltration basin. Put simply, it is a vegetated sand filter designed to stop nutrients, rubbish and sediment from entering the stormwater drainage system. Similar to a regular garden bed, raingardens capture and filter polluted runoff from surfaces such as roofs, lawns, roads, footpaths, car parks and driveways after it rains.

The main pollutants captured by raingardens are suspended solids, metals and nutrients including Nitrogen and Phosphorus compounds which are highly damaging to receiving aquatic and riparian ecosystems. Raingardens can also be used to encourage infiltration and groundwater recharge or simply to filter runoff.

Benefits of Raingardens

- Self-watering and easy to maintain.
- Helps to filter polluted stormwater runoff.
- Slows the flow and reduces the volume of runoff.
- Water saving, uses less mains drinking water than regular gardens, especially if planted with native drought tolerant plants.
- Contributes to reducing the peak rate of flood flows downstream.
- Provides habitat and contributes to healthy waterways.

What can I do?

- Construct your own raingarden – use WSUD elements and smart landscape design to slow the flow of runoff and ensure sediments, leaves, grass clippings and nutrients do not leave your property.
- Install a rainwater tank – use the water for gardening, car washing or flushing the toilet.
- Reduce or eliminate the use of water soluble fertilisers on your property – nutrients from fertilisers contribute to algal blooms in local waterways.
- Choose permeable or porous paving options to allow water infiltration.

FURTHER INFORMATION:

Adoption Guidelines for Stormwater Biofiltration Systems
https://watersensitivecities.org.au/wp-content/uploads/2016/09/Adoption_Guidelines_for_Stormwater_Biofiltration_Systems.pdf

Melbourne Water
www.melbournewater.com.au/planning-and-building/stormwater-management/options-treating-stormwater/raingardens

Cooks River Alliance
http://cooksriver.org.au/publications/build-your-own-raingarden/

Healthy Land and Water
https://www.hlw.org.au/resources/downloads/water-by-design/test/factsheets/261-healthy-land-water-building-a-raingarden-2023/file