



Stormwater and Sediment Field Day

Auckland Botanic Gardens 2008

Demonstration Rain Garden

Rain gardens are used widely around the Auckland region to treatment stormwater runoff, and are a practice that is strongly advocated by the ARC.

There are two rain garden demonstrations at the 2008 field day; one being a scale model cross-section of a rain garden highlighting the relative layers of media, the other being a full-scale rain garden constructed to draw attention to the key design features.

A number of common issues associated with the construction of rain gardens arise through the ARC stormwater consent compliance programme. The purpose of this demonstration at the field day is to emphasise and raise awareness of these common issues.

What is a Rain Garden and how do they Work?

A rain garden is a management practice for treating stormwater runoff.

- Stormwater flows from impervious areas drain into rain gardens generally via swales and or filter strips.
- Water then ponds over the garden to a depth of up to about 200mm, with excess water overflowing into a raised catchpit or overflow system.
- The ponded water drains through the underlying filter medium at a rate of about 300mm per day.
- Sediment and attached contaminants are retained by filtration, and dissolved contaminants such as zinc and copper are retained by adsorption to the filter medium and by the plants.
- Some water volume reduction can be achieved both through evapotranspiration from the rain garden plants and infiltration into the subsoil.
- Treated stormwater reaching the base of the filter bed is picked up by the underdrain and discharged to the receiving system.

Three Key Design Features of Rain Gardens

The Right Media

- The media must be permeable, so that stormwater can come into contact with the surface of the media.
- It is recommended that the media have permeability rate of 300mm per day to allow effective filtration and adsorption of contaminants.
- The media must also sustain a healthy plant community to maximise evapotranspiration, maintain the media's permability and uptake contaminants (metals and nutrients).

A Ponding Area

- A ponding area (a depth of approximately 200mm above the surface of the rain garden) is formed by an elevated overflow catchpit.
- The ponded volume provides temporary storage for stormwater, to allow time for the stormwater to percolate through the media.
- An overflow is needed for when the rain garden's ponding capacity is exceeded. The overflow structure is normally connected to the under drain system draining to the receiving system.

Dense Covering of Vegetation

- A dense covering of plants is necessary to maintain the media's permeability, maximise the amount of water lost by evapotranspiration, and enhance treatment by uptake.
- Native plants are recommended because of the ability to withstand local conditions and provide valuable habitat. For a detailed list of which native plants are suited to rain garden conditions refer to the ARC Stormwater Management Devices: Design Guidelines Manual (TP10).

Additional Design Features

- A grass filter strip conveying stormwater to the rain garden.
- A layer of mulch on top of the rain garden media. Research has shown that the mulch layer plays an important role in the overall treatment efficiency of a rain garden system.
- Permeability of the rain garden media should be at least 300mm / day.
- Underdrain network (including gravel/scoria and perforated pipes), conveying filtered stormwater to the receiving system.
- An impermeable membrane between the rain garden media and in-situ soils, where the natural land around the garden is unstable.
- An optional layer of sand between the underdrain gravel and rain garden media, to help prevent migration of media between layers.

Operation and Maintenance of a Rain Garden

Rain gardens treat runoff by filtering it through vegetation and then passing it vertically through an organic soil which also filters the runoff. Besides vegetative filtration, treatment may, if designed for, rely upon infiltration of runoff into underlying soils or to an underdrain. Maintenance is therefore primarily concerned with:

- Maintenance of flow to and through the biofilter
- Maintaining planted vegetation and preventing undesired overgrowth vegetation from taking over the area
- Removal of accumulated sediments
- Debris removal

Construction sequence of the 2008 Field Day demonstration rain garden.

The hole for the rain garden is excavated.



The underdrain network is connected to the bypass pipe. Drainage material is placed at the base of the excavation.

The outlet to the rain garden is installed.





Rain garden media is placed in layers and lightly compacted on top of the drainage material.

Rain garden media is brought almost to the top of the excavation.



Media is used to create a bund around one edge of the rain garden to allow water to pond and drain through the garden.