

# In-Depth: *Landscape Shapes – Raingardens, Biocells, & Bioswales*



**Cascade Meadow**  
Wetlands & Environmental Science Center

## Function

We included biocells and bioswales in the landscape design at Cascade Meadow because they balance the site's storm water management needs, costs, aesthetics, and education goals.

The landscape shapes at Cascade Meadow were designed as part of a larger storm water management plan that

- Ensures that water flow and infiltration conditions were maintained or improved as a result of development and construction.
- Promotes infiltration, controls discharge rates, and prevents pollution from runoff. This protects the adjacent wetland and Cascade Creek, which was impaired because the turbidity levels (too much dirt!) exceeded state water quality standards.

Infiltration recharges both shallow and deep groundwater systems, which supply our drinking water. It also prevents runoff, erosion, and pollution during small storm events. Together with the other storm water design features, the biocells and bioswales at Cascade Meadow provide for 100% *infiltration* of a 2-year storm event (approx. 2.8 inches of rainfall over a 24-hour period). This high rate of infiltration results in 80-100% reduction in total suspended solids (soil/dirt) and total phosphorus for 2-year storm events.



## What are raingardens, biocells, & bioswales?

These terms are used to describe three similar landscape shapes that help our homes, businesses, and communities reduce their impact on local waterways. You may have already heard the term *raingarden*, which is a garden of typically native plants that is strategically placed on a site. A biocell is really the same thing, except it usually is bigger than a raingarden, and isn't always planted in the same orderly fashion as many raingardens. Both biocells and raingardens are usually shaped as a depression in the ground that receives re-directed storm water runoff or where water naturally flows or gathers during a rainstorm. A bioswale looks and acts very similarly to a biocell except that it is shaped as a long sloping ditch or "swale." The swale usually ends at a biocell, a storm water pipe inlet, or a body of water. All of these areas are purposely filled with native plants that have deep root systems.

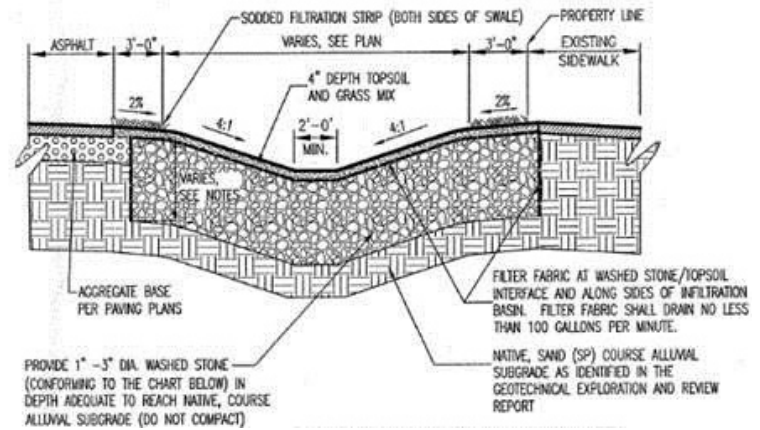
## What are they good for?

Untreated and unmitigated storm water runoff can have negative impacts on local waterways and the communities alongside them. For example, rain water that falls on pavement and flows directly to storm water sewers collects litter, pollution, debris, chemicals, and even pet droppings before it empties into our fragile and precious rivers, lakes, and streams. Also, fast-moving storm water can result in erosion problems, which can be dangerous near roads or steep hillsides, and sweep even more sediment and soil into the waterways. Additionally, any storm water that flows off the land instead of soaking in is water that doesn't go deep to recharge our groundwater supplies – which includes our drinking water. Raingardens, biocells, and bioswales can all significantly reduce these impacts. All three landscape shapes represent a designed attempt to capture, slow, and treat a site's storm water run-off.



## Construction

Because biocells and bioswales are usually incorporated into designs of a scale larger than a single residence, they are generally expected to handle relatively large volumes of water. Greater amounts of water to manage means higher erosion and flooding risks should the design fail. For this reason, Cascade Meadow strongly recommends that those designing large-scale sites who are interested in pursuing incorporation of biocells and bioswales should approach a qualified landscape architect or planning firm to begin the design process.



With raingardens, on the other hand, it is possible to undertake the planning and construction on one's own, especially if it's to be on a smaller, residential scale. It's important to remember, however, that a raingarden is more than a hole in the ground. There are several key components in designing a raingarden that functions properly. A good plan starts with a comprehensive map of the area that shows features like elevation, the path of the sun, and existing physical structures (like buildings) and vegetation (trees, shrubs, etc.). The plan should identify known or suspected wet areas and locations of storm water run-off from building roofs or other sources. The designer must carefully consider shape and size. Depth is unique to each location; soils must be tested to

determine the drainage capacity of the site. Once all of these have been considered and the drainage potential of the planned raingarden is determined, the designer can then choose the long-rooted, preferably native, plants that will fill the area. Even for a residential raingarden, if at any point in the planning there is uncertainty, it's very important to seek additional expertise so that nothing is overlooked.

## Maintenance

Maintaining a biocell, bioswale, or raingarden is as simple as ensuring that both of the garden's main design features (its shape and its plants) do not degrade significantly before they are established. This means: a) protecting against and repairing any erosion or filling-in of the depression or swale, b) weeding at least two times per month, and c) possibly watering about one inch per week (unless rainfall is adequate). These measures are particularly important during the first growing season. As the plants become more established with each season, the watering needs diminish because the plant roots become able to reach water deeper in the soils. Checking your raingarden, biocell, or bioswale for troublesome weed species, especially those considered noxious in MN, is important, as it is for any native planted area.

### Learn More

Visit the City of Rochester Storm Water Department at [www.rochesterstormwater.com](http://www.rochesterstormwater.com) and [www.BlueThumb.org](http://www.BlueThumb.org).

Cascade Meadow's website provides lots of additional information about various sustainability technologies. Visit [www.cascademeadow.org](http://www.cascademeadow.org) for more details, and watch the website's Events page to learn about upcoming workshops and events that can help answer your sustainability questions.

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