

Designing Ornamental Gardens for Highly Effective Stormwater Infiltration

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Stormwater infiltration gardens, also known as bioretention gardens or rain gardens, are a key feature of comprehensive sustainable stormwater management strategies. Despite their proven environmental benefits, however, many people are reluctant to use rain gardens because they are typically unattractive with sparse and unhealthy vegetation. But by rethinking bioretention gardens as primarily dry environments that experience only brief wet periods (rather than the other way around), the relationships between vegetation, soil, and environmental performance are dramatically improved. This shift in the design approach to rain gardens opens up new possibilities for incorporating ornamental, attractive and easily maintained stormwater management systems in all types of locations and climates.

One of the fundamental problems of the conventional rain garden design approach is that the water-loving plant species many designers call for are not appropriate in areas that commonly experience long dry periods between rainstorms—which is the case in many areas of the country during the summer months. These extended dry periods effectively limit water at a time when the plants need it the most. The moisture-loving plants then become stressed and, at best, enter dormancy until the rains come again or, at worst, simply die. As a result, people see these landscapes as cluttered, unkempt and unmanaged.

Dry Rain Gardens

The most effective rain garden designs adapt the following principles to the unique circumstances of every project:

1. Mimic historic hydrologic patterns that infiltrate water on-site.
2. Establish natural processes associated with soil and vegetation that cleanse water.
3. Maximize opportunities to use stormwater management features as attractive landscape elements.
4. Implement practical solutions that reduce construction and maintenance costs by designing traditional expansive stormwater infrastructure out of the system.

Hydrology

Rain gardens like other sustainable landscape-based stormwater management solutions must be based on a solid understanding of the land's natural and historic hydrologic patterns. These patterns are typically dominated by infiltration in upland areas. Rain gardens mitigate the hazardous stormwater runoff aspects of development by decreasing peak flows responsible for storm surges and flooding, reducing pollutant discharges, minimizing streambank erosion, replenishing ground water, and restoring base flows and aquatic habitats.

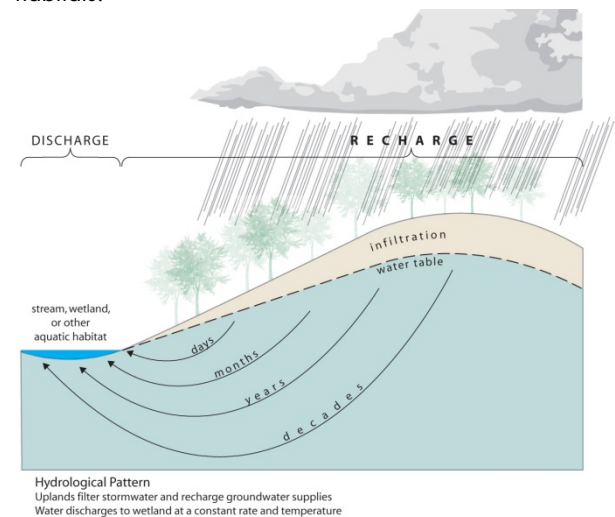


Figure 1. Historic Wetland Hydrology

Another characteristic of natural and historic hydrologic patterns is stability. In contrast, urban hydrology is typically dominated by erratic and flashy surface water flows, and this condition is only tolerated by a few weedy plant species. A dry rain garden regime with temporary wet periods during and shortly after storms is significantly more hydrologically stable from a plant perspective (and within the preference zone of many ornamental plants) than a wet rain garden regime that regularly experiences long dry periods between rainstorms. By planting rain gardens with attractive drought-tolerant species that thrive in dry summers and easily manage brief rainy periods, rain gardens can be lush and look like ornamental gardens, all without compromising their stormwater management functions.

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Natural Abilities of Soil & Vegetation to Cleanse Water

The first flush of runoff from pavement surfaces carries sediments, greases, and oils from roadways and parking lots, and excess fertilizers and pesticides from conventional lawns care. A healthy soil matrix with a diverse assemblage of plant roots, bacteria and fungi makes full use of the physical, chemical and biological powers of soil and vegetation to trap, attenuate and transform pollutants before they reach aquifers or aquatic resources.

From a soil health and permeability perspective, grasses are the most important component of a rain garden planting. Most of the biomass of grasses is below ground in the roots, even at the height of the growing season. Approximately one-third of a grass root system dies annually which helps to maintain a good soil structure and porosity by providing a continuous source of organic matter. The death and decay of these extensive root systems also contributes to an effective cycling of nutrients within the soil system. The lush green growth of these plants also assists in creating attractive landscapes as described below.

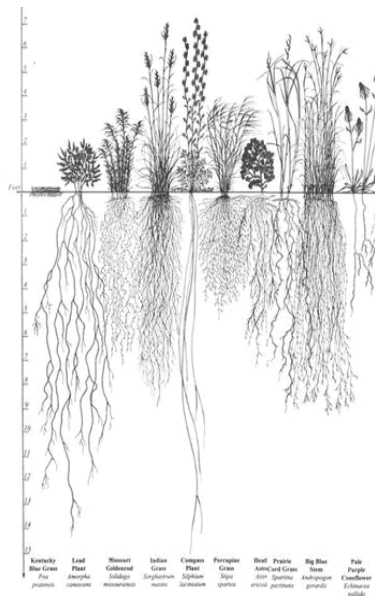


Figure 2. Root System of Meadow Plants

Attractive Landscapes

A skilled designer with detailed knowledge of plants and their tolerance to common pollutants and water inundation open up new possibilities for incorporating ornamental attractive stormwater management systems in a variety of scales, site locations and regional climates. These gardens can be designed to not only mitigate negative ecological impacts, but also to create community assets that respect people’s deep connection with landscape and provide opportunities to improve mental and physical well being.



Figure 3. Established 'Dry' Rain Garden

Practical Solutions

Even when rain gardens are properly designed and installed, their function can be compromised if they are not properly maintained. Easy access for inspection and maintenance, therefore, is an important consideration in the design of rain gardens. A stone trench at the edge of a rain garden, for example, serves as an easily accessible sand and sediment trap and provides the additional benefit of dissipating the energy of concentrated water flows.

Long-term landscape maintenance of rain gardens featuring grasses and wildflowers consists of annual mowing of the vegetation. Mowing the previous year’s growth down to the ground clears the way for the current season’s growth to begin neatly and cleanly, and also keeps weeds under control. Over time, a thatch layer may develop at the soil surface that keeps the wildflowers from self seeding effectively, slowly leading to the dominance of the grasses. This has no effect on performance, but in order to keep the balance from an aesthetic point of view, new wildflower plantings may be desirable every few years.