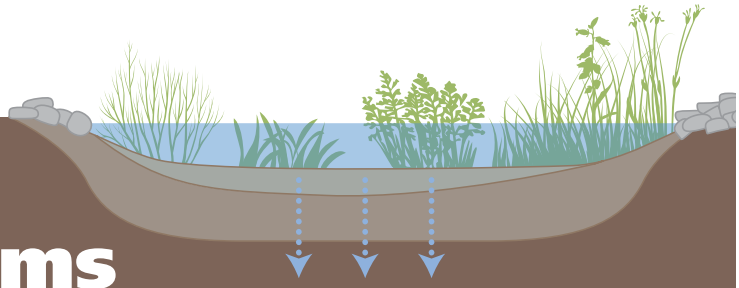

Benefits of Bioretention Systems

by Sally Brown, PhD
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In natural settings when it rains, the water infiltrates into the ground. How quickly the water soaks into the ground depends on the intensity and quantity of the rain and on the permeability of the soils. If the soil is sandy, it will disappear quickly. However, if the soil is heavy or high in clay, it will take time for the water to soak in, leading to ponding or overland flow. As the water passes through the soil, it is filtered via a range of naturally occurring processes. Metals and nutrients tend to bind to soil particles where they are eventually used by soil microbes or plants. Disease-causing organisms are consumed by native soil organisms. That is why it is generally much safer to drink groundwater rather than water from a stream.

In urban areas, engineers have attempted to move water off streets as quickly as possible during rains. This has generally meant conveying water to wastewater treatment plants via combined sewer systems or directly to streams. While this is good for cars and pedestrians, it is not good for the environment. When stormwater is directed to natural water bodies without treatment, it results in extreme flow variability in streams. Contaminants from the stormwater are carried directly into streams. Treatment plants are less efficient and more energy intensive than soils for cleaning stormwater. During heavy rains, combined systems can lead to overflows that include sewage in addition to untreated stormwater. Not letting water infiltrate into soils also reduces subsurface flow of water to streams. Subsurface flow provides a steady, filtered source of water to streams, keeping flow consistent even during drier periods.

After a big rain, wetlands and bioswales clean the water and allow it to soak into the ground over several hours.

Bioretention systems are an attempt to make urban areas more like natural areas for absorbing rain. They generally include a mixture of sand and composts as well as different types of plants. These systems are designed to mimic soils that absorb water quickly and also to start the process of filtering water. This filtering process continues as the water passes through the bioretention mixture and into the subsoil. Both scientific research and working systems have shown that bioretention systems are highly effective, generally absorbing high volumes of stormwater. Like any natural system, their efficiency will depend on a range of factors. Over time, they are more effective, dramatically cheaper and better for the environment than engineered systems.

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