**Article 117**

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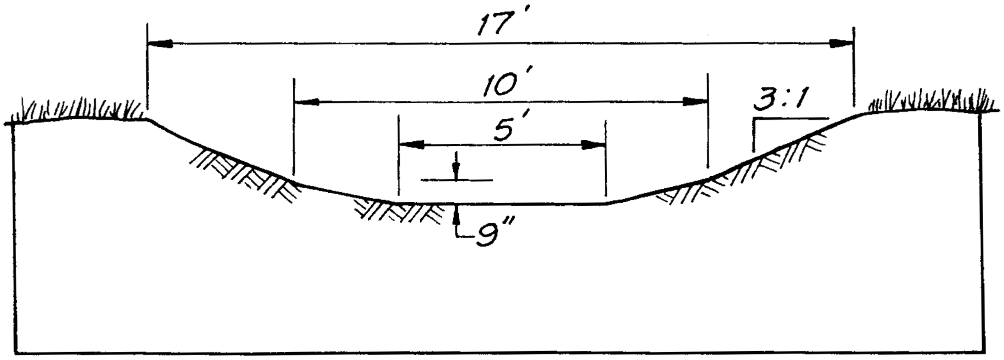
# Performance of Dry and Wet Biofilters Investigated in Seattle

Biofilters are grass channels designed to treat stormwater runoff instead of merely conveying it downstream. To remove pollutants, biofilters employ greater swale lengths, broad bottoms, gentle slopes, and dense grass turf. Together, these factors increase the residence time of runoff throughout the channel, allowing time for adsorption, uptake, settling and filtering and infiltration of stormwater pollutants. A monitoring study by Seattle METRO indicated that a 200-foot long biofilter showed promise in removing many pollutants found in urban stormwater.

Biofilters are easy to design and construct and are extremely cost-effective in comparison to other practices. For these reasons, the concept is gaining popularity in the Northwest although the practice is not yet commonplace. As more biofilters are being constructed, some nagging questions remain. First, the pollutant removal capability of biofilters is derived from a single monitoring study. If more biofilters are monitored, will they confirm the pollutant removal capability of the first study or show it to be a sampling fluke? Second, field inspections have consistently shown that most biofilters are not constructed and maintained under the ideal test conditions that were followed in the first monitoring study. Does pollutant removal performance decline in biofilters that are in fair or poor condition, and by how much?

Two recent studies from the greater Seattle area explore these questions in some detail. In the first study, Jennifer Goldberg investigated the performance of a biofilter retrofit known as the "Dayton Avenue Swale." The original channel was a 600-foot long drainage ditch located in the right-of-way separating the backyards of a residential area. It was converted into a biofilter by reshaping the dimensions of the channel, adding top soil over the glacial till soils, and re-planting a dense cover of grass. The new dimensions of the biofilter were a length of 570 feet, a base width of five feet and an average longitudinal slope of 1%. Figure 1 shows a cross-section of the new and broader channel, with other site and design data provided in Table 1.

Goldberg sampled eight storm events at Dayton swale during 1991 to 1993. Sample collection was limited by "lost flows" (i.e., analysis of the biofilter revealed that as much as 30 to 80% of all incoming runoff infiltrated into the soil and never reached the downstream end). Goldberg noted that downstream runoff was seldom observed unless the biofilter soils were already saturated, and the rainstorm had at least moderate intensity and long duration. In addition, incoming sediment often dropped out in the first 50 feet of the biofilter, forming a small "hump" that impeded the flow of stormwater and caused minor ponding. In general, the investigators found it difficult to maintain a constant grade along the entire length of the biofilter. Investigators also discovered possible internal sources of pollution within the biofilter, including a colony of mountain beavers that made their burrows in the side slopes, pets that routinely used the biofilter to defecate, and adjacent trees that dropped rotting fruit into the swale.




*A biofilter has much broader and longer dimensions than a typical grass channel.*

**Figure 1: Schematic of the Cross-Section of the Dayton Biofilter**