



Vegetated Filter Strip Systems for the treatment of irrigation water runoff

Why use a vegetated filter strip system?

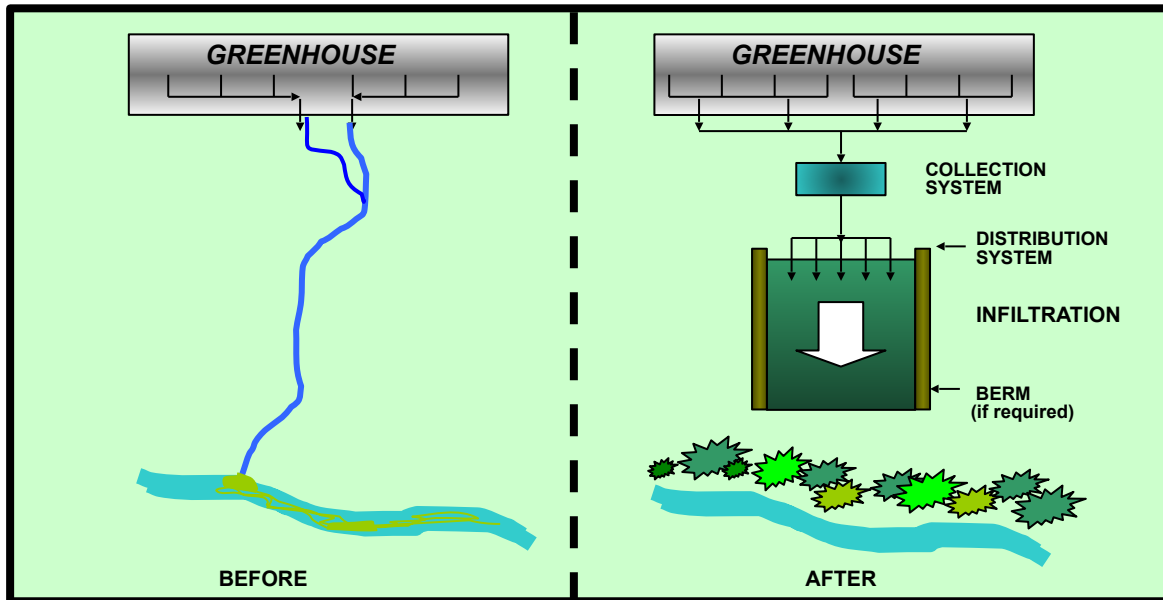
Vegetated filter strips (VFS) are engineered systems designed to encourage the complete infiltration of the water to be treated. Nutrients and other elements from the water are removed as the water spreads out and moves slowly and uniformly down a wide, permanently vegetated area on a gentle downslope. This gives time for the water to infiltrate and elements to be trapped by the receiving soil and vegetation. VFS systems are a recognized Best Management Practice (BMP) with a permit under the Ontario *Nutrient Management Act* used for treatment of a variety of agricultural wastewaters.

A schematic VFS system is shown in the diagram below and consists of the following components:

1. A collection and temporary storage tank or holding basin (these can be located below ground outside the greenhouse or above ground within the greenhouse to function under winter conditions)

2. A screen to remove detritus from runoff
3. A distribution system, either gravity-fed or pump-fed, designed to provide uniform flow across the width of the infiltration area
4. An infiltration area of sufficient size and shape to allow for uniform and complete infiltration of applied wastewater, (i.e. zero discharge)

The infiltration area needs to be “a densely vegetated (planted) strip of land, graded to accept and manage runoff through settling, filtration, absorption and infiltration processes”. It is sized according to specific criteria based on soil type, infiltration rate and wastewater volumes to be treated. Sandy-loam to loam soils perform best; sand infiltrates too fast while clay is too slow. To avoid saturation at the upper end of the infiltration area, water should be applied at a rate that slightly exceeds the infiltration rate of the soil, thus forcing the water to move slowly down the VFS slope. The maximum application rate is 5 cm (2”) per week, but soil type and infiltration rates dictate the required



size of the infiltration area because all the water must infiltrate before the flow reaches the bottom edge of the VFS. For a VFS to perform adequately there must be uniform or “sheet” flow over the surface for even distribution of water over the entire infiltration area; channels or rills must not be allowed to develop. The slope must be consistent over the length of the infiltration area, usually 2% to 5%. Depth to groundwater must be at least 0.9m and depth to bedrock at least 0.5m for at least a 10m zone around the perimeter of the filter bed. There must be at least a 50m flow path from the lower edge of the infiltration bed OR a vegetated buffer zone planted adjacent to the top of the bank of the surface water with a minimum width that is dependent on the slope of the infiltration area. The VFS must not be located within 3m of field tile drains or within a floodplain area. An engineer should be consulted to properly design a vegetated filter strip. It should be mowed 3-4 times over the growing season to a) remove nutrients, b) prevent thatch build up, and 3) limit the spreading of weeds. Any observed areas of settling or rilling through time should also be patched to ensure uniform flow is maintained along the VFS.

- Sites with low, uniform slopes
- Growers transitioning to collect and store, but are not yet ready to recirculate
- Growers who have to periodically replace some of their recirculating nutrient solution to prevent salt buildup

Treating greenhouse irrigation runoff with a VFS

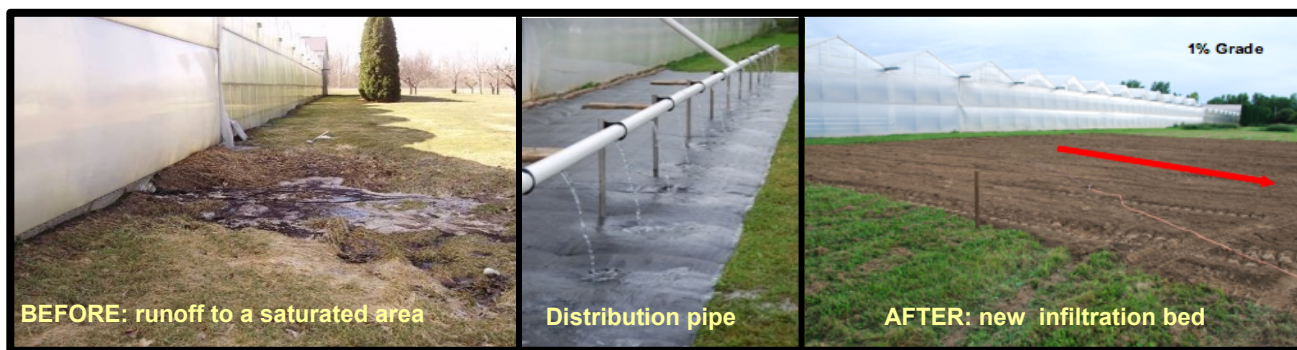
An engineered VFS system was installed at a small bedding and flowering plant greenhouse to treat seasonal irrigation runoff water. Runoff water was collected into a central storage tank located inside the greenhouse and pumped at approximately three-day intervals to a PVC header pipe at 300L/min located at the top end of the infiltration area. The piping was designed to completely drain to prevent freezing in winter. A two-metre width of landscape cloth was installed under the legs of the header pipe to stop weeds and form an erosion-resistant splash pad. The 1000m² infiltration area was uniformly graded to blend in well with the existing contours and sized for zero discharge (i.e. all the water infiltrates before it reaches the end of the filter strip).

Who can use this management option?

- Growers with some land base and relatively small volumes of water to manage
- Sites with sandy loam to loam soils

Further Reading

The Vegetated Filter Strip (VFS) System Design Manual (Ontario Publication 826) can be found at: (http://www.omaf.gov.on.ca/english/engineer/facts/vfss_manual/vfssman1.htm)



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