

## Vegetated Filter Strips

### Description

Vegetated Filter Strips (VFS) are zones of vegetation where pollutant-laden runoff is introduced as sheet flow. VFS may take the form of grass filters, grass filter strips, buffer strips, vegetated buffer zones, riparian vegetated buffer strips, and constructed filter strips.

### When and Where to Use It

Applicable in areas where filters are needed to reduce pollutant impacts to adjacent properties and water bodies. VFS are used to remove pollutants from overland sheet flow but are not effective in removing sediment from concentrated flows. There are two main classifications of VFS:

- Constructed filter strips: Constructed and maintained to allow for overland flow through vegetation that consists of grass-like plants with densities approaching that of tall lawn grasses.
- Natural vegetative strips: Area where pollutant-laden flow is directed in an overland manner, including riparian vegetation around drainage channels. Vegetation ranges from grass-like plants to brush and trees with ground cover.

VFS remove pollutants primarily by three mechanisms:

1. Deposition of bedload material and its attached chemicals as a result of decreased flow velocities and transport capacity. This deposition takes place at the leading edge of the filter strip.
2. Trapping of suspended solids by the vegetation at the soil vegetation interface. When suspended solids settle to the bed, they are trapped by the vegetated litter at the soil surface instead of being re-suspended as would occur in a concentrated flow channel. When the litter becomes inundated with sediment, trapping no longer occurs by this mechanism.
3. Trapping of suspended materials by infiltrating water. This is the primary mechanism by which dispersed clay sized particles are trapped.

VFS effectiveness fluctuates considerably depending on vegetation type, vegetation height and density, season of the year, eroded particle characteristics, size of drainage area, and site topography.

### Design Criteria

Select a vegetation type, a ground slope, filter strip width, and strip length. Locate VFS on the contour perpendicular to the general direction of flow. Select vegetation to be dense, turf-forming grass in order to minimize water channelization. Never assume that natural vegetation is adequate for VFS. Design a ponding area at the leading edge of the VFS for bedload deposition.

### General Design Requirements

- Select an applicable area for the VFS  
Minimum Ground Slope = 1 percent  
Maximum Ground Slope = 10 percent
- Select a vegetation type.
- Select the design life and maximum allowable sediment deposition. A design life of 10 years and deposition of 0.5-feet is recommended.
- Estimate the long-term sediment yield entering the filter strip and a 10-year 24-hour design single-storm sediment yield.
- Determine desired Trapping Efficiency- 80 percent design removal efficiency goal of the total suspended solids (TSS) in the inflow.
- Estimate the filter length necessary to prevent deposition within the filter greater than 0.5-feet. (Assume filter width is equal to disturbed area width but no smaller than 15-feet.)
- Use the filter length to calculate Trapping Efficiency for the design storm.
- Repeat (d) and (e) until the lengths match.

### Inspection and Maintenance

- Maintenance is very important for filter strips, particularly in terms of ensuring that flow does not short circuit the practice. They require similar maintenance to other vegetative practices.
- Inspect vegetation for rills and gullies annually and correct. Seed or sod bare areas.
- Inspect grass after installation to ensure it has established. If not replace with an alternative species.
- Inspect to ensure that grass has established annually. If not, replace with an alternative species.
- Mow grass to maintain a height of 3- to 4-inches.
- Remove sediment build-up from the bottom when it has accumulated to 25% of the original capacity.

### Average Pollutant Removal Capability

75 feet in length	150 feet in length	Average
<u>Total Suspended Solids:</u> 54%	<u>TSS:</u> 84%	<u>TSS:</u> 70%
<u>Lead:</u> 16%	<u>Lead:</u> 50%	<u>Metals</u> 40%-50%
<u>Zinc:</u> 47%	<u>Zinc:</u> 47%	<u>Total N:</u> 30%
<u>Total Phosphorus:</u> - 25%	<u>Total Phosphorus:</u> -40%	<u>Total P:</u> 10%
<u>Nitrate Nitrogen:</u> -27%	<u>Nitrate Nitrogen:</u> -20%	<u>Nitrate Nitrogen:</u> 0%
		<u>Pathogens/Bacteria:</u> NA



Roadside Vegetated Filter Strip

### Summary of Maintenance Requirements

Required Maintenance	Frequency
Mow grass to maintain design height.	Regularly (frequently)
Remove litter and debris.	Regularly (frequently)
Inspect for erosion, rills and gullies, and repair.	Annual, or as needed
Repair sparse vegetation.	Annual, or as needed
Inspect to ensure that grass has established. If not, replace with an alternative species.	Annual, or as needed
Nutrient and pesticide management.	Annual, or as needed
Aeration of soil.	Annual, or as needed