NRCS Natural Resources Conservation Service

Filter Strip

WV Conservation Practice Job Sheet *Code 393*

Definition

Filter strips are areas of herbaceous vegetation situated between cropland, grazing land, forest land, or disturbed land and environmentally sensitive areas. Sensitive areas include streams, lakes, wetlands, and other water bodies and areas susceptible to damage by water-borne pollutants, including sediment, particulate organics, sediment-adsorbed contaminants, and dissolved contaminants.

Purpose

Filter strips can reduce sediment,-reduce dissolved contaminants, and even provide some wildlife habitat.

Filter strips entrap and transform pollutants that are generated in areas upgradient to them. They should not be considered the sole management practice to prevent offsite movement of pollutants from the contributing area. Rather, other conservation practices and management techniques, such as crop residue management, nutrient management, pest management, and timing of tillage and chemical applications, should be applied as well.

Where Used

Filter strips are used on cropland, grazing land, forest land, or disturbed land.

Filter strips are normally established concurrently with other practices as part of a resource management system for a conservation management unit. They should be installed only below areas where sheet and rill erosion have been reduced to an acceptable level and where other practices are in place that slow runoff and contaminant delivery. A filter strip may be influenced by, but is not considered part of, the adjacent crop rotation.

Design Considerations

Functions

Filter strips perform several functions including: entrapment and deposition, filtration, infiltration, adsorption, absorption, decomposition, transformation, food and cover for wildlife and provide physical setback areas.

Location

Filter strips are used at the lower edges of cropland fields where pollutants may move off the cropland area. They can also be used above conservation practices, such as ponds, drainageways, and terraces, to reduce the load of sediment or other contaminants moving into the practice areas.

A filter strip is designated as a vegetated area to treat runoff and is not part of the adjacent cropland rotation. A filter strip is typically positioned at the down-slope edge of a field or disturbed area. Filter strips are normally only used when contributing areas have slopes between 1 and 10 percent.

Filter strips are helpful immediately below confined animal areas to capture and transform pollutants that could move off the livestock area. In forest land and along roads, filter strips are needed as a part of the construction and operation measures to reduce delivery of sediment into waterways, trails, and roads. Keep in mind that filter strips are only a part of an overall system of conservation practices that control the source and transport of contaminants that may be lost as part of the agricultural production system.

Filter strips should be installed so that run-on water enters the filter strip as shallow flow. This allows maximum contact time between soil, vegetation, and water to enable deposition, sorption, and transformation to work. If the run-on water enters as concentrated flow, the efficiency of the filter strip to trap and transform contaminants is greatly reduced.

Layout

Width is measured in the direction of flow. Since filter strips are placed along the contour, as much as possible, their dimension at the narrow point is called width. The flow of water moves parallel with the width. The length of a filter strip is the longitudinal distance across the landscape that the strip occupies perpendicular to the direction of flow. Other terms, such as flow length, may be used to depict the direction of flow (figure 1).

The slope of the filter and soil of the filter area impact the overall filter performance. Steeper slopes in the filter strips increase flow velocity and shorten the amount of time the material carried in the runoff water has to interact with the vegetation and soil in the filter area.

In most filter systems the greater flow length (width), the greater the entrapment and removal of contaminants. However, a filter strip that achieves 100 percent removal of contaminants or completely reduces the water discharge to zero would be difficult and impractical to design and maintain. Most practical designs are based on contaminant removals of 50 to 80 percent depending on the type of contaminant.

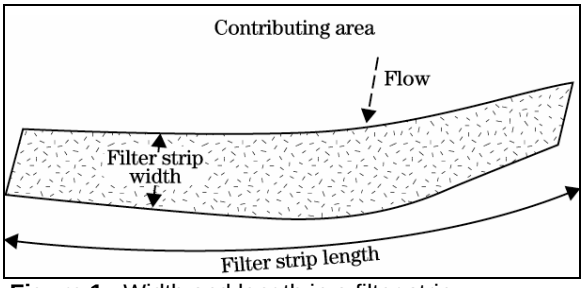

Figure 1. Width and length in a filter strip

Effective Width

The design width of a filter strip depends on a number of factors. First, the purpose of the filter strip must be defined. Filters to entrap and deposit sediment are not required to be as wide as filters used to remove soluble compounds, such as nitrate nitrogen or pesticides. It takes more surface area and longer flow paths to adsorb and infiltrate soluble material than to entrap solid material. Climate conditions and storm events also influence the effectiveness of the filter to retard flow and remove pollutants. Frozen and snow covered soil, saturated soil, and crusted soil surface may also severely reduce the effectiveness of filter strips.

Length

Strip length is the measured distance along the landscape where the filter strips are placed. This is the long direction. Not all areas along the edge of the

field or continuous landscape receive runoff water as sheet or laminar flow where filter strips work the best. For continuity, filter strips can be extended up and over non-flow areas to connect different segments of a filter strip and provide other benefits, such as corridors or setbacks.

Slope
The slope may influence the width of the filter area. Slopes between 1 and 10 percent are most effective. Slopes less than one percent are too flat and may cause ponding and concentrated flow channels. Slopes greater than 10 percent are too steep and may not allow ample contact time within the filter area. Ideal slopes for filter strips range between 2 and 6 percent.

Species of Vegetation
The species selected are based on climate conditions, soils, purpose and function of the filter, and desired by-products to be gained. Select plant species that can tolerate inundation by sediment or chemicals. Operation and maintenance for a specific purpose may require the species to possess certain attributes (e.g. wildlife and warm season grasses or forbs and pollinators). Filters designed for entrapping plant nutrients, such as nitrogen and phosphorus, require frequent harvest.

Operation and Maintenance

The first axiom about filter strips is, “Filter strips are designed to fail!” To function properly, the filter area must be contaminated with sediment and other pollutants. Becoming dirty is a desirable result for a filter strip. Some basic operations and maintenance work must be done to maintain the function and value of filter strips.

1. Any development of channels or rills within the filter strips must be minimized and immediately repaired. Shallow furrows or small berms placed across any concentrated flow may help re-establish sheet flow. Concentrated flow areas that cannot be redirected should be treated separately. A grassed waterway or shallow impoundment may be required to stabilize the waterway and reduce flow velocity to encourage deposition and infiltration. Refer to other conservation practices such as Grassed Waterway (412) Contour Buffer Strips (332), Terrace (600), etc.

2. Accumulated sediment should be removed before it reaches a height where it begins to divert the runoff water around the filter strip as concentrated flow. Removal and redistribution can be accomplished with tillage equipment or other machinery. The filter strip may need to be re-established at the contributing area interface.

3. The vegetation of the filter strip performs such tasks as nutrient uptake and carbon sequestering more efficiently if the biomass is mowed and removed from the filter area. This keeps the filter strip in a vigorous vegetative condition and absorbs nutrients and other contaminants more effectively. A mowing and harvesting schedule should be a vial part of the operation and management plan. Refer to other practices such as Prescribed Grazing (528), Forage Harvest Management (511) or other practices specifying the timing and intensity of grazing.

4. If bacteria or other pathogens are being removed by the filter strip, a close, short-mowed sod is desirable to allow sunlight and air movement to destroy entrapped pathogens. Likewise, if nutrient sequestering is the purpose, continual harvesting is required to remove the nutrients from the filter area and promote a vigorous sod of filtering vegetation.

5. Weeds, especially noxious weeds, must be controlled in the filter area.

6. Mow filter strips (and harvest if possible) as necessary to encourage dense vegetative growth. If established for wildlife habitat, avoid mowing during the nesting periods (March 15 - July 15) or during critical pollinating times. Disturb no more than 50% of the entire area of the filter strip at one time if feasible.

7. Exclude livestock and vehicular traffic from filter strips to reduce compaction that will limit infiltration. This type of traffic should be excluded at all times to the extent practical.

8. Restoration is required if the filter strip has accumulated sediment to a point that it no longer functions effectively.

Nutrient and Soil Amendments
Fertilizer and lime are applied based on soil test recommendations. Nutrients applied for establishment of filter strips can have a high risk of movement into those same sensitive areas that are intended to be protected. Phosphorus and potassium should be incorporated into the seedbed to lessen the risk for surface movement during any overland flow immediately after establishment. Nitrogen usually presents less risk if it is applied after the vegetation is established and actively growing. Nutrient status of the filter strip must be periodically assessed to maintain a healthy, vigorous stand of vegetation.

NRCS Natural Resources Conservation Service

Specifications

Site-specific requirements are listed on the following pages of this job sheet. Specifications are prepared in accordance with the WV NRCS Field Office Technical Guide. Information in this jobsheet is considered to be part of the conservation plan.

Filter Strip – Job Sheet

Client:	**Farm #:**
Field(s):	**Tract #:**
Designed By:	**Date:**

Purpose (check all that apply)	
☐ Reduce sediment, particulate organics, and sediment-adsorbed contaminant loadings in runoff	☐ Restore, create, or enhance herbaceous habitat for wildlife, pollinators and beneficial insects
☐ Reduce dissolved contaminant loadings in runoff	☐ Other (specify):

Layout	**Strip 1**	**Strip 2**	**Strip 3**
Strip Width (ft)			
Strip Length (ft)			
Area in Strip (acres)			
Field Slope (%)			
Soil Type			

Plant Materials (species/cultivars)	**Seeding Rate** (lbs/acre)	**Seeding Date**
Strip 1:		
Strip 2:		
Strip 3:		

☐ Refer to the attached seeding mix for wildlife, pollinator habitat or other specialized purpose.

Soil Amend. and Fertilization	**Strip 1**	**Strip 2**	**Strip 3**
Lime per Soil Test (tons/acre)			
N (lbs/acre)			
P_2O (lbs/acre)			
K_2O (lbs/acre)			

Site Preparation

Prepare a firm seedbed. If needed, firm the seedbed with a cultipacker or other suitable implement prior to broadcasting seed and/or plants to insure good seed to soil contact and to prevent seeds or plants from being deeply buried. **Additional requirements:**

Planting Methods (Check all that apply)

☐ **No-Till Drill** seed _____ inches deep uniformly over area. Establish vegetation according to the specified seeding rate above. A small grain crop may be needed as a companion crop at the rate of _____ pounds per acre (clip or harvest before it heads out).

☐ Seed should be **broadcast** at the rate listed above. A small grain crop may be needed as a companion crop at the rate of _____ pounds per acre (clip or harvest before it heads out).

☐ Refer to WV conservation practice standard Mulching (484) if required.

Operation and Maintenance

Maintain the filter strip as described in this document under the section "**Operation and Maintenance**". Maintain original width and length of the filter strip. Harvest, mow, reseed, and fertilize as necessary to maintain plant density and vigorous plant growth. Inspect after major storms, remove trapped sediment, and repair eroding areas. Shut off pesticide sprayers when turning on a filter strip.

NRCS Natural Resources Conservation Service

Filter Strip – Job Sheet

If needed, an aerial view or a side view of the practice can be shown below. Other relevant information, complementary practices and measures, and additional specifications may be included.

Refer to the conservation plan map for practice locations

Additional Specifications (Planting Methods, seeding mix, site & seedbed preparation, operation and maintenance and notes):

Maintain the filter strip as indicated in the section of this document entitled "Operation and Maintenance".

For questions concerning this practice contact:

_____ at _____