

**UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE**

**CONSERVATION PRACTICE STANDARD**

**FILTER STRIP**

(Ac.)

**CODE 393**

**DEFINITION**

A strip or area of herbaceous vegetation that removes contaminants from overland flow.

**PURPOSE**

This practice supports one or more of the following purposes:

- Reduce suspended solids and associated contaminants in runoff – Resource concerns (WATER QUALITY DEGRADATION – Excess nutrients in surface and ground waters, Pesticides transported to surface and ground waters, excess pathogens and chemicals from manure, bio-solids or compost applications, and excessive sediment in surface waters).
- Reduce dissolved contaminant loadings in runoff - Resource concerns (WATER QUALITY DEGRADATION – Excess nutrients in surface and ground waters, pesticides transported to surface and ground waters, and excess pathogens and chemicals from manure, bio-solids or compost applications).
- Reduce suspended solids and associated contaminants in irrigation tailwater – resource concern (WATER QUALITY DEGRADATION – Excess nutrients in surface and ground waters, pesticides transported to surface and ground waters, excess pathogens and chemicals from manure, bio-solids or compost applications, and excessive sediment in surface waters).

**CONDITIONS WHERE PRACTICE APPLIES**

Filter strips are established in areas where overland flow degrades water quality from sediment, suspended solids or dissolved contaminants.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Overland flow entering the filter strip shall be primarily sheet flow. Concentrated flow shall be dispersed before it enters the filter strip.

The maximum gradient along the leading edge of the filter strip shall not exceed one-half of the up-and-down hill slope percent, immediately upslope from the filter strip, up to a maximum of 5%.

State listed noxious or invasive plants will not be established in the filter strip.

Filter strip establishment shall comply with local, state and federal regulations. Filter strips shall not be used as a travel lane for equipment or livestock.

**Additional Criteria to Reduce Suspended Solids and Associated Contaminants in Runoff**

The filter strip will be designed to have a 10-year life span, following the procedure in the Agronomy Technical Note No. 2, based on the sediment delivery in RUSLE2 to the upper edge of the filter strip and ratio of the filter strip flow length to the length of the flow path from the contributing area. Table 1 lists maximum length of the flow path from the contributing area based on the sheet and rill erosion rate

and the filter strip width. The minimum flow length for this purpose shall be 20 feet.

**Location.** The filter strip shall be located along the downslope edge of the source area of contaminants.

**Drainage Area.** The drainage area above the filter strip shall have greater than 1% slope.

**Vegetation.** The filter strip shall be established to permanent herbaceous vegetation. Species selected shall have stiff stems and a high stem density near the ground surface. In addition, species shall be able to withstand partial burial from sediment deposition and tolerant of herbicides used on the area that contributes runoff to the filter strip.

Species selected for seeding or planting shall be suited to current site conditions and intended uses. Selected species will have the capacity to achieve adequate density and vigor within an appropriate period to stabilize the site sufficiently to permit suited uses with ordinary management activities.

Species, rates of seeding or planting, minimum quality of planting stock, such as pure live seed (PLS) or stem caliper, and method of establishment shall be specified before application. Only viable, high quality seed or planting stock will be used.

Site preparation and seeding or planting shall be done at a time and in a manner that best ensures survival and growth of the selected species. What constitutes successful establishment, e.g. minimum percent ground/canopy cover, percent survival, stand density, etc. shall be specified before application.

Planting shall be scheduled during periods when soil moisture is adequate for germination and/or establishment. Seeding shall be timed so that tillage or other farming activities for the adjacent crop does not damage the seeded filter strip.

The minimum seeding and stem density shall be equivalent to a high quality grass hay seeding rate for the climate area, or the density of vegetation selected in RUSLE2 to determine trapping efficiency, whichever is the higher seeding rate. See Forage and Biomass Planting (code 512) for a detailed listing of

planting dates and seeding rates for permanent herbaceous vegetation in Alabama.

#### **Additional Criteria to Reduce Dissolved Contaminants in Runoff**

The criteria in “**Additional criteria to reduce suspended solids and associated contaminants in runoff**” for location, drainage area and vegetation characteristics also apply to this purpose.

The minimum flow length for this purpose shall be 30 feet.

#### **Additional Criteria to Reduce Sediment, Particulate Organics and Sediment-adsorbed Contaminant Loadings in Surface Irrigation Tailwater**

Temporary filter strip vegetation may be a small grain or other suitable annual. The seeding rate shall be sufficient to ensure that the plant spacing does not exceed 4 inches (about 16-18 plants per square foot).

Filter strips shall be established early enough prior to the irrigation season so that the vegetation can withstand sediment deposition from the first irrigation.

### **CONSIDERATIONS**

**General.** Filter strip size should be adjusted to a greater flow length to accommodate harvest and maintenance equipment.

Filters strips with the leading edge on the contour will function better than those with a gradient along the leading edge.

Seeding rates that establish a higher stem density than the normal density for a high quality grass hay crop will be more effective in trapping and treating contaminants.

If needed, invasive plant species may be controlled through mowing, herbicides and hand weeding based on the land users situation.

When filter strips are grazed, implement prescribed grazing (code 528) to improve soil health, maintain plant health and forage production and filter strip functionality.

Organic producers may have to submit plans and specifications to their certifying agent for

approval prior to installation, as part of the organic producer's Organic System Plan.

***Reducing Suspended Solids and Associated Contaminants in Runoff.***

Increasing the width of the filter beyond the minimum required will increase the potential for capturing contaminants in runoff. Also, adding a Riparian Forest Buffer to the Filter Strip will increase the potential for capturing contaminants, especially dissolved contaminants and sub-surface runoff.

A system of conservation practices provides a more effective treatment than Filter Strips, used singly. For example, in a cropland situation, a system of Residue Management, Nutrient Management, Cover Crops, Filter Strips and Riparian Forest Buffers may be implemented. In grazingland situations, a system of Prescribed Grazing, Access Control, Filter Strips and Riparian Forest Buffers may be implemented.

***Creating, Restoring or Enhancing Herbaceous Habitat for Wildlife and Beneficial Insects and Pollinators.***

Filter strips are often the only break in the monotony of intensively-cropped areas. When filter strips are used for wildlife habitat the calculated minimum width of the filter strip must meet the vegetation requirements of the criteria. Where site appropriate, the wildlife and pollinator benefits of this herbaceous cover can be enhanced by:

- Using native grass species that fulfill the purposes of the practice while also providing habitat for priority wildlife.
- Adding wildlife and pollinator friendly herbaceous plant species, including native forbs, to the filter strip seeding mix. The plants should be compatible with one of the listed purposes. Changing the seeding mix should not detract from the purpose for which the filter strip was established.
- Increasing the width beyond the minimum required. This additional area can increase food and cover for wildlife and pollinators.
- Management activities on filter strips, such as mowing, burning, or light disking, should

not be done more often than every other year with frequency dependent on geographical location to maintain the purposes of the practice.

- Management activities on the filter strip should be completed outside of the primary nesting, fawning, and calving seasons. Activities should be timed to allow for regrowth before the growing season ends whenever possible.

Refer to conservation practice, Upland Wildlife Habitat Management (code 645).

***Maintain or Enhance Watershed Functions and Values.***

Filter strips can:

- Enhance connectivity of corridors and non-cultivated patches of vegetation within the watershed.
- Enhance the aesthetics of a watershed.
- Be strategically located to reduce runoff, and increase infiltration and ground water recharge throughout the watershed.

***Increase Carbon Storage.*** Increasing the width of filter strip beyond the minimum required will increase the potential for carbon sequestration.

**PLANS AND SPECIFICATIONS**

Plans and specifications shall be prepared for each field site where a filter strip will be installed. Record practice specifications on the Filter Strip Implementation Requirement document. A plan includes information about the location, construction sequence, vegetation establishment, and management and maintenance requirements.

As a minimum, the plans shall include:

- a) Length (flow length through the filter strip), width, and slope of the filter strip to accomplish the planned purpose.
- b) Species selection and seeding or sprigging rates to accomplish the planned purpose.
- c) Planting dates, care and handling of the seed to ensure that planted materials have an acceptable rate of survival.

- d) A statement that only viable, high quality and regionally adapted seed will be used.
- e) Site preparation, instructions sufficient to establish and grow selected species.
- f) Type, application rate and method of mulching, if required.

## OPERATION AND MAINTENANCE

For the purposes of filtering contaminants, permanent filter strip vegetative plantings should be harvested as appropriate to encourage dense growth, maintain an upright growth habit and remove nutrients and other contaminants that are contained in the plant tissue.

Control undesired plant species, especially state-listed noxious weeds.

Prescribed burning may be used to manage and maintain the filter strip when an approved burn plan has been developed according to the NRCS conservation practice standard, Prescribed Burning-338.

Inspect the filter strip after storm events and repair any gullies that have formed, remove unevenly deposited sediment accumulation that will disrupt sheet flow, reseed disturbed areas and take other measures to prevent concentrated flow through the filter strip.

Apply supplemental nutrients as needed to maintain the desired species composition and stand density of the filter strip. Nutrients will be applied in accordance with NRCS conservation practice standard Nutrient Management-590. Do not be apply animal and poultry manure, poultry litter, compost, solids and waste water from treatment plants and agricultural by-products to filter strips as maintenance fertilizer.

To maintain or restore the filter strip's function, periodically regrade the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function, and then reestablish the filter strip vegetation, if needed. If wildlife habitat is a purpose, destruction of vegetation within the portion of the strip devoted to that purpose should be minimized by regrading only to the extent needed to remove sediment and fill concentrated flow areas.

If grazing is used to harvest vegetation from the filter strip, the grazing plan must ensure that the integrity and function of the filter strip is not adversely affected.

Organic producers may have to maintain records for five years, as part of their Organic System Plan.

## REFERENCES

- Dillaha, T.A., and J.C. Hayes. 1991. A Procedure for the Design of Vegetative Filter Strips: Final Report Prepared for U.S. Soil Conservation Service.
- Dillaha, T.A., J.H. Sherrard, and D. Lee. 1986. Long-Term Effectiveness and Maintenance of Vegetative Filter Strips. VPI-VWRRRC Bulletin 153.
- Foster, G.R. Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Science Documentation (In Draft). USDA-ARS, Washington, DC. 2005.
- M.G.Dosskey, M.J Helmers, and D.E.Eisenhauer 2008 A Design Aid for Determining Width of Filter Strips, Journal of Soil and Water Conservation
- OMRI Organic Seeds Database. Organic Materials Review Institute.  
<http://www.omri.org/seeds>
- Renard, K.G., G.R. Foster, G.A. Weesies, D.K. McCool, and D.C. Yoder, coordinators. 1997. Predicting Soil Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE). U.S. Department of Agriculture. Agriculture Handbook 703.
- Revised Universal Soil Loss Equation Version 2 (RUSLE2) website (checked May 2007):  
[http://fargo.nserl.purdue.edu/rusle2\\_dataweb/RUSLE2\\_Index.htm](http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm).
- Sources of Organic and Untreated Non-GMO Seeds. National Sustainable Agriculture Information Service.  
<http://attra.ncat.org/sorg/seeds.html>
- USDA-AMS National Organic Program National List of Allowed and Prohibited Substances.  
<http://www.ams.usda.gov/AMSV1.0/nop>
- USDA-AMS National Organic Program Regulations, 7 CFR Part 205.  
<http://www.ams.usda.gov/AMSV1.0/nop>

USDA-NRCS Technical Guide, Section 4,  
Conservation Practice Standards:

*Mulching - 484*

*Nutrient Management – 590*

*Forage and Biomass Planting – 512*

*Prescribed Burning – 338*

*Prescribed Grazing – 528A*

*Wildlife Upland Habitat Management – 645*

Table 1. The maximum length of the flow path from the contributing area in feet based on the sheet and rill erosion rate and the filter strip width that will meet the 10-year life span criteria.

		Filter Strip Width (ft.)						
		20	25	30	35	40	45	50
Sheet and Rill Erosion (tons/ac)	<3	1330 <sup>a</sup>	1680	1980	2330	2640	3010	3310
	3-5	650	830	1000	1150	1330	1480	1630
	5-7.5	360	460	540	630	720	810	910
	7.5-10	240	300	370	440	500	570	630
	>12.5	190	240	280	330	380	420	480

a. The length of the flow path from the contributing area is in feet. The length of the flow path from the contributing area is defined as the slope length from the point of origin of flow to the upper edge of the filter strip.