

**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 may be applied for one or more of the following purposes:

1. To reduce suspended solids (e.g., sediment, particulate organic matter) and associated contaminants in runoff;
2. To reduce dissolved contaminant loadings (e.g., nutrients, pesticides) in runoff;
3. To reduce suspended solids and associated contaminants in irrigation tailwater.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice may be applied in the following locations:

1. On the lower edges of cropland, grazing land, or disturbed areas where sediment, other suspended solids and dissolved contaminants in runoff may move offsite into environmentally sensitive areas (e.g., water courses, water bodies, or wetlands);
2. Up slope of conservation practices, such as ponds, diversions, and terraces, to reduce the amount of sediment or other contaminants moving into the practice area.

This practice does not apply to treatment of wastewater from milking parlors, silos, waste treatment lagoons, waste storage facilities,

composting facilities, or below concentrated livestock holding areas. Refer to the Delaware conservation practice standard for Vegetated Treatment Area (635).

Where restoration or improvement of wildlife habitat adjacent to water courses, water bodies, or wetlands is a primary concern, use the Delaware conservation practice standard for Riparian Herbaceous Cover (390).

**CRITERIA**

**General Criteria Applicable to All Purposes**

The filter strip shall consist of an herbaceous planting that is not part of a cropland or pasture rotation. The location, layout, and density of the filter strip shall reflect the intended purpose of the practice, conditions of the site, and the objectives of the land user.

Site preparation and planting to establish the filter strip shall be done at a time and manner to insure survival and growth of the selected species. To the extent feasible, use a reduced tillage method for seedbed preparation.

Species, rates of seeding or planting, minimum quality of planting stock (such as Pure Live Seed), and method of establishment shall be specified before implementation. Only viable, high quality seed or planting stock shall be used.

Select plant species that are native to Delaware, or are introduced and are non-invasive (i.e., not likely to spread beyond the planted area and displace native species). Selection of native species shall be a priority when feasible. No plant listed by the state of Delaware as an invasive species shall be established in the filter strip.

Selected species shall have the capacity to achieve adequate density and vigor to stabilize the site sufficiently to accomplish the intended purpose in a timely manner. What constitutes successful establishment, e.g., minimum percent ground/canopy cover, percent survival, stand density, etc. shall be specified before implementation.

Overland flow entering the filter strip shall be primarily uniform sheet flow. Concentrated flow shall be dispersed using level spreaders before it enters the filter strip. The leading edge of the filter strip shall be approximately on the contour.

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%.

The minimum flow length through the filter strip shall be 20 feet.

Protect the filter strip from uncontrolled livestock access and frequent vehicular traffic.

Control noxious weeds as required by state law.

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

These criteria apply to filter strips on the lower edges of cropland, grazing land, or disturbed areas where pollutants may move offsite via surface flow into adjacent water courses, water bodies, wetlands, or other environmentally sensitive areas. These criteria also apply to filter strips installed up slope of conservation practices such as diversions.

The filter strip shall be located immediately downslope from the source area of contaminants. The drainage area above the filter strip shall have a slope of 1% or greater.

The filter strip shall be designed to have a 10-year life span, following the procedure in the NRCS Agronomy Technical Note No. 2, *Using RUSLE2 for the Design and Predicted Effectiveness of Vegetative Filter Strips (VFS) for Sediment*, based on the sediment delivery in RUSLE2 to the upper edge of the filter strip and

the ratio of the filter strip flow length to the length of the flow path from the contributing area.

The filter strip shall be established to perennial herbaceous vegetation. Species selected for planting shall have stiff stems and high stem density near the ground surface to reduce water velocities and facilitate infiltration into the filter strip.

Species selected shall be:

1. Able to withstand partial burial from sediment deposition; and,
2. Tolerant of herbicides used on the area that contributes runoff to the filter strip.

The minimum seeding rate 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. Refer to the Delaware conservation practice standard for Critical Area Planting (342) for recommended seed mixes and planting rates for filter strips.

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

The criteria given in “Additional Criteria to Reduce Suspended Solids and Associated Contaminants in Runoff” for location, drainage area, and vegetation characteristics also apply to this purpose. In addition, the minimum flow length for this purpose shall be 35 feet.

#### **Additional Criteria to Reduce Suspended Solids and Associated Contaminants in Irrigation Tailwater**

Filter strip vegetation shall be a small grain or other suitable annual planting. 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 before the start of the irrigation season so that the vegetation is sufficiently mature to filter sediment when irrigation is first used.

*Note: Specific programs may impose criteria in addition to, or more restrictive than, those specified in this standard.*

## CONSIDERATIONS

### **General Considerations Applicable to All Purposes**

Consider the long-term land use objectives of the client and how the implementation and maintenance of this practice will affect those objectives. Consider adjusting the size of the filter strip to accommodate harvesting and maintenance equipment.

Assess site conditions, including surrounding land uses, types and quantity of pollutants, slopes and soils, residual herbicides (to the extent known), available moisture during the growing season, and existing vegetation on the site and in adjacent areas, including any noxious weeds that may be present.

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

Consider the potential for erosion where the filter strip will outlet into streams or channels.

Identify and evaluate any constraints such as economic feasibility, management options, and regulatory and cost-share program requirements.

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

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.

Increasing the width of the filter strip beyond the minimum required will increase the potential for capturing contaminants in runoff.

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

Filter strips are often the only break in the monotony of intensively-cropped areas. The

wildlife benefits of the filter strip can be enhanced by:

1. Adding herbaceous plant species to the seeding mix that are beneficial to wildlife and compatible with one of the listed purposes. Any adjustments to the seeding mix to benefit wildlife should not detract from the purpose for which the filter strip will be established;
2. Increasing the width beyond the minimum required for removal of pollutants, and planting the additional area to a diverse mix of species that can provide food and cover for wildlife. This additional width should be added on the downslope side of the filter strip. The total width of the filter strip should be at least 35 feet;
3. Once established, the filter strip should not be mowed during the nesting season of the desired wildlife species. For Delaware, the primary nesting season is from April 15 through August 15. Livestock and vehicular traffic should likewise be excluded during the primary nesting season.

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

Filter strips can:

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

### **Air Quality**

Increasing the width of a filter strip beyond the minimum required will increase the potential for carbon sequestration.

## PLANS AND SPECIFICATIONS

Plans and specifications for this practice shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail to ensure successful implementation of this practice and may be recorded in narrative form, on Implementation Requirements (IR) worksheets, or other approved forms.

For most sites and intended uses of the filter strip, select herbaceous plant species and mixes in accordance with the Delaware conservation practice standard for Critical Area Planting (342).

Follow the establishment recommendations provided in the Delaware fact sheets for warm season grass plantings and/or cool season grass plantings and complete the 393 IR worksheet. The appropriate fact sheet(s) and IR worksheet can serve as the planting plan and specifications for the practice.

The following items shall be addressed, as appropriate:

1. Soil type(s);
2. Length, width (flow path), and slope of the filter strip to accomplish the planned purpose (width refers to flow length through the filter strip). Include RUSLE2 worksheets to document minimum width needed to address the planned purpose;
3. Method of site preparation;
4. Species selected for establishment, seeding/planting rates, and planting dates;
5. Rate and type of soil amendments to be applied (if any);
6. Method(s) used to protect plantings from animal damage (e.g., fencing, repellents, etc.) or for weed control.

## OPERATION AND MAINTENANCE

An Operation and Management (O&M) plan shall be prepared and is the responsibility of the client to implement. The appropriate fact sheet(s) and IR worksheet may serve as the management plan, as well as supporting documentation, and shall be reviewed with and provided to the client.

At a minimum, the following components shall be addressed in the O&M plan, as applicable:

1. Describe the extent of management needed to maintain vegetation in a vigorous condition. For optimum sediment retention and other water quality benefits, mow two to three times annually to a height of 3 to 5 inches and remove top growth if possible. Removal of top growth from the site can significantly reduce the amount of nitrate-nitrogen in the soil and can reduce the movement of nitrate-nitrogen below the root zone. If phosphorus is a concern, periodically test the soil to monitor phosphorus build-up;
2. Inspect the filter strip at least annually. Shape and reseed areas damaged by heavy rainfall, animals, chemicals, tillage, or equipment traffic, and any other areas where the stand is not adequate;
3. Remove sediment that accumulates along the upper part and within the filter strip before it accumulates to a height of 6 inches and begins to divert runoff water around the filter strip as concentrated flow;
4. Check for insects and diseases, and if an incidence threatens stand survival, take corrective action to keep the pest under control;
5. Control undesirable plants by pulling, mowing, or spraying with a selective herbicide. Control noxious weeds as required by state law;
6. Protect the filter strip from wildfire and damage from livestock, wildlife, and equipment, to the extent feasible;
7. Where wildlife habitat is a concern, mow only the minimum area necessary to filter

sediment, and do not mow during the primary nesting season (April 15 to August 15);

8. Apply soil amendments periodically, if needed to maintain plant vigor. If nutrients are applied, refer to the conservation practice standard for Nutrient Management (590);
9. Do not use the filter strip for hay storage or machinery parking for an extended period of time, especially if doing so will damage or impair the function of the practice;
10. Describe the acceptable uses (e.g., flash grazing, haying, etc.) and time of year or frequency of use restrictions, if any. *Pay particular attention to program requirements as they relate to acceptable vs. restricted uses and other management restrictions.*

### **Record Keeping**

It is the responsibility of the landowner/client to maintain records as needed to document plan implementation. Records will include actual implementation details of all applicable components under Plans and Specifications.

### **SUPPORTING DATA AND DOCUMENTATION**

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Extent of planting in acres, field number where the practice located, and the location of the practice marked on the conservation plan map;
2. Assistance notes. The notes shall include dates of site visits, name or initials of the person who made the visit, specifics as to alternatives discussed, decisions made, and by whom;
3. Copy of the appropriate fact sheet(s) and completed IR worksheet, or other specifications and management plans.

### **REFERENCES**

1. Dillaha, T.A., J.H. Sherrard, and D. Lee. 1986. *Long-Term Effectiveness and Maintenance of Vegetative Filter Strips*. VPI-VWRRC Bulletin 153.
2. 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*.
3. 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.
4. USDA, Agricultural Research Service. March, 2013. *Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Science Documentation*.
5. USDA, Natural Resources Conservation Service. *Conservation Practice Standards*. Delaware Field Office Technical Guide, Section IV.
6. USDA, Natural Resources Conservation Service, June 2007. *Using RUSLE2 for the Design and Predicted Effectiveness of Vegetative Filter Strips (VFS) for Sediment*. Agronomy Technical Note No. 2.