

USDA
NATURAL RESOURCES
CONSERVATION SERVICE
MARYLAND CONSERVATION
PRACTICE STANDARD

FILTER STRIP
CODE 393
(Reported by Acre)

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 Maryland conservation practice standard for Vegetated Treatment Area, Code 635.)

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

DEFINITION

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

PURPOSES

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

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

CONSIDERATIONS

General

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.

Identify and evaluate any constraints such as management options, economic feasibility, access, state and federal regulations, or cost-share program requirements.

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.

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

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.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the [Natural Resources Conservation Service - Maryland](#) or visit the [electronic Field Office Technical Guide \(eFOTG\)](#).

Reducing Suspended Solids and Associated Contaminants in Runoff

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. Increasing the width beyond the minimum required for removal of pollutants, and planting the additional area to species that can provide food and cover for wildlife. This additional width should be added on the downslope side of the filter strip;
2. 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 was established.

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.

CRITERIA

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. A conservation tillage method shall be used for establishment when feasible.

Select plant species that are native to Maryland, 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.

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.

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

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 protected from uncontrolled livestock access and frequent vehicular traffic. Noxious weeds shall be controlled as required by state law.

Note: Specific cost-sharing programs or other funding sources may impose criteria in addition to, or more restrictive than, those specified in this standard.

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 terraces or diversions.

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 permanent herbaceous vegetation. Species selected shall have stiff stems and a high stem density near the ground surface.

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 Maryland conservation practice standard for Critical Area Planting, Code 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.

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.

PLANS AND SPECIFICATIONS

Plans and specifications for establishment of the filter strip shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail concerning site preparation and establishment to ensure successful installation of the practice. Documentation shall be in accordance with the section “Supporting Data and Documentation” in this standard.

Follow the establishment recommendations provided in the Maryland Job Sheets for warm season grass plantings and cool season grass plantings. The completed Job Sheet(s) can serve as the planting plan and specifications for the practice.

OPERATION AND MAINTENANCE

Job Sheet(s) or site specific management plans shall be developed and provided to the client to assure performance of the practice as intended. At a minimum, the following components shall be addressed, as applicable:

Vegetation in the Filter Strip

Vegetation must be maintained 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.

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).

When tilling adjacent fields, care must be taken to not plow into the filter strip and decrease the width, or to create furrows adjacent and parallel to the filter strip that can turn into gullies.

Maintain fencing as needed to protect the filter strip from uncontrolled access.

Control undesirable plants by pulling, mowing, or spraying with a selective herbicide. Control noxious weeds as required by state law.

Inspect for insects and diseases, and if an incidence threatens stand survival, take corrective action to bring the pest under control.

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.

Sheet Flow

Maintain sheet flow entering the filter strip. Repair all rills and small channels within the filter strip. Needed repairs must be made immediately to reestablish sheet flow onto and through the filter strip.

Sediment Accumulation

Sediment that accumulates along the upper part and within the filter strip shall be removed before it accumulates to a height of 6 inches and begins to divert runoff water around the filter strip as concentrated flow. Removal and redistribution can be accomplished with tillage equipment or other machinery. The area disturbed by this removal shall be regraded and replanted if necessary.

Acceptable Uses

Describe the acceptable uses (e.g., flash grazing, haying, etc.) and time of year/frequency of use restrictions, if any. Pay particular attention to cost-sharing program requirements as they relate to acceptable vs. restricted uses, and other management restrictions.

Frequency of Inspections

Inspect the filter strip at least once per year.

SUPPORTING DATA AND DOCUMENTATION

1. Field location and extent of planting in acres, and assistance notes. Also note the location of the planting on the conservation plan map. Assistance notes shall include dates of site inspections, name or initials of the person who made the inspections, specifics as to what was inspected, alternatives discussed, decisions made, and by whom.
2. Soil type(s);
3. 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;
4. Species selected for establishment, seeding/planting rates, and planting dates;
5. Design slope, width and length of the filter strip;
6. Operation and Maintenance plan, or job sheet.

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. Foster, G.R., 2005 *Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Science Documentation (In Draft)*. USDA-ARS, Washington, DC.
4. 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.
5. USDA, Natural Resources Conservation Service. *Conservation Practice Standards*. Maryland 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.