United States Department of Agriculture

Natural Resources Conservation Service

CONSERVATION PRACTICE STANDARD

FILTER STRIP

CODE 393

(ac)

DEFINITION

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

PURPOSE

This practice is used to accomplish one or more of the following purposes–

- Reduce suspended solids and associated contaminants in runoff and excessive sediment in surface waters (WATER QUALITY DEGRADATION)
- Reduce dissolved contaminant loadings in runoff (WATER QUALITY DEGRADATION)
- Reduce suspended solids and associated contaminants in irrigation tailwater and excessive sediment in surface waters (WATER QUALITY DEGRADATION)

CONDITIONS WHERE PRACTICE APPLIES

Filter strips are established where environmentally sensitive areas, primarily surface water resources, need to be protected from sediment, other suspended solids, and dissolved contaminants in runoff.

CRITERIA

General Criteria Applicable to All Purposes

Overland flow entering the filter strip will be uniform sheet flow.

Concentrated flow will be dispersed before it enters the filter strip.

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

The maximum width of a filter strip for any purpose will not exceed the width of the area upslope from it.

Filter strips will not be used as a travel lane for equipment or livestock.

Additional Criteria to Reduce Dissolved Contaminants, Suspended Solids and Associated Contaminants in Runoff and Excessive Sediment in Surface Waters

The filter strip will be designed to have a 10-year functional life span. Thus, the total sediment accumulation in the filter strip cannot exceed 6 inches. The filter strip will be designed following the procedure described in Agronomy Technical Note No. 2, "*Using Revised Universal Soil Loss Equation, Version 2 (RUSLE2) for the Design and Predicted Effectiveness of Vegetative Filter Strips (FVS) for Sediment*," based on the amount of sediment delivery (as calculated through current erosion prediction technology) to the upper edge of the filter strip and ratio of filter strip flow length to length of flow path from the contributing area. Agronomy Technical Note No 2 and the companion Excel Filter Strip design spreadsheet are posted in the NC eFOTG with this standard.

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The minimum pass through flow length of the filter strip will be 20 feet to reduce suspended solids and associated contaminants in runoff and 30 feet to reduce dissolved contaminants and pathogens in runoff.

The filter strip will be located immediately downslope from the source area of contaminants.

The drainage area immediately above the filter strip will have a slope of one percent or greater.

Vegetation
The filter strip will be established to **permanent**herbaceous vegetation. The Forage Planting Guide posted with the NC 512 Forage and Biomass Planting practice standard Job Sheet or NC 342 Critical Area Planting practice standard vegetative establishment tables will be used to develop filter strip seeding and establishment specifications.

Species selected will be—

- Able to withstand partial burial from sediment deposition (up to 6 inches).
- Tolerant of herbicides used on the area that contributes runoff to the filter strip.
- Stiff stemmed and a high stem density near the ground surface.
- Suited to current site conditions and intended uses.
- Able to achieve adequate density and vigor within an appropriate period to stabilize the site sufficiently to permit suited uses with ordinary management activities.

Plant species, rates of seeding (lbs/ac), vegetative planting (plants/ac), minimum quality of planting stock (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.

Perform site preparation and seeding/planting at a time and in a manner that best ensures survival and growth of selected species. Successful establishment parameters, (e.g., minimum percent ground/ canopy cover, percent survival, stand density, stand adequacy determined via visual observation) will be included in developed establishment specifications.

Schedule planting dates during periods when soil moisture is adequate for germination and establishment. Seeding will be timed so that tillage for adjacent crop does not damage the seeded filter strip.

Where the purpose is to remove phosphorus, remove (or harvest) the filter strip above ground biomass at least once each year.

The minimum seeding and stem density will be equivalent to the seeding rate for a high quality grass hay seeding rate for the climate area or the density of vegetation selected in current water erosion technology to determine trapping efficiency, whichever is the higher seeding rate.

Filter strips as practice alternatives to treat surface runoff from a ‘bare soil’ concentrated livestock feeding or watering area

When a filter strip is considered during the conservation planning process as a practice alternative to treat surface runoff from a concentrated livestock feeding or watering area that is effectively devoid of vegetation for significant periods of time, and where a Water Quality Degradation resource concern is identified during the inventory of planning area, the following site condition applies to determine the viability of the filter strip practice as a treatment alternative.

- A potential filter strip area must provide least 100 feet vegetative treatment between a ‘bare soil’ concentrated livestock area and the down-slope water resource to provide sufficient treatment for surface runoff. A forest component is permitted within this minimum width, provided water moves through the forest litter as diffuse flow.

When a filter strip is included in the plan record of decisions to treat surface runoff from a concentrated livestock feeding or watering area, the following <u>additional criteria</u> also apply and must be included in provided specifications:

- A minimum of 20 feet of the filter strip shall not be grazed, and there shall be no livestock access to the remaining 80 feet during the period that concentrated livestock area is used for feeding.
- A diversion (362) will be planned if needed to safely convey pollutants to a more suitable location for the filter strip or sediment basin.
- The design must specify measures that exclude roof water and unpolluted surface runoff from the filter strip.
- To maintain the effectiveness of the grass filter area, the vegetation needs to be mowed and removed. Controlled grazing may be practiced when the filter area is dry and firm. Prescribed burning the filter strip is permitted.
- When the filter strip is designed as part of a forestry operation's streamside management zone to reduce delivery of sediment into waterways, the filter strip shall be designed in accordance with NC NRCS practice standard 490, Tree/Shrub Site Preparation. When a filter strip is being established as a forest component use this standard.

<u>Additional Criteria to Reduce Suspended Solids and Associated Contaminants in Irrigation Tailwater and Excessive Sediment in Surface Waters</u>

Filter strip vegetation will be a small grain or other suitable annual plant.

The seeding rate shall be sufficient to ensure that the plant spacing does not exceed 4 inches (about 16–18 plants per square foot).

Establish filter strips prior to the irrigation season so that the vegetation is mature enough to filter sediment from the first irrigation.

The minimum sheet flow length for this purpose shall be 20 feet.

CONSIDERATIONS

<u>General Considerations</u>

Filter strip width (flow length) can be increased as necessary 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.

When needed, invasive plant species may be controlled through mowing, herbicides, and hand weeding.

Considerations for 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 more contaminants in runoff.

Considerations for 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. The wildlife and pollinator benefits of this herbaceous cover can be enhanced by the following:

- When appropriate, use native grass species that fulfill the purpose(s) of the practice while also providing habitat for priority wildlife.

- Adding herbaceous plant species (including native forbs) to the seeding mix that are beneficial to wildlife and pollinators and are compatible for one of the listed purposes. Changing the seeding mix should not detract from the purpose for which the filter strip is established.
- Increasing the width beyond the minimum required. The additional area can increase food and cover for wildlife and pollinators.
- Management activities on filter strips (mowing, burning, or light disking), should not be done more often than every other year with frequency dependent on geographical location to maintain the purpose(s) of the practice.
- Management activities 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.
- Organic producers should submit plans and specifications to their certifying agent for approval prior to installation, as part of the organic producer's organic system plan.

Considerations to Maintain or Enhance Watershed Functions and Values
Filter strips may be used to enhance connectivity of corridors and noncultivated patches of vegetation within the watershed, enhance the aesthetics of a watershed, and be strategically located to reduce runoff, and increase infiltration and groundwater recharge throughout the watershed.

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

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice will be prepared for each field or treatment unit. Record the specifications using the implementation requirements document. A record of the filter strip design method must be kept for the case file. The specifications will identify at a minimum the following:

- Practice purpose(s).
- Length, width (width refers to flow length through the filter strip), and slope of the filter strip to accomplish the planned purpose(s).
- Plant species selection and seeding/planting/sprigging rates to accomplish the planned purpose.
- Planting dates and planting method(s).
- Specific care and handling requirements of the seed or plant material to ensure that planted materials have an acceptable rate of survival.
- A statement that only viable, high quality, and adapted seed will be used.
- Site preparation instructions sufficient to establish and grow selected species.
- When the filter strip is planned for treatment of surface runoff from 'bare soil' concentrated livestock feeding or watering areas, specifications must include all information necessary to meet additional criteria in this standard.

OPERATION AND MAINTENANCE

For the purposes of filtering contaminants and nutrients (phosphorus), permanent filter strip vegetative plantings will be harvested and removed 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 weed species, especially State-listed noxious weeds.

If Conservation Practice Standard (CPS) Prescribed Burning (Code 338) is used to manage and maintain the filter strip, an approved burn plan must be developed.

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.

Periodically regrade and reestablish the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function. Reestablish the filter strip vegetation in regraded areas, if needed.

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.

REFERENCES

Dillaha, T.A., J.H. Sherrard, and D. Lee. 1986. Long-Term Effectiveness and Maintenance of Vegetative Filter Strips. VPI-VWRRC Bulletin 153.

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.

Foster, G.R. Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Science Documentation (In Draft). USDA-ARS, Washington, DC. 2005.

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) Web site (checked May 2007): http://fargo.nserl.purdue.edu/rusle2_dataweb/RUSLE2_Index.htm.

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