Filter Strip (Ac.) 393

DEFINITION

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

PURPOSE

- Reduce suspended solids and associated contaminants in runoff.
- Reduce dissolved contaminant loadings in runoff.

CONDITIONS WHERE PRACTICE APPLIES

Filter strips are established where environmentally-sensitive areas 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 shall be uniform 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 plants will not be established in the filter strip. Filter strips shall not be used as a travel lane for equipment or livestock.

Vegetation

The filter strip shall be established to permanent herbaceous vegetation

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

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 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 dates shall be scheduled during periods when soil moisture is adequate for germination and/or establishment. See NRCS-Michigan Practice Standard 327 Conservation Cover.

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. The recommended vegetation will be selected from Table 1, Planting Table for Grasses and Legumes.

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 Michigan Agronomy Tech Note #40. The Michigan Filter Strip Design Tech Note is based on the NRCS National Agronomy Technical Note No. 2 (Using RUSLE2 for the Design and Predicted Effectiveness of Vegetative Filter Strips (VFS) for Sediment).

Filter Strip design width is 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. The minimum flow length through the filter strip shall be 20 feet.

Use Agronomy Tech Note #40 Filter Strip Design Spreadsheet or the tables in Agronomy Tech Note #58 Filter Strip Design Tables to determine the flow length needed. Use the greater flow length from the two procedures to design the filter strip.

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.

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.

The minimum flow length for this purpose shall be 30 feet. Use Agronomy Tech Note #40 Filter Strip Design Spreadsheet or the tables in Agronomy Tech Note #58 Filter Strip Design Tables to determine the flow length needed. Use the greater flow length from the two procedures to design the filter strip.

CONSIDERATIONS

General - 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.

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 this herbaceous cover can be enhanced by:

- Increasing the width beyond the minimum required, and planting this 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. See Biology Conservation Sheet (645) Wildlife Corridor.
- Adding herbaceous plant species to the filter strip seeding mix that are beneficial to wildlife and compatible for one of the listed purposes. Changing the seeding mix should not detract from the purpose for which the filter strip was established.

Select vegetation species that compliment the habitat of the desired wildlife species. See NRCS-Michigan Practice Standard 327 Conservation Cover and Biology Conservation Sheet (645) Wildflower Plantings for additional plant mix recommendations suitable for wildlife and beneficial insects.

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; and
- 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 shall be prepared for each field site where a filter strip will be installed. 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, width (flow path), and slope of the filter strip to accomplish the planned purpose (width refers to flow length through the filter strip).

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 sufficient to establish and grow selected species

OPERATION AND MAINTENANCE

For the purposes of filtering contaminants, permanent filter strip vegetative plantings shall 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 weed species, especially state-listed noxious weeds.

If prescribed burning 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 of the filter strip.

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

If grazing is used to harvest vegetation from the filter strip, the grazing plan must insure 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.

TABLE 1 - Planting Table for Grasses and Legumes

Recommended species of grasses, legumes, and other forbes. (Select one of the species or seeding mixes below.)

Species or Seeding Mixture	Cool/ Warm Season	Seeding Rate (Lb./Acre)	Established Density (Stems/Ft^2)	Minimum Mowing Height (In.)	Sediment Trapping	Nutrient Trapping	Wildlife Value
Single Grass Species Rates							
INTRODUCED SPECIES							
1. Smooth Bromegrass	Cool	15-30	50	4	Y		
2. Garrison Creeping Foxtail	Cool	6-10	70	4		Y	
3. Orchardgrass	Cool	10-15	70	4	Y	Y	Y
4. Reed Canarygrass	Cool	10	50	4	Y	Y	
5. Tall Fescue **	Cool	15-25	60	4	Y		
NATIVE SPECIES							
6. Tall Wheatgrass ***	Cool	8-12		6	Y		Y
7. Intermediate Wheatgrass	Cool	8-12	60	4	Y		Y
8. Big Bluestem	Warm	10-20	40-50	10-12		Y	Y
9. Eastern Gammagrass	Warm	8*	40	10-12	Y	Y	Y
10. Indiangrass	Warm	10-15*	40-50	12		Y	Y

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Plant Mixtures							
INTRODUCED PLANT MIXTURES							
1. Timothy	Cool	5-10	60	4	Y	Y	Y
Alfalfa		6-10					
2. Bromegrass	Cool	6-12	60	4	Y	Y	Y
Alfalfa		6-10					
3. Orchardgrass	Cool	2-5	60	4	Y	Y	Y
Alfalfa		6-10					
4. Orchardgrass		2.5	70	4	Y	Y	Y
Timothy		2.5					
Red Clover		3					
Alfalfa		3					
5. Orchardgrass		2.5	70	4	Y	Y	Y
Redtop		1					
Alsike Clover		3					
White Dutch Clover		3					
NATIVE PLANT MIXTURE							
6. Switchgrass	Warm	5-10*	50	12	Y	Y	Y
Big Bluestem	Warm	2 *					
Indiangrass	Warm	2					
Little Bluestem	Warm	2					
Wildflowers		0.5					

* Pounds of PLS - Pure Live Seed.
** Use Endophyte - free tall fescue if area is planned for grazing or forage.
*** Do not include tall wheatgrass with filter strips for forestland applications