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

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

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 upslope 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 and will be controlled if present (refer to “Oklahoma Noxious Weed Law”).

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

Supplemental nutrients will be applied as needed according to the Oklahoma NRCS Nutrient Management (590) standard, to maintain the desired species composition and stand density of the filter strip.

Filter strips establishment shall comply with local, state and federal regulations.

Additional Criteria to Reduce Suspended Solids and Associated Contaminants in Runoff

The filter strip width will be designed to have a 10-year life span, following the procedure outlined in National Agronomy Technical Note No. 2 “Using RUSLE2 for the Design and Predicted Effectiveness of Vegetative Filter Strips (VFS) for Sediment”. The procedure includes calculating the RUSLE2 sediment delivery rate 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. National Agronomy Technical Note No. 2 can be found in Section I of eFOTG.

An excel version of a spreadsheet to assist with the design, relating to the above Technical Note, can be found under Oklahoma ECS Computer Tools in Section I of eFOTG.

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 suspended solids.

The drainage area above the filter strip shall have a slope of 1% or greater.

Haying of the filter strip shall be in accordance with the Oklahoma NRCS Forage Harvest Management (511) standard.

Grazing shall not be permitted in the filter strip unless a prescribed grazing system is being implemented. Grazing of filter strips will be in accordance with the Oklahoma NRCS Prescribed Grazing (528) standard.

Grazing will be permitted under a prescribed grazing system only when soil moisture conditions support livestock traffic without excessive compaction and the integrity and function of the filter strip is not adversely affected.

Vegetation. The filter strip shall be established to permanent herbaceous vegetation consisting of a single species or a mixture of grasses, legumes and/or other forbs adapted to the soil, climate, nutrients, chemicals, and practices used in the current management system.

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.

Grasses will be established according to the Oklahoma NRCS Critical Area Planting (342) standard for all filter strips. Planting rates, dates, varieties, and area of adaptation for grasses will be in accordance with the above standard. The following grass species are approved for filter strips:

Native Mixture	Switchgrass
Tall Fescue	Alkali Sacaton
Old World bluestems	Tall Wheatgrass
Bermudagrass	

Forbs and legumes will be limited to overseeding on the above grasses. Overseeding shall be done in accordance with the Oklahoma NRCS Critical Area Planting (342) standard.

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.

The minimum stem density shall be equivalent to a high quality grass hay for the climate area or the type of vegetation selected in RUSLE2 to determine trapping efficiency, whichever is the higher.

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, vegetation characteristics, grazing and haying also apply to this purpose.

Table 1 shall be used to design filter strip widths when pesticides, nitrogen, phosphorus or pathogens are a concern.

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

Filter strip vegetation shall be planted to either permanent grasses or an annual plant such as small grain or forage sorghum.

The seeding rate shall be sufficient to ensure that the plant spacing does not exceed 4 inches. Follow the guidance in the Oklahoma NRCS Cover Crop (340) standard for dates and seeding rates when planting annuals.

Filter strips shall be established early enough prior to the irrigation season so that the

vegetation is mature enough to filter sediment from the first irrigation.

Annuals may be left in place, mowed or harvested. Stubble or residues shall be left standing at least 4 inches in height until the next crop is planted. Volunteer of small grains should be destroyed to break pest cycles such as wheat streak mosaic.

The minimum width of the filter strip for this purpose shall be 20 feet and the maximum shall be 50 feet.

CONSIDERATIONS

Filter strip width (flow length) can be increased as necessary to accommodate harvest and maintenance equipment.

Caution should be observed when tilling with equipment or spraying herbicides next to the vegetative filter strip in order to prevent damage to vegetation and maintain the designed flow length.

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.

Filter strips are often the only break in the monotony of intensively-cropped areas. The secondary wildlife benefits of this herbaceous cover can be enhanced by 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.

To maintain or enhance watershed functions and values, filter strips can:

- Be strategically located to 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.

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, and slope of the filter strip to accomplish the planned purpose (width refers to flow length through the filter strip).

b) Vegetative 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.

f) Plans for practices used to induce sheet flow across the filter strip and to stabilize concentrated flow passing through the filter strip.

OPERATION AND MAINTENANCE

For the purposes of filtering contaminants, permanent filter strip vegetative plantings shall be harvested (hayed) as appropriate to encourage dense growth, maintain an upright growth habit and remove nutrients and other contaminants that are contained in the plant tissue. Hay bales shall be removed from the filter strip in a timely manner to avoid damage to the grass stand.

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

If prescribed burning is used to manage and maintain the permanent vegetation within the filter strip, an approved burn plan must be developed according to guidance found in the Oklahoma NRCS Prescribed Burning (338) standard.

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.

To maintain or restore the filter strip's function, periodically re-grade and re-establish the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function. Re-establish the filter strip vegetation in these regraded areas, if needed.

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

(Filter width to reduce dissolved contaminants in runoff - pesticides, nitrogen, phosphorus and pathogens)

Percent slope of land in contributing area	Width of filter (Feet)			
	Hydrologic soil group of filter strip area			
	A	B	C	D
1-3	34	35	38	40
3-5	36	46	46	50
5-8	43	54	60	65
>8	63	78	90	100