

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### FILTER STRIP (ACRE) CODE 393

#### DEFINITION

A strip or area of vegetation for removing sediment, organic material, and other pollutants from runoff and waste water.

#### PURPOSE

To remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, adsorption, absorption, decomposition, and volatilization, thereby reducing pollution and protecting the environment.

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies: (1) on cropland at the lower edge of fields or above conservation practices such as terraces or diversions; (2) on fields up gradient to intermittent or perennial streams, ponds and lakes; (3) in fields up gradient to sinkholes; (4) in areas requiring filter strips as part of a waste management system to treat polluted runoff or waste water; (5) on forest land where filter strips are needed as part of a forestry operation to reduce delivery of sediment into waterways.

#### CRITERIA (General for all purposes and conditions)

The filter strip will be designed to intercept overland sheet flow and to promote infiltration. Adequate soil drainage should be maintained to eliminate ponding and saturation problems that interfere with the proper functioning of the filter strip.

Site permits, regulations and cost-share programs may supersede NRCS management and vegetative specifications for filter strips.

Pesticide applications that involve certain chemicals may be restricted within filter strip areas in order to remain in compliance with label directions. Under Sections 401 and 404 of the Clean Water Act, State and federal agencies must issue water quality certifications for many stream bank and floodplain disturbances. Consultation with the Kentucky Division of Water and/or the U.S. Army Corps of Engineers or other technical agency for guidance is suggested prior to initiating work.

Conservation practice standards are reviewed periodically and updated, if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service or web site ([www.ky.nrcs.usda.gov](http://www.ky.nrcs.usda.gov))

USDA programs may prohibit certain management requirements (such as periodic forage harvesting) as mentioned in this standard.

#### VEGETATION CRITERIA (General for all purposes and conditions)

The following information will be used during the planning phase to determine the vegetation in the filter strip that best serves the objectives being addressed. Site conditions such as soil suitability, runoff velocities, sediment delivery and others must be considered. Plant growth habits, planting dates, harvest methods and forage suitabilities must also be considered when determining the appropriate vegetative species to be established.

Filter strips will be established to recommended grasses and legumes in consideration of local soil and climate conditions. Recommended plants (species and seeding rates) are provided in Table 1, which is an attachment to this standard. Establishment procedures will meet NRCS Technical Specifications for Critical Area Planting (342) or Pasture and Hayland Planting (512).

Plants selected for filter strips must be capable of retaining sediment and/or sequestering nutrients during the expected filtering period. The filter strip land area must be capable of producing vigorous plant growth with normal management. The plant species will be compatible with other objectives of the landowner. **NATIVE GRASSES ARE NOT RECOMMENDED FOR FILTER STRIPS AS PART OF A WASTE MANAGEMENT SYSTEM.**

Filter strips must be established with at least one grass species. When filter strips are established with native grasses a legume must also be established in the mix. Legumes are optional in Filter Strips established with introduced grasses. The legume species chosen must be compatible with the seeding dates for the other plant species if they are to be seeded simultaneously in a mixture. Note: (Do not establish introduced and native species together.)

A nurse crop of winter wheat or annual rye may be established during periods when the perennial species cannot be established. Fertilizer, lime and other soil amendments should be applied at the time of establishment according to soil test recommendations.

Vegetation must have the ability to recover from inundation by water and sediment. In situations when existing vegetation is present in the filter area, the vegetation will be evaluated according to its potential to assure the overall effectiveness of the filter strip in consideration of pollutant loading.

**CRITERIA (1) FOR FILTER STRIPS UP GRADIENT TO WATER COURSES, WATER BODIES, WETLANDS DEPRESSIONAL AREAS, SINKHOLES AND ABOVE CONSERVATION PRACTICES**

The length of flow through filter strips, will be based on considerations such as land use, sediment/pollutant loading, slopes above the filter strips, proximity to intermittent or perennial streams, and presence of critical landscape features such as sinkholes, streams, springs, and wells.

Measurement of all flow lengths for filter strips to be installed adjacent to a water course or water body will be made upstream and away from the top of the bank or other landscape position most applicable.

Measurement of all flow lengths for filter strips to be installed up gradient to a depressional area or sinkhole will be made upstream and away from the approximate bottom of the depression or the outer rim of the sinkhole opening.

Measurement of all flow lengths for filter strips to be installed for the protection of conservation practices or wetlands will be made upstream and away from the designed edge of the practice or wetland, as most appropriate.

For filter strips designed in consideration of landscape features (such as those mentioned in Criteria 1), the minimum flow length will be between 20 feet and 100 feet. In some cases, longer flow lengths may be recommended in order to more fully address multiple resource concerns.

**CRITERIA (2) FOR FILTER STRIPS AS PART OF A WASTE MANAGEMENT SYSTEM**

For filter strips in areas required as part of a waste management system to treat runoff from lots, heavy use/feeding areas, application areas, storage structures, facility drainage and constructed wetland drainage, the following criteria shall apply:

<u>Avg. Land Slope Percent of the Filter Strip Area</u>	<u>Minimum Length of Flow (Feet)</u>
0- 6	40 - 60
7 and above	60 - 100

Note: The flow length information is also applicable for filter strips (set backs) on manure application areas (fields) adjacent to intermittent or perennial streams, ponds, lakes, or critical landscape features. In regard to land application, additional site specific set back distances may apply near streams and other water bodies consistent with federal, state, or local regulations and policies.

On lots and other concentrated livestock areas, a constructed settling basin or other type of retention structure, if needed shall be designed, built, and maintained. This will prevent discharges that are caused by storms up to and including the 25-year, 24-hour storm. The capacity of the retention structure must be based on the amount of wastewater generated by the facility and the volume of the expected runoff from a 25-year, 24-hour storm for all the contributing drainage areas (including open lot surfaces, roofed areas, and areas between lots and retention structures). Any basin outflow onto the vegetated filter strip shall be disregarded in computing minimum storage. Additional storage capacity, based on frequency of cleaning shall be provided for manure and other solids settled within the basin. When the basin is cleaned after every significant runoff event, additional storage equivalent to at least 0.5 inches from the concentrated waste area shall be provided. If only annual cleaning of the basin is planned, additional storage equivalent to at least six inches from the concentrated waste area shall be provided.

A filter strip may be a relatively uniform vegetated area. Minimum dimensions shall be based on the peak outflow from the concentrated waste area or settling facility based on a 25-year, 24-hour rainfall.

Filter strips that are planned only for the purpose of treating facility wash water should be constructed with an infiltration trench in the bottom.

A low velocity channel, if needed, shall be a minimum of 60 feet long. It shall be designed for a flow depth of 0.5 feet or less to pass the peak flow resulting from a 25-year, 24-hour rainfall at a velocity of 0.5 feet per second or less. Provisions shall be provided for removal of settled solids from the channel as necessary to maintain proper functioning.

Vegetated filter strips (with channel) shall be designed to carry the peak flow at a depth of 0.5 feet or less. Flow length shall be sufficient to provide at least 30 minutes of flow through time. The stems of the vegetation shall remain upright during design flow. There shall be no discharge from the end of the filter strip directly to water courses or drainage ditches and other conduits leading to a stream, lake, or wetland, etc. Discharge will require a KPDES permit from the KY Division of Water.

Vegetated filter strips (without channel) shall be generally on the contour with level bottoms and be sufficiently wide enough to pass the peak flow at a depth of 0.5 inches or less. Flow length should be sufficient to provide at least 15 minutes of flow through time. Waste water application rates should not exceed two acre inches per week. Application times should not exceed six hours per day, and should be decreased to two hours for more concentrated wastes, such as that from animal waste storage facilities.

Application to the filter strip should not exceed two acre inches per week with a two to three day rest period between application events. Items such as a level lip weir, gated pipe, tile gravity system, sprinklers, perforated corrugated plastic pipe, or other facilities may be needed to distribute flow uniformly across the top of the filter strip and maintain sheet flow through the strip.

#### **CONSIDERATIONS (For all filter strips as applicable)**

The following items should be considered in order to implement filter strips according to a plan that addresses the pollutants to be filtered:

1. Consider situations that impact irrigation, visual aspects, fire hazards, wildlife benefits, and other special needs. Prevent erosion where filter strips outlet into streams or channels.
2. Consider effects of the water budget, especially on volumes and rates of runoff, infiltration, evapotranspiration, deep percolation, and ground water recharge.
3. Consider effects caused by seasonal weather variations such as with frozen soils, snow cover, summer dormancy, and varying ranges of soil moisture. Loading rates may require adjustments to accommodate climate variables.
4. Consider effects of vegetation on water retention within the soil profile of the filter strip.
5. Consider effects within the filter strip on removal or accumulation of nutrients. Nutrient budgets should account for effects of growing and decaying vegetation.
6. Consider effects on the visual quality of onsite and downstream water resources.
7. The selection and management of vegetation is essential to the achievement of the purpose of the filter strip practice.

8. The proper sequence of applying conservation practices within the watershed area that is contributing overland flow will assure that excessive erosion and pollution rates do not prohibit the successful establishment of the filter strip.

9. Severely eroded sinkhole openings or depressional areas should be stabilized during filter strip establishment in order to achieve maximum sediment retention and water quality benefits. For guidance refer to NRCS Field Office Technical Guide (FOTG) Specification No. 342, Critical Area Planting.

10. Provisions for preventing continuous or daily discharge of liquid waste should be made unless the area is adequate for infiltrating all daily-applied effluent. Temporary storage should be considered to prevent discharge to the filter strip in excess of two-acre inches per week.

11. Enough rest periods should be scheduled between periods of heavy flow and/or waste applications in order to maintain an aerobic soil profile. Storage or alternating filter strips may be desirable, however, drainage is an essential component.

12. An adequate filter area and length of flow must be maintained to achieve the desired reduction of pollutants. A serpentine or switchback channel can be used to provide greater length of flow. The minimum flow lengths as stated in this standard may be extended as needed to better accommodate site conditions.

13. Provisions should be made to exclude roof water and unpolluted surface runoff. Full use should be made of diversions, terraces, dikes, roof gutters, etc., in developing an effective filter area to reduce run on quantities from unpolluted sources.

14. Where there is a concern for nitrate nitrogen entering the ground water and the filter strip is located on a soil with a high infiltration rate (Hydrologic Group A), the filter strip should be established to a high nitrogen using plant. Over seeding with an annual grass should be considered to aid in nitrogen removal during the dormant period of the perennial vegetation.

15. Consider the effects of the filter strip in regard to the enhancement of wildlife habitat. For additional information, refer to the NRCS Technical Specification for Upland Wildlife Habitat Management (645).

#### **PLANS AND SPECIFICATIONS**

Plans and specifications for filter strips are to be prepared for each field site based on this standard. The plans will describe the requirements for properly establishing, managing, and maintaining the practice to achieve its intended purpose. As requested, NRCS can provide a job sheet that contains the following site specific information: plan map, practice design recommendations, vegetative recommendations and operation and maintenance requirements.

### OPERATION AND MAINTENANCE (General)

A narrative will be prepared for operation and maintenance of the filter strip area. It will cover the following operations:

1. Concentrated flow within the filter strip area must be minimized. If concentrated flow occurs, needed repairs should be made immediately to reestablish sheet flow.
2. Vegetation in the filter strip area shall be maintained in a vigorous growing condition. Periodic applications of nutrients (if not supplied by the runoff) and lime shall be applied according to soil test recommendations in order to maintain fertility levels that support optimum vegetative production. Fertilizer applications should be consistent with the University of Kentucky recommendations as stated in (AGR-1).
3. The filter strip area shall be maintained in vegetative species that support the design criteria. Periodic removal of undesirable species should be performed by methods that do not hamper the overall performance of the filter strip.
4. The filter strip area shall be inspected on a seasonal basis and also following storm events to correct any damages.
5. Vegetative plant density shall be maintained by over seeding and by the application of management methods such as clipping and harvesting that promote tillering and other reproductive plant growth functions. Generally, plants should be managed for stiff upright growth to occur. Vegetation shall be maintained at an effective plant height of no lower than six inches for cool season species and eight to ten inches for native warm season grass species. Effective plant height may be adjusted as needed to promote the maximum growth potential of the key species. When wildlife habitat enhancement is a primary concern, vegetation shall be maintained to an effective plant height of at least 12 inches.
6. Grazing shall not be permitted in the filter strip area unless a prescribed grazing system is being implemented in the contributing watershed. Grazing shall be permitted on the filter strip area only when soil conditions support animal traffic.
7. Hay harvesting should be performed on a regular basis to stimulate plant growth, maintain an upright growth habit, and provide for the removal of nutrients that are contained in the plant tissue. When wildlife habitat enhancement is a primary concern, hay harvesting should be performed only between August 15 and September 30.
8. The filter strip shall be maintained according to the minimum flow length. The length may be extended if actions in the contributing watershed create an increase in pollutants.
9. The filter strip area may need to be adjusted if management changes occur in the contributing watershed area. Sinkhole and depression area openings may need periodic maintenance in order to control erosion.
10. The filter strip area below a waste management system may need to be adjusted if management changes occur. Herd size, rations, and animal types influence pollutant loading.
11. Whenever possible, vegetation in the filter strip shall be managed to improve nesting and brood rearing habitat for grassland associated wildlife. Mowing/clipping (other than hay harvesting) should only be performed (only during late winter) at necessary intervals so as to limit plant succession.
12. The filter strip shall not be used as a field road for regular access or transport of vehicles or equipment in any manner that would interrupt sheet flow of water. The effective length of flow through the filter strip will not apply to an area used as a field road.

**Table 1. Plant List for Filter Strips.** Use the column on the left for establishing single species stands and the column on the right for establishing multiple species stands. Mixtures of introduced grasses must include a minimum of ten pounds PLS (pure live seed) grass/acre. Mixtures of native grasses must include a minimum of eight pounds PLS grass/acre. The minimum seeding rates on this table may be exceeded by 25 percent as needed to accommodate site specific situations.

Plant Type	Single Species Seeding Rate Minimum LBS Acre	Multiple Species Seeding Rate (Mixture) Minimum LBS Acre
<b>GRASSES – Introduced Species</b>		
Reed Canary	20	n/a
Bermudagrass <sup>1/</sup>	40 bu/ac	n/a
Smooth Brome <sup>2/</sup>	20	10
Tall Fescue	25	15
Ryegrass	20	10
Orchardgrass	15	10
Timothy	10	5
KY Bluegrass	15	10
Red Top	8	4
<b>GRASSES – Native Species</b>		
Switchgrass	8	1
Indiangrass	8	2
Big Bluestem	8	2
Little Bluestem	n/a	2
Eastern Gama Grass	8	3
Side Oats Gama	n/a	1
Virginia Wild Rye	n/a	2
<b>LEGUMES</b>		
White Cover	3	1
Red Clover	10	5
Korean Lespedeza	10	5
Birdsfoot Trefoil	6	3
Alsike Clover	4	2
Patridge Pea	6	3
Kobe Lespedeza	10	5
Ladino Clover	1	1
“Appalow” Lespedeza <sup>3/</sup>	10	5
Sweet Clover	10	5
Crimson Clover	10	5
New Zealand Clover	10	5
Hairy Vetch	10	5
Lathco Flat Pea	10	5

<sup>1/</sup> Applicable to Major Land Resource Areas (MLRA) 131, 134, 120, 122.

<sup>2/</sup> Applicable to Major Land Resource Areas (MLRA) 121, 125.

<sup>3/</sup> Do not use the “Interstate” sericea variety.