

**NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD**

FILTER STRIP

(ACRES)

CODE 393

DEFINITION

A strip or area of herbaceous vegetation situated between cropland, grazing land, or disturbed land (including forest land) and environmentally sensitive areas.

• **PURPOSE**

- To reduce sediment, particulate organics, and sediment adsorbed contaminant loading in runoff
- To reduce dissolved contaminant loading in runoff
- To serve as Zone 3 of a Riparian Forest Buffer, Practice Standard 391
- To reduce sediment, particulate organics, and sediment adsorbed contaminant loading in surface irrigation tailwater
- To reduce pathogen loading in runoff
- To reduce dissolved contaminant and particulate loading from an AFO feedlot.
- To for treatment of runoff as part of an animal waste management system
- To restore, create or enhance herbaceous habitat for wildlife and beneficial insects.
- To maintain or enhance watershed functions and values

CONDITIONS WHERE PRACTICE APPLIES

This practice applies (1) in areas situated below cropland, grazing land, or disturbed land (including forest land) (2) where sediment, particulate organic matter and/or dissolved contaminants may leave these areas and are entering environmentally sensitive areas; (3) in areas where permanent vegetative establishment is needed to enhance wildlife and beneficial insects, or maintain or enhance watershed function. This practice applies when planned as part of a conservation management system.

CRITERIA

General criteria applicable to all purposes

Filter strips shall be designated as vegetated areas to treat runoff and are not part of the adjacent cropland rotation. Suitable species, planting rate and dates are shown in [Appendix 1, Seeding Table for Buffer Applications](#).

The application of a dead litter cover, where needed, will follow the guidance in [Appendix 2](#).

Overland flow entering the filter strip shall be primarily sheet flow. Concentrated flow shall be dispersed.

Noxious weeds will not be established in the filter strip and will be controlled if present.

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

Additional criteria to reduce sediment, particulate organics, and sediment-adsorbed contaminant loading in runoff

Filter strip flow length shall be determined based on field slope percent and length, and filter strip slope percent, erosion rate, amount and particle size distribution of sediment delivered to the filter strip, density and height of the filter strip vegetation, and runoff volume associated with erosion producing events. The minimum flow length for this purpose will be determined by **Appendix 3, Table 1, *Minimum Filter Strip Flow Lengths to Reduce Sediment, Particulate Organics, and Sediment-adsorbed Contaminant Loading in Runoff***, or the drainage area to filter strip ratio shown below.

Filter strip location requirements:

- a) The filter strip shall be located along the downslope edge of a field or disturbed area. To the extent practical it shall be placed on the approximate contour. Variation in placement on the contour should not exceed a 0.5% longitudinal (perpendicular to the flow length) gradient.
- b) The drainage area above the filter strip shall have greater than 1% but less than 10% slopes.
- c) The ratio of the drainage area to the filter strip area shall be less than 70:1 in regions with RUSLE-R factor values 0-35, 60:1 in regions with RUSLE-R factor values 35-175, and 50:1 in regions with RUSLE-R factor values of more than 175.
- d) The average annual sheet and rill erosion rate above the filter strip shall be less than 10 tons per acre per year

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, and nutrients, chemicals, and practices used in the current management system. Species selected shall have stiff stems and a high stem density near the ground surface. **Stem density shall be such that the stem spacing does not exceed 1 inch.**

Additional criteria to reduce dissolved contaminants in runoff

The criteria given in “Additional criteria to reduce sediment, particulate organics, and sediment-adsorbed contaminant loading in runoff” also apply to this purpose.

Filter strip flow length required to reduce dissolved contaminants in runoff shall be based on management objectives, contaminants of concern, and the volume of runoff from the filter strip’s drainage area compared with the filter strip’s area and infiltration capacity.

The flow length determined for this purpose shall be in addition to the flow length determined for reducing sediment, particulate organics, and sediment-adsorbed contaminant loading in runoff. The minimum flow length for this purpose will be determined by **Appendix 3, Table 2, *Minimum Filter Strip Flow Lengths to reduce dissolved contaminants in runoff***, or the drainage area to filter strip ratio discussed in the previous section.

The minimum flow length for this purpose, when used in association with agricultural waste application will be 100 feet.

Additional criteria to serve as Zone 3 of a Riparian Forest Buffer, Practice Standard 391

Except for the location requirements, the criteria given in “Additional criteria to reduce sediment, particulate organics, and sediment-adsorbed contaminant loading in runoff” also apply to this purpose when zone 3 is adjacent to cropland or other poorly vegetated areas.

When zone 3 is adjacent to an agricultural waste application area, and receiving "sheet flow" from the application area the combine width of Zone 1, 2, & 3 must be at least 100 feet wide, with the filter strip being a minimum of 20 feet wide.

If concentrated flows entering Zone 3 are greater than the filter strip’s ability to disperse them, other means of dispersal, such as spreading devices, must be incorporated.

Additional criteria to reduce sediment, particulate organics, and sediment adsorbed contaminant loading in surface irrigation tailwater

Filter strip vegetation may be a small grain or other suitable annual with a plant spacing that does not exceed 4 inches.

Filter strips shall be established early enough prior to the irrigation season so that the vegetation can withstand sediment deposition from the first irrigation.

The flow length shall be based on management objectives, see appendices for appropriate minimum wide.

Additional criteria to reduce pathogen loading in runoff

Using filter strips as sole treatment for pathogen removal may not reduce the pathogen counts to levels meeting water quality standards. Other management practices may need implementation.

The filter strip will be designed and constructed to promote infiltration. Infiltration basins, filled trenches, and/or vegetative barriers may be used to enhance effectiveness of the filter strip.

The minimum flow length for this purpose for this purpose will be determined by **Appendix 3, Table 3, Minimum Filter Strip Flow Lengths to reduce pathogens in runoff.**

Additional criteria to reduce dissolved contaminant and particulate loading from an AFO feedlot

Where solids entrapment will have a negative effect on the filter strip, a means will be provided for removing solids from the effluent before it reaches the filter strip.

A sediment basin for settling solids, if needed above the filter strip area, will be constructed according to the practice standards Sediment Basin (350), or Waste Storage Facility (313).

The filter strip will not be used until the vegetation is established such that the stem spacing does not exceed 1 inch.

The herd size within the lot using this form of treatment must be less than the number considered a Concentrated Animal Feeding Operation (CAFO).

The minimum flow length for this purpose for this purpose will be determined by **Appendix 3, Table 4, Minimum Filter Strip Flow Lengths to reduce dissolved contaminant and particulate loading from an AFO feedlot.**

Additional criteria for treatment of runoff as part of an animal waste management system

For filter strips in areas required as part of a waste management system to treat waste water, including facility water (milkhouse and parlor), and over-flow from a constructed wetland or waste storage pond that is part of the animal waste management system.

A means will be provided for removing solids from the effluent before it reaches the filter strip.

The filter strip will not be used until the vegetation is established such that the stem spacing does not exceed 1 inch.

The herd size within the lot using this form of treatment must be less than the number considered a Concentrated Animal Feeding Operation (CAFO).

The minimum flow length for this purpose for this purpose will be determined by **Appendix 3, Table 5, Minimum Filter Strip Flow Lengths for treatment of waste water as part of an animal waste management system.**

If one type of contaminant is the primary concern, the length of flow given in **Table 5** may be reduced to the minimum for that type according to the appropriate **Table** in **Appendix 3. This option will only be taken when monitoring of will be used to verify that the discharge of contaminant from the wetland, waste storage pond, or other areas does not exceed acceptable concentration standards.**

Filter strips that treat wastewater should be located where prevailing winds will minimize odor nuisance and where there are no objections of aesthetics from both the neighbors and the landowner.

Items such as a level lip weir, gated pipe, tile gravity flow system, sprinklers, or other facilities will be needed to distribute flow uniformly across the top of the filter strip and maintain laminar flow through the length of the filter area.

All outside uncontaminated water will be diverted around or away from the treatment filter strip.

Loading to the filter strip will be limited to 2 inches per week.

The filter strip shall not outlet directly into a water course or water body. A watercourse is a natural or constructed channel that carries concentrated water flow. Water courses and water bodies are designated as water features on a soil survey map.

Additional criteria to restore, create, or enhance herbaceous habitat for wildlife and beneficial insects

If this purpose is intended in combination with one or more of the previous purposes, then the minimum criteria for the previous purpose(s) must be met. **Additional filter strip flow length devoted to this purpose must be added to the length required for the other purpose(s).**

Any addition to the flow length for wildlife or beneficial insects shall be added to the downhill slope of the filter strip. Vegetation to enhance wildlife may be added to that portion of the filter strip devoted to other purposes to the extent they do not detract from its primary functions.

Plant species selected for this purpose shall be for permanent vegetation adapted to the wildlife or beneficial insect population(s) targeted.

If wildlife enhancement is the **only** purpose, filter strip width and length shall be based on the wildlife purpose or insects. The recommended width for a filter strip used as a wildlife movement corridor is 20 feet to 100 feet, and for a filter strip used as nesting or escape cover is 40 feet to 200 feet. The minimum wide of a filter strip designated as an area for beneficial insects is 20 feet. Density of the vegetative stand established for this purpose shall consider targeted wildlife habitat requirements and encourage plant diversity. Dispersed woody vegetation may be used to the extent it does not interfere with herbaceous vegetative growth, or operation and maintenance of the filter strip.

The filter strip shall not be mowed during the nesting season of the target wildlife.

Livestock and vehicular traffic in the filter strip shall be excluded during the nesting season of the target species.

Additional criteria to maintain or enhance watershed functions and values

Filter strips shall be strategically located to enhance connectivity of corridors and non-cultivated patches of vegetation within the watershed.

Filter strips should be strategically located to enhance aesthetics of the watershed.

Plant species selected for this purpose shall be for establishment of permanent vegetation. Minimum flow length for this purpose will be 20 feet.

CONSIDERATIONS

Filter strips should be strategically located to reduce runoff, and increase infiltration and ground water recharge throughout the watershed.

Filter strips for the single purposes of wildlife/beneficial insect habitat or to enhance watershed function should be strategically located to intercept contaminants thereby enhancing the water quality of the watershed.

To avoid damage to the filter strip consider using vegetation that is somewhat tolerant to herbicides used in the upslope crop rotation.

Consider using this practice to enhance the conservation of declining species of wildlife, including those that are threatened or endangered.

Consider using this practice to protect National Register listed or eligible (significant) archaeological and traditional cultural properties from potential damaging contaminants.

Filter strip size should be adjusted to a greater flow length to accommodate harvest and maintenance equipment.

PLANS AND SPECIFICATIONS

Based on this standard, plans and specifications shall be prepared for each specific 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.

Specifications will include:

- a) Length, width, and slope of the filter strip to accomplish the planned purpose (length refers to flow length across 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

Grazing shall not be permitted in the filter strip unless a prescribed grazing system is being implemented. Grazing will be permitted under a prescribed grazing system only when soil moisture conditions support livestock traffic without excessive compaction or roughening of the filter strip area.

OPERATION AND MAINTENANCE

For the purposes of filtering contaminants, permanent filter strip vegetative plantings should 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 noxious weeds.

Prescribed burning may be used to manage and maintain the filter strip when an approved burn plan has been 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.

To maintain or restore the filter strip's function, periodically regrade the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function, and then reestablish the filter strip vegetation, if needed. If wildlife habitat is a purpose, destruction of vegetation within the portion of the strip devoted to that purpose should be minimized by regrading only to the extent needed to remove sediment and fill concentrated flow areas.

Appendix 3

Minimum Flow Length Tables

Table 1, Minimum Filter Strip Flow Lengths to Reduce Sediment, Particulate Organics, and Sediment-adsorbed Contaminant Loading in Runoff

Length of Flow (Feet)				
Land Slope of Contributing Area	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
0 - 1 %	20	20	22	24
>1 - 3 %	20	25	28	30
>3 - 5 %	24	30	33	36
>5 - 8 %	28	35	40	42
>8 - 10%	32	40	44	48

Table 2, Minimum Filter Strip Flow Lengths to reduce dissolved contaminants in runoff

Length of Flow (Feet)				
Land Slope of Contributing Area	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
0 - 1 %	30	30	33	36
>1 - 3 %	40	50	55	60
>3 - 5 %	56	70	77	84
>5 - 8 %	72	90	100	108
>8 - 10%	96	120	132	144

Minimum flow width adjacent to an animal waste application area is 100 feet.

Appendix 3

Minimum Flow Length Tables

Table 3, Minimum Filter Strip Flow Lengths to reduce pathogens in runoff

Length of Flow (Feet)				
Land Slope of Contributing Area	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
0 - 1 %	20	25	28	30
>1 - 3 %	24	30	33	36
>3 - 5 %	32	40	44	48
>5 - 8 %	48	60	66	72
>8 - 10%	100	125	137	150

Table 4, Minimum Filter Strip Flow Lengths to reduce to reduce dissolved contaminant and particulate loading from an AFO feedlot

Length of Flow (Feet)				
Land Slope of Contributing Area	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
< 2 %*	48	60	66	72
> 2 - 4 %	72	90	100	108
> 4 - 6 %	96	120	132	144
> 6 %	Not Recommended too steep			

* Slopes < 2 % are permitted only if a solid removal system, such as a sediment basin, is functioning above the filter strip area, a means is in place to spread the effluent evenly over the top of the filter strip, and the cross slope area is nearly flat.

Appendix 3

Minimum Flow Length Tables

Table 5, Minimum Filter Strip Flow Lengths for treatment of wastewater as part of an animal waste management system

Length of Flow (Feet)				
Land Slope of Contributing Area	Hydrologic Group A	Hydrologic Group B	Hydrologic Group C	Hydrologic Group D
< 2 %*	60	75	83	90
> 2 - 3 %	80	100	110	120
> 3 - 4 %	120	150	165	180
> 4 - 5 %	160	200	220	240
>5 - 6 %	240	300	330	360
> 6 %	Not Recommended too steep			

* Slopes < 2 % are permitted only if a means is in place to spread the effluent water evenly over the top of the filter area, and the cross slope of the filter area is nearly flat.