

FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

Filter Strip
393

*University of California Cooperative Extension
Natural Resources Conservation Service*



Filter strips are areas of vegetation for removing sediment and pollutants from runoff and waste water through filtration. This practice can be applied to cropland at the lower edge of fields, above conservation practices such as terraces and diversions, or on fields adjacent to waterways. The width should be at least 10 feet of dense vegetation on slopes of less than 1% and proportionately up to 25 feet for 30% slopes.

Advantages

- Reduces erosion
- May enhance wildlife habitat, especially if native species are used
- Potential capture of sediments from upslope land uses
- Potential capture of some nutrients and pesticides

Disadvantages

- May require maintenance such as mowing

Practice Effectiveness for Reducing Water Quality NPS Pollution Potential

Erosion-sheet & rill	Erosion-streambank	Pesticides-leaching	Pesticides-dissolved in runoff	Pesticides-adsorbed to sediment	Nutrients-leaching	Nutrients-surface waters
slight to significant	slight to significant		moderate	significant	Negligible to slight	slight to moderate

Empty boxes indicate information not yet collected for this practice

Additional sources of information regarding filter strips:

UC Sustainable Agriculture Research and Extension Program <http://www.sarep.ucdavis.edu/>
 UC Weed Research and Information Center <http://wric.ucdavis.edu/>

Some of the information in this management sheet has been taken from the Natural Resource Conservation Service (NRCS) Handbook of Conservation Practices practice #393. The picture is from Daniel Mountjoy, USDA-NRCS. Contact your local NRCS office or visit <http://www.nrcs.usda.gov> for more information.

A Practice Specification has not been prepared. Specifications and design details will be prepared upon request of the Area Engineer or State Conservation Engineer.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

FILTER STRIP

(acre)
CODE 393

DEFINITION

A strip or area of vegetation for removing sediment, organic matter, and other pollutants from runoff and wastewater.

Scope

This standard establishes the minimally acceptable requirements for design and operation and maintenance of filter strips for removing sediment, organic matter, and other pollutants from runoff or wastewater.

PURPOSES

To remove sediment and other pollutants from runoff or waste water by filtration, deposition, infiltration, absorption, adsorption, 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, or on fields adjacent to streams, ponds, and lakes; (2) in areas requiring filter strips as part of a waste management system to treat polluted runoff or waste water; and (3) on forest land where filter strips are needed as part of a forestry operation to reduce delivery of sediment into waterways.

CRITERIA

Filter strips for sediment and related pollutants

These criteria apply to filter strips on cropland at the lower edge of fields, on fields, on pastures, or in manure spreading areas adjacent to streams, ponds, and lakes, and above conservation practices such as terrace or diversions.

The length of flow through vigorous vegetation shall be at least 10 ft for slopes of less than one percent and proportionately up to at least 25 ft for 30 percent slopes.

Filter strips for runoff from concentrated livestock areas

These criteria apply to filter strips for feedlot and backyard runoff.

A settling basin, vegetated barriers, or low velocity channel shall be provided between the waste source and filter strip when more than 100 1,000-pound animal units are confined. Such facilities should be considered for use with all filter strips.

A constructed settling basin, if needed, shall have sufficient capacity, as a minimum, to store the runoff computed for 15 minutes duration at the peak inflow rate resulting from 2-year, 24-hour rainfall. Any basin outflow 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 in. from the concentrated waste area shall be provided. If only annual cleaning of the basin is planned, additional storage equivalent to at least 6 in. from the concentrated waste area shall be provided.

A low velocity channel shall be minimum of 75 ft long. It shall be designed for a flow depth of 0.5 ft or less to pass the peak flow resulting from a 2-year, 24-hour rainfall at a velocity of 0.5 ft per second or less. Provisions shall be provided for removing settled solids from the channel as necessary to maintain proper functioning.

A filter strip may be a relatively uniform grass area or grass waterway. Minimum dimensions shall be based on the peak outflow from the concentrated waste area or settling facility based on a 2-year, 24-hour rainfall.

Grass area filter strips shall be generally on the contour and sufficiently wide to pass the peak flow at a depth of 0.5 in. or less. Flow length shall be sufficient to provide at least 15 minutes of flow-through time.

Grass channel filter strips shall be designed to carry the peak flow at a depth of 0.5 ft or less. Flow length shall be sufficient to provide at least 30 minutes of flow thorough time. Grass species and shape of channel shall be such that grass stems will be remain upright during design flow.

Filter strips for controlled overland flow treatment of liquid wastes

These criteria apply to filter strips for wastewater from milk parlors, milking centers, waste treatment lagoon, food processing plants, and animal waste storage facilities. Overland flow filter strips shall be installed on natural or constructed sloped of 2 to 6 percent. They shall have minimum flow lengths of 100 ft on 2 percent slopes and proportionately up to 300 ft on 6 percent slopes. Weekly wastewater application rates should not exceed 6 in. and should be only 1 or 2 in. for highly concentrated wastes. Daily application times should times should not exceed 6 hours, and should be decreased to 2 hours for more concentrated wastes such as that from animal waste storage facilities. Filter strips should be rested at least 2 days each week.

Filter strips on forestland

These criteria apply to filter strips for runoff as part of a forestry operation to reduce delivery of sediment into waterways.

As a guide, the length of flow through undisturbed forest floor should be at least 25 ft for slopes of less than one percent and proportionately up to at least 65 ft for 30 percent slopes and at least 150 ft for 70 percent slopes. Longer flow lengths should be used as contributing drainage areas increase.

CONSIDERATIONS

Evaluate type and quantity of pollutant, slopes and soils, adapted vegetative species, time of year for proper establishment of vegetation, necessity for irrigation, visual aspects, fire hazards, and other special needs. Prevent erosion where filters outlet into streams or channels. If filter strips are to be used in treating wastewater or polluted runoff from concentrated livestock areas, the following must be considered.

1. Adequate soil drainage to ensure satisfactory performance.
2. Provisions for preventing continuous or daily discharge of liquid waste unless the area is adequate for infiltrating all daily applied effluent.

Temporary storage should be considered to prevent discharge to the filter strip more frequently than one every 3 days.

3. Enough rest periods to maintain an aerobic soil profile. Storage or alternating filter strips may be desirable.
4. Reduced effectiveness of filter strips under snow or frozen conditions.
5. An adequate filter area and length of flow to provide the desired reduction of pollutants. A serpentine or switchback channel can be used to provide greater length of flow.
6. Provisions for excluding roof water and unpolluted surface runoff.
7. Slopes less than 5 percent are more effective; steeper slopes require a greater area and length of flow.
8. Provisions for mowing and removing vegetation to maintain the effectiveness of the filter area. While not generally recommended, controlled grazing may be satisfactory when the filter area is dry and firm.
9. The need for a level lip weir, gated pipe, sprinklers, or other facilities to distribute flow uniformly across the top of the filter strip and maintain sheet flow through the strip.

Filter strips by themselves will not meet the "non-discharge" requirement applicable to livestock operations requiring permits under the National Pollutant Discharge Elimination System. More stringent pollution abatement measures may also be necessary where receiving waters must be highly protected.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and

recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that during critical periods, such as spawning, eggs in gravel's, and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

1. Filter strips may have only a minor effect on the quantity of surface and ground water.

Water Quality

1. Filter strips for sediment and related pollutants meeting minimum requirements may trap the coarser grained sediment.
2. Filter strips for runoff from concentrated livestock areas may trap organic material, solids, materials that become absorbed to the vegetation or the soil within the filter.
3. Filter strips for controlled overland flow treatment of liquid wastes may effectively filter out pollutants.
4. All types of filters may reduce erosion on the area on which they are constructed.
5. Filter strips trap solids from the runoff flowing in sheet flow through the filter.

PLANS AND SPECIFICATIONS

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

OPERATION AND MAINTENANCE

Development of rills and small channels within filter areas must be minimized. Needed repairs must be made immediately to reestablish sheet flow. A shallow furrow on the contour across the filter can be used to reestablish sheet flow. Vegetation must be maintained in a vigorous condition. If livestock have access to the filter area, it must be fenced to control grazing.

Filter strips may not filter out soluble or suspended fine-grained materials. When a storm causes runoff in excess of the design runoff, the filter may be flooded and may cause large loads of pollutants to be released to the surface water. This type of filter requires high maintenance and has a relatively short service life and is effective only as long as the flow through the filter is shallow sheet flow.

Often they will not filter out soluble materials. This type of filter is often wet and is difficult to maintain.

The filter must be properly managed and maintained, including the proper resting time. Filter strips on forestland may trap coarse sediment, timbering debris, and other deleterious material being transported by runoff.