NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD
FILTER STRIP - AREA
New York

(acre)
code NY393a

DEFINITION

An area of grass sod for removing sediment, organic matter, nutrients and other pollutants from barnyard runoff or waste water.

PURPOSE

To remove sediment and other pollutants from barnyard 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 in areas requiring a Grass Filter Area (GFA) as part of a Waste Management System (312) to treat polluted barnyard runoff or waste water.

CRITERIA

A GFA is a designed and constructed area of a dense grass sod, on which liquid waste is applied, to capture, settle and treat most pollutants from farm generated wastes.

A GFA, if designed and maintained properly, is an excellent method for reducing the total solids, sediment, biochemical oxygen demand (BOD) and total phosphorus. The filtering and deposition processes have been shown in a variety of situations. Organic solids will decompose biologically on the filter. Once settled out on a filter, the BOD concerns will be met in an aerobic environment with the organic matter reduced to humus. Ammonia volatilization and denitrification of nitrates occurs. Phosphorus will be fixed to soil particles and organic matter. Where control of pathogens and soluble substances such as ammonia, nitrates, and phosphorus, is desired, infiltration will need to occur before significant reduction in pollutant flows can be expected. Each specific site will need to be evaluated to determine if a GFA will meet the objectives in reducing the pollutants that are of concern.

Source control will be used to reduce the total volume, frequency, and concentrations of pollutants, thereby increasing the effectiveness of the GFA.

Design Criteria

A. General

1. Siting

A GFA will:

- be outside a 25 year flood plain or protected from flood damage,
- have a level cross-section that insures sheet flow,
- be placed such that the lower edge shall be a minimum of 25 feet from a surface water body,
- be 100 feet or more from a well,
- be placed where vigorous dense vegetation exists or can be established, and
- have a finished grade not less than 2 percent and not more than 12 percent.

2. Soils

A GFA will:

- have a natural permeability between

moderately slow and moderately rapid, or
have its site and/or soil modified to achieve acceptable permeability,

- will have at least two feet of soil depth between the bottom of unlined distribution trenches and bedrock and seasonal high groundwater,
- will have at least two feet of soil depth between the finished surface of the filter area and bedrock and seasonal high groundwater.

3. Land Grading

- Where site has an irregular surface and adequate soil, grade surface into a smooth, level cross-section. Add topsoil and establish vegetation.

4. Vegetation

Existing Vegetation:

- Site will have healthy existing vegetation with uniform cover.
- pH shall be maintained at a minimum of 6.2.
- P and K will be in the medium range (Cornell Nutrient Analysis Lab).
- Interseed as needed.

Establishing New Vegetation:

Seedbed Preparation: Initial establishment conditions should have the pH adjusted to 6.2 and P and K in the medium range (Cornell Nutrient Analysis Lab). Apply lime, as needed, and fertilize to insure rapid, healthy growth of the tall fescue.

Where topsoil is to be applied, lime the substrate to a pH of 6.2 prior to topsoiling. Add a minimum of 2 inches of topsoil. Mix topsoil with substrate to a depth of 4-6 inches to remove any surface compaction. Mix the lime and fertilizer into the soil to blend the topsoil layer into the subsurface layer.

Finish seedbed like a lawn with a smooth rolled surface to allow for easy maintenance.

Seeding: Seed in accordance with Table 1 to obtain a uniform solid stand of vegetation.

Late August or early September seedings are best. Early spring seedings are very satisfactory. Do not seed between June 15 to August 15.

Mulch the seeding with 2 ton/acre (90 lb./1000 square feet) of small grain straw to avoid rilling during establishment. Anchor mulch as necessary.

Establishment Period: Allow at least one full growing season for the vegetation to develop before allowing the area to be used as a filter zone. Inspect and approve vegetation before applying waste.

Maintenance:

To keep in a growing state or mostly leafy condition, mow when seed heads appear. Cut to a height of 3-5 inches and remove the top growth at least three times each year. Avoid driving over the filters if soil moisture conditions will result in vehicle ruts.

TABLE 1

	Species	**lbs./ac.**	**lbs./ 1000 sq. ft.**
well drained soils, dry conditions			
1.	Tall fescue Orchardgrass Perennial ryegrass or Redtop	20 10 5 2	(0.5) (0.25) (0.1) (0.1)
2.	Orchardgrass Timothy	10 10	(0.25) (0.25)

	Timothy Perennial ryegrass	10 5	(0.25) (0.1)
less than well drained soils, wet conditions			
3.	Tall fescue Reed canarygrass Redtop	20 10 2	(0.5) (0.25) (0.1)
4.	Tall fescue Perennial ryegrass or Redtop	30 5 2	(0.75) (0.1) (0.1)

Grazing:

Livestock shall be excluded from the GFA. Occasional controlled grazing may be satisfactory when the filter area is dry and firm. Stubble height will be maintained at 3 to 5 inches high or more.

5. Clean Water Exclusion

A GFA design shall:

- exclude clean surface water, up to the peak discharge from a 25 year - 24 hour storm, from the grass filter area surface,
- exclude subsurface seepage.

6. Solids Removal

A GFA shall:

- have a means for removing solids from the effluent before discharging to the vegetative filter,
- have settling facilities designed for easy clean-out at regular intervals.

7. Pumps and Piping

- Inlet Pipe: A water-sealed trap and vent or a similar device shall be provided on pipelines from enclosed buildings. Such a device helps to prevent gases from entering the building.
- Inlet pipes shall be made of materials that will not separate at the joints, that will be watertight, and that can withstand sunlight, weather, and earth and traffic loading.
- Clean water seepage along the inlet pipe shall be prevented from entering the filter area.
- Gravity flow pipes shall have a minimum diameter of 4 inches, a minimum grade of one percent and be protected from crushing.
- Pressurized pipes will be sized according to hydraulic loading but shall not be less than 1.5 inches in diameter.
- When gravity flow is not possible, pumps shall be appropriate for the waste materials and sized to handle the required discharge and head.

8. Effluent Spreaders

- An effluent spreader shall be installed along the top width of the filter strip when waste is not applied by irrigation.
- Effluent will be spread using a clean gravel trench with post and plank spreader, 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.
- Effluent spreaders shall not exceed 40 feet in length - more than one may be required.
- Provide 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 once

every 3 days.

9. Loading

- The size of the GFA shall be large enough to assure that the total liquid volume will not exceed 104 inches per year (average annual precipitation plus estimated waste volume).

B. For Runoff from Barnyard and Concentrated Livestock Areas

A GFA will be installed only in conjunction with a Barnyard Water Management System (NY707). Source reduction to remove manure solids from the barnyard is an essential design and maintenance component for the continued functioning of the filter area.

The following are in addition to the general design criteria:

1. Solids Removal

- Solids will be removed before runoff is discharged to a Grass Filter Area. Excess solids will smother vegetation and disrupt uniform overland flow interfering with the normal functions of a Grass Filter Area.
- A settling basin, low velocity channel, or other suitable device shall be provided between the waste source and filter area.
- A constructed settling basin 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 inch from the concentrated waste area shall be provided. If only annual cleaning of the basin is planned, additional storage equivalent to at least 6 inches from the concentrated waste area shall be provided.
- A *low velocity channel* shall be a minimum of 75 feet long. It shall be designed for a flow depth of 0.5 feet or less to pass the peak flow resulting from a 2-year, 24-hour rainfall at a velocity of 0.5 feet per second or less. Provisions shall be provided for removing settled solids from the channel as necessary to maintain proper functioning.

2. Size of Filter Area

- Minimum dimensions shall be based on the routed peak outflow from the concentrated waste area or settling facility, based on a 25 year, 24 hour rainfall when storage is provided, but in no case less than the peak flow from a 2 year, 24 hour rainfall event when storage is not provided.
- *Length of Flow* - The flow length of a GFA shall be sufficient to provide at least 15 minutes of flow-through time.

Table 2 gives flow lengths for a GFA, for barnyard runoff treatment for various slopes as calculated using Manning's formula with a "n" value of 0.24.

TABLE 2
GFA 15 minute flow length for barnyards runoff

Average Land Slope (percent)	Flow length (feet)
2	100
4	135

6	165
8	190
10	215
12	230

Mannings "n" = 0.24

- *Width* - Vegetative Filter Areas shall be generally on the contour and sufficiently wide to pass the routed peak or peak flow at a depth of 0.5 inches or less. In all cases, positive control of urine and other liquid sources will be achieved in the barnyard to prevent continual flows into the Grass Filter Areas.

C. For Controlled Overland Treatment of Liquid Wastes (milking parlor, milking center, silage leachate, and compost pad runoff).

The following are in addition to the general design criteria:

I. <u>Milking Center Waste</u>:

1. Size of Filter Area

A GFA shall have a minimum length of flow of:

- on slopes less than 6 percent
  - 100 feet
- on slopes greater than 6 percent
  - Table 2, or
  - 100 feet if using a collection and redistribution system in the middle of the GFA.

- Provide a minimum of 10 square feet minimum of filter area per gallon per day of wash water. When specific data is unavailable, volume can be estimated as 4 gallons per cow per day for milkhouse operations and 8 gallons per cow per day for milking parlor operations.

2. Solids Removal

- Source control is needed to remove as much milk and manure from the waste stream as possible. Special consideration must be given when high BOD loading and high solid contents are present. These conditions will occur when waste milk is dumped into the waste stream or manure from milking parlor floors is washed into the waste stream. Additional settling capacity and more frequent clean out will be required with high solid waste.

- Two Grass Filter Areas that allow alternating use and resting are required for high volume waste applications and required for all milking parlor applications.
- A settling tank with PVC pipe tee inlets and outlets will be provided with three day storage capacity. The inlet pipe into the tank should bring the waste in at least 2.5 feet from the bottom of the tank. The outlet shall draw waste water off the bottom 1 to 1.5 feet of the tank.
- Settling facilities shall be cleaned out at regular intervals where excess manure enters the system. Pumping will not be done from the settling tank - a pump station shall be used.

II. <u>Silage Leachate</u> (tower silo juice and bunk silo runoff):

1. General:

- The amount of flow will be monitored and adjusted to prevent a large kill zone from developing.
- Use source control to reduce leachate volume and solids loadings to filter area.
- Effluent flow path shall be a minimum of 300 feet to surface water as measured from the top of the GFA.

2. Tower silo:

- Provide settling in accordance with milking center waste.
- Dilute 1:1 with clean water before applying to GFA and apply at agronomic rates.

3. Bunk silo:

- Provide 1/3 acre of GFA for each one acre of bunk silo.
- Grass Filter Areas will be used only when concentrated low flows have been controlled and eliminated from the filter area.
- Grass Filter Areas should flow only when a runoff event is occurring.

III. <u>Compost Pad Runoff</u>

1. General

- Compost and/or compost ingredients on pad shall be less than 70% moisture or have positive control of any leachate, such as roofs or tarps and/or leachate collection systems to insure that no free water flows from the compost or ingredients.

2. Size of Filter Area

- Provide 1/3 acre of GFA for each acre of compost pad.
- Effluent flow path shall be a minimum of 300 feet to surface water as measured from the top of the GFA.
- Grass filter areas shall flow only when a runoff event is occurring

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. If a GFA is used the following must be considered:

1. Providing rest periods to maintain an aerobic soil profile. Storage with periodic dosing or alternating Filter Areas may be desirable.
2. The reduced effectiveness of a GFA under snow, frozen or saturated conditions.
3. Using a settling facility before the pump station when waste is pumped to a GFA.
4. Using a serpentine or switchback channel to provide a greater length of flow if adequate filter area and length of flow to provide the desired reduction of pollutants is not available.
5. Annually checking the rate of nitrogen being applied to grass filter area plant species. If too high, increase the size of the filter area.
6. Locating the GFA where prevailing winds will minimize odors and other aesthetic problems for neighbors.

<u>Water Quality/Quantity Considerations</u>: Grass Filter Areas by themselves will not meet the "no-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.

OPERATION AND MAINTENANCE

An Operation and Maintenance Plan shall be developed for the Grass Filter Area system that is planned and installed.

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. Maintain fencing to control grazing.

PLANS AND SPECIFICATIONS

Plans and specifications for Grass Filter Areas shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. The completed work is to be checked and documented to verify that this practice was completed according to the drawings, specifications, and this standard**.**

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