NRCS Natural Resources Conservation Service

Vegetated Treatment Area

Conservation Practice Fact Sheet 635

Definition

An area of permanent vegetation used for agricultural wastewater treatment.

Purpose

To improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations.

Condition where practice applies

Where a Vegetated Treatment Area (VTA) can be constructed, operated and maintained to treat contaminated runoff from such areas as feedlots, compost areas, barnyards, and other livestock holding areas; or to treat process wastewater from agricultural operations.

How is a Vegetative Treatment Area Different from a Buffer or Filter Strip?

A buffer or filter strip is a narrow strip of vegetation (usually 30-60 feet wide), between cropland and a stream or other surface water. Runoff passes through buffer or filter strips with some "reduction" of pollutants, but no attempt is made to control or check the flow into or out of the strip.

The critical aspect of the VTA is that is has been designed and sized to "treat" the runoff nutrients generated by the livestock lot area (--letting runoff flow uncontrolled across the nearest pasture or crop field is not likely to achieve the desired wastewater treatment). For a VTA to function properly the runoff needs to be released in a controlled manner. This control is what differentiates a VTA from grass buffer or filter strips. Controls also need to be put in place to eliminate or manage discharges from the VTA.

Figure 1:

Figure 1, Collecting runoff from a feedlot pen during a rain event

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Vegetative Treatment Area Types

There are many different types or options of vegetative treatment area systems. Soil available water holding capacity, soil infiltration rate, topography, depth to groundwater, distance to surface water, and slope are the primary factors that determine whether a particular type of VTA is appropriate for a site. Below are but some of the system types:

Figure 2:

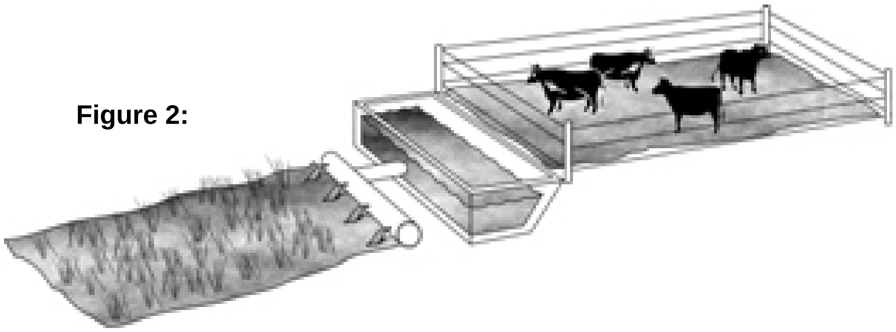

Figure 2, Sloped VTA is defined as a vegetative area with slopes of 1 to 5%. This is the most popular type of vegetated treatment area and is one of the most simple. The advantage of the sloped VTA is that the gradual slope works well for achieving uniform distribution across the VTA. The disadvantage of the sloped VTA is that is can allow runoff to leave the system during large storm events.

Figure 3:

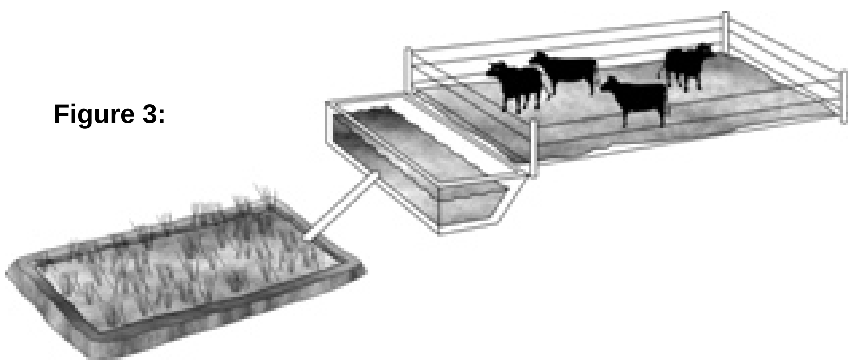

Figure 3, Level VTA is defined as having a level area (0-1% slope) or a shallow infiltration basin. Berms for a level VTA are usually in the 1 to 2 foot range and have the advantage of containing and treating large runoff events. For small runoff events even distribution across the level VTA is more difficult. Technical evaluation when siting a level VTA is critical for the water quality improvement purposes of this practice.

Site soils and depths to groundwater must be considered to ensure groundwater quality is protected. If groundwater resources are at risk, a sub surface drainage system beneath the root zone may be considered as part of a multiple VTA system (see Figure 7). Collected percolation water from below the level VTA can be further treated for improved water quality benefits.

Figure 4:

Terraced

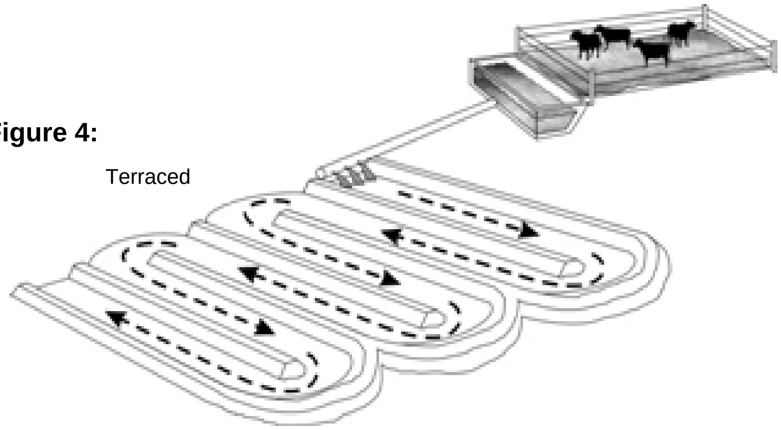

Figure 4, VTA terrace systems are typically designed as serpentine broad base terraces or as storage terraces. They have the advantage of having a long contact time, but are difficult to construct on sloped land with an adequate vegetated area. The terrace VTA may require a land area twice as large as a sloped VTA for the same treatment area, as so much land is lost to terrace slopes. Another disadvantage of a terrace system is the difficulty in achieving uniform distribution across the entire length of the VTA.

Figure 5A, Site plan

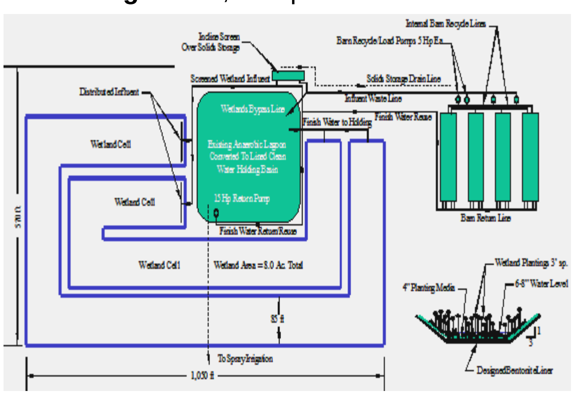

Figure 5B, Aerial view

Figure 5, Constructed wetlands site plan (5A) and aerial view (5B) are shallow impoundments (3-4 feet maximum depth) that use the liquid surface to treat the nitrogen (denitrify) in the runoff water. Cattails and bulrush have been used successfully to establish vegetation in constructed wetlands. Usually the bottom is flat and liquid levels are maintained at six to twelve inches. The advantage of a constructed wetland is that they need less space than a conventional VTA, because they are able to treat more nitrogen per unit area than, say a sloped VTA.

Their disadvantage is that they cannot completely clean the water, so they need to be coupled with another type of VTA to be effective. The other main disadvantage is that they are very costly, and depending upon the geology of the site, need a liner to be acceptable (with the addition of fill on top of the liner for plant media).

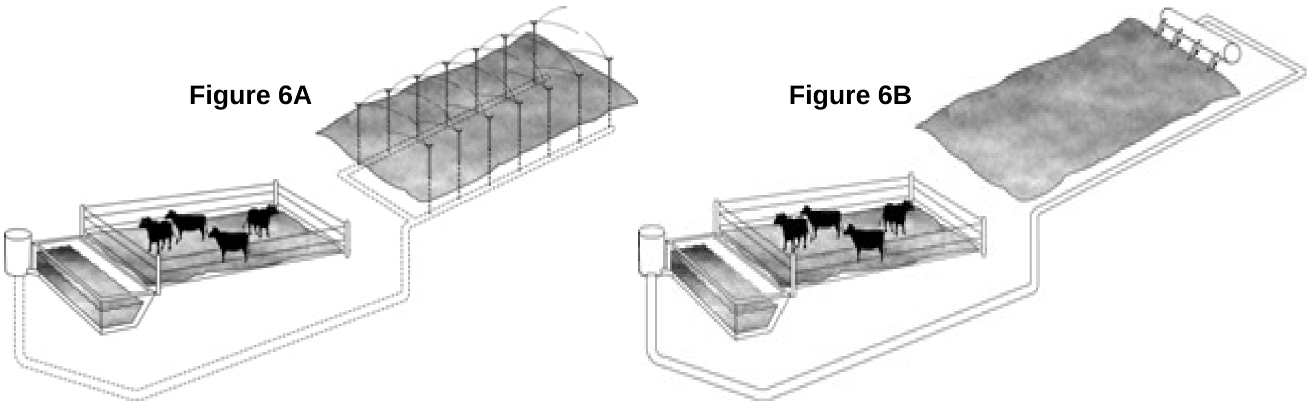

Figure 6, A pump and sprinkler (6A) or spreader (6B) VTA concept uses a pump or mechanical device to convey runoff water to a distribution system, up gradient of the sediment settling structure. A sprinkler VTA uses sprinklers to distribute runoff. A pump VTA uses low pressure mechanisms, such as gated pipe or concrete spreaders to distribute runoff to a VTA. The advantage of sprinkler and pump VTA is that they can be constructed where suitable land below the sediment settling structure is not available. The disadvantage of pump and sprinkler systems is that they are more costly and require more maintenance to maintain the pump and distribution system.

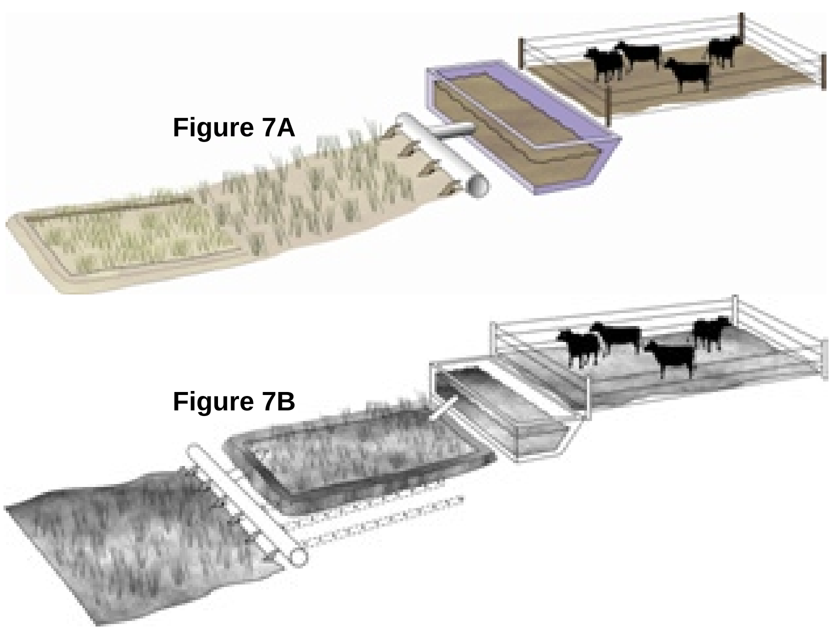

Figure 7, Dual (7A) and Multiple (7B) VTA systems combine more than one VTA type, and have the advantage of increasing the performance and efficiency of a VTA system. Whenever possible, dual or multiple VTA systems are preferable to single type VTA systems.

Criteria

Permit requirements must be followed for all applicable state and local agencies for this practice and must comply with all state laws, rules, and regulations regarding discharges to state waters.

The VTA design shall be based on the nutrient contents of the contaminated runoff and the VTA's ability to hold and uptake the nutrients. Permanent vegetation consisting of a single species or a mixture of grasses, legumes and/or other forbs adapted to the soil and climate shall be established in the treatment area.

Harvesting the VTA should be appropriate to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue.

Livestock need to be excluded from the VTA to maintain graded slopes and uniform plant growth.

Operation and Maintenance

- Control undesired weed species, especially state-listed noxious weeds, and other pests that could inhibit proper functioning of the VTA
- Inspect and repair treatment areas after storm events to fill in gullies, remove flow disrupting sediment accumulation, re-seed disturbed areas, and take other measures to prevent concentrated flow
- Apply supplemental nutrients and soil amendments as needed to maintain the desired species composition and stand density of herbaceous vegetation
- Maintain or restore the treatment area as necessary by periodically grading when deposition jeopardizes its function, and then reestablishing to herbaceous vegetation
- Conduct maintenance activities only when the surface layer of the VTA is dry enough to prevent compaction

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