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Enhanced Vegetative Strips for Livestock Facilities

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Animal production facilities have become the focus of water quality regulators because of the potential threat that these facilities pose. In some cases, impervious production areas (concrete, compacted soil, etc.) create streams of polluted water that move off-site and pollute surface water resources.

An enhanced vegetative strip (EVS) is a best management practice that can be installed to protect surface waters from pollution produced by animal production facilities. Most people think of a vegetative strip as a grassed area or waterway, but when intentionally installed and properly managed, an EVS can be much more effective than a simple grassed filter strip. If properly managed, enhanced vegetative strips can be used to trap, treat, and absorb pollutants, which can be removed from the designated area by harvesting or grazing.

An enhanced vegetative strip is an area of grass or other permanent vegetation that is maintained to remove sediment, organic material, nutrients, pesticides, and other contaminants from runoff in order to protect water quality. These strips slow the velocity of water, allowing particles to settle out and infiltration to increase. Enhanced vegetative strips also have the ability to produce high per-unit yields from an area that is essentially irrigated with the runoff received from impervious areas—water and nutrients that would otherwise be wasted.

The information provided in this publication may differ slightly from Natural Resources Conservation Service (NRCS) practice codes for vegetative treatment strips or filter strips. Producers using NRCS funding or design will have to adhere to the NRCS practice standards and policy.

Applications

There are several systems in which an enhanced vegetative strip can be applied, including rotational grazing and a partially covered backgrounding facility.

Rotational Grazing System with Dry Lot

The first system, a rotational grazing system that utilizes a dry lot for partial confinement and heavy use, is illustrated in Figure 1. This system forces runoff from the dry lot and pastures through an enhanced vegetative strip before it reaches an environmentally sensitive area like a stream, sinkhole, well, karst depression, or lake. This system protects natural resources better than a traditional feeding system located in a low-lying riparian area, where pollutants can easily reach surface water.

Partially Covered Backgrounding Facility

Another application of enhanced vegetative strip technology is shown in Figures 2 and 3. Figure 2 illustrates a barn and concrete floor used for backgrounding cattle. The concrete pad drains runoff containing nutrients and other pollutants into the adjacent pasture. Soil samples from the area receiving this drainage were analyzed for soil test phosphorus (STP), and the results are shown in relation to the distance from the facility in Figure 3. These results show a high concentration of phosphorus near the facility that decreases as the distance from the facility increases. Although only phosphorus concentrations are shown, other pollutants, such as pathogens and nitrogen, could also be present.

Figure 1. Schematic of a rotational grazing system with an attached dry lot for feeding and watering livestock that includes an enhanced vegetative strip.

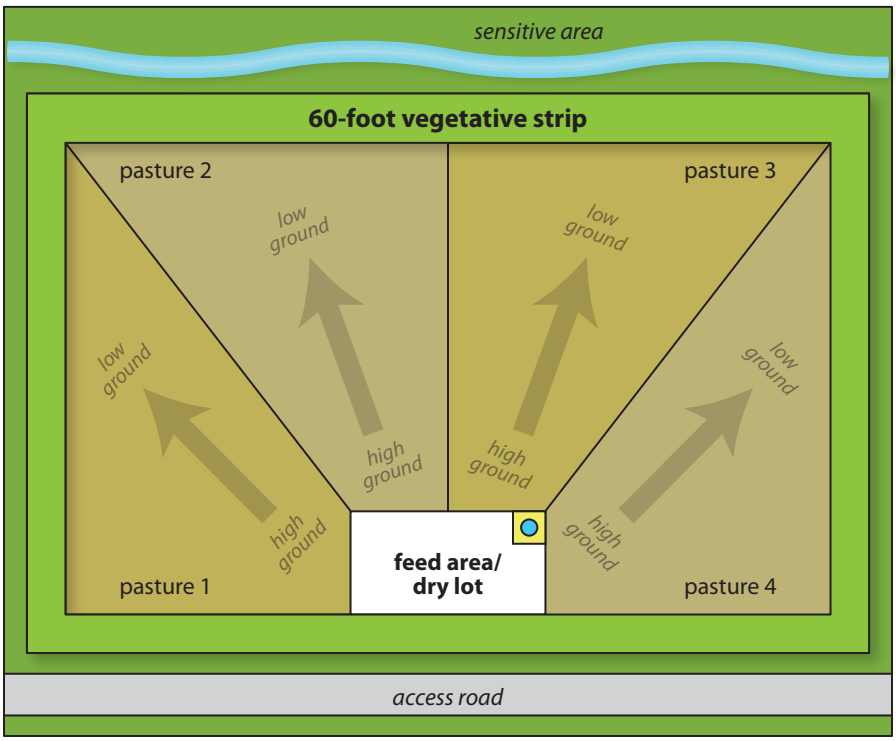

Figure 2. Water that runs over this concrete cattle feeding area picks up nutrients and other pollutants that can flow to surface water if not controlled.

Figure 3. Aerial view of the concrete cattle feeding facility with soil test phosphorus (STP) levels shown for the adjacent pasture.

Nutrients, pathogens, and sediment moving off-site from the livestock facility shown in Figures 2 and 3 could be trapped, treated, and removed by installing enhanced vegetative strips along the edge of the concrete pad and into the adjacent pasture. If implemented correctly, the width of the strip should coincide with the width of the facility (or the drainage area), and the strip should extend far enough to capture pollutants from the runoff until phosphorus levels have decreased to natural levels.

Design Specifications

Enhanced vegetative strips should be located immediately downhill from the production area and are most effective in areas that have a grade of less than 5%. Using enhanced vegetative strips on slopes greater than 15% is not recommended (Grismer et al., 2006). The width of the enhanced vegetative strip, from top of the hill to the bottom, should increase as the slope increases (Table 1).

When there is an environmentally sensitive area below the production area, the NRCS recommends the establishment of an enhanced vegetative strip with a minimum width of 60 feet. Justification for a 60-foot buffer width is depicted in Figure 3, in which the phosphorus levels begin to drop off sharply approximately 60 feet from the facility (Figure 4).

Table 1. Minimum enhanced vegetative strip width based on slope.

Slope (%)	Width (ft)
1-3	25
4-7	35
8-10	50

Vegetation Establishment

The type of vegetation used in the enhanced vegetative strip is one of the most crucial elements in creating an effective barrier between a pollutant source and water resources. Some species of vegetation are more beneficial than others in certain situations, so it is important to determine which type of vegetation is most beneficial to you and the environment. Since it is important to remove the vegetation in order to remove excess nutrients, the vegetation should serve a purpose after harvesting. Depending on the intended post-harvest use and the season in which filtering needs to be accomplished, several different types of vegetation could be used.

The type of vegetation should be chosen based on seasonal management differences. For example, if the facility producing runoff is being used for backgrounding calves during the fall and winter season, cool-season vegetation should be chosen, because it will be actively growing during the confinement period, when pollutants are released. Warm-season vegetation should be selected for the summer months to help facilitate additional removal of nutrients.

For the facility shown in Figures 2 and 3, a blend of orchardgrass and timothy was selected as the warm-season grass, and a perennial rye was interseeded to provide a cool-season grass in the same area. The strip was established in the fall by first spraying the area with 2,4-D herbicide to remove broadleaf weeds (Figure 5) and then interseeding the mix into a stand of tall fescue (Figure 6).

Figure 4. The yellow line delineates the recently-seeded 60-foot buffer zone established next to the facility shown in Figures 2 and 3.

Figure 5. Broadleaf weeds were removed from the proposed filter strip area using this ATV, equipped with a spray boom.

Figure 6. The filter strip was planted with seeding equipment borrowed from the local Cooperative Extension office.

Tall Fescue (cool season)

Research shows that tall fescue can be a good enhanced vegetative strip material, as it effectively wicks up nutrients; however, it has limited grazing and harvesting use. Also tall fescue can become saturated if it receives high volumes of water, which can result in stand thinning and encroachment of undesirable weed species.

Orchardgrass and Timothy

Orchardgrass is a good choice for an enhanced vegetative strip because it grows well in the cool spring as well as during the hot summer months. Orchardgrass removes a lot of nutrients per unit of yield, and is highly palatable to all classes of livestock. Cattle should be allowed to graze orchardgrass between 9 and 4 inches, at which point it should be left to grow again.

Timothy can also be used in enhanced vegetative strips. It is nutritious and palatable to livestock and horses and is most productive in early summer. Grazing should be timed to occur before jointing, although after the second grazing, plants normally do not joint. Timothy can be grazed down to 4 inches.

Bermudagrass (warm season)

Bermudagrass is a warm-season grass that is used throughout the southern United States for forage and turf. This grass produces a deep root system, grows to a height of 15 to 24 inches, and tolerates drought and close grazing relatively well. When irrigated, this grass can produce yields of 15 tons per acre. Considering that it could receive large amounts of nutrient-rich runoff from impervious production areas, this grass is ideal for an enhanced vegetative strip.

Several varieties of bermudagrass can be started from seed, and they are usually divided into winter-hardy and non-winter-hardy types. A winter-hardy variety is the best choice, since it provides a long-term stand. The variety Wrangler has shown excellent survival in all areas of Kentucky. Cereal rye or annual ryegrass should be interseeded with the pre-established bermudagrass in the fall.

Once bermudagrass reaches 8 inches or more, it can be mowed for hay. If the enhanced vegetative strip will be used for grazing purposes, livestock can be introduced when the bermudagrass reaches a height of 6 to 8 inches and can be grazed down to 3 to 4 inches. Ideally, cattle would graze the small area established as an enhanced vegetative strip and then deposit their waste in another area to accomplish nutrient removal.

Gamagrass

If the enhanced vegetative strip will be used for grazing, eastern gamagrass is a species to consider. Since gamagrass is very palatable and is favored over other grasses by grazing animals, it is best managed in a pure stand. Gamagrass has a deep root system that allows it to absorb a lot of nutrients. If soil moisture conditions and other forage needs are sufficient, production can be expected to increase as more fertilizer (i.e., nutrient runoff) is applied. This forage is probably best suited for high nutrient and moisture areas such as drainages from milk parlors.

Management

Managing an enhanced vegetative strip includes harvesting the vegetation in some way in order to remove excess nutrients from the soil. Essentially, there are two types of enhanced vegetative strips: those that are accessible by livestock and those that are not. Other maintenance practices, aside from grazing and harvesting, that ensure an effective enhanced vegetative strip include proper fertilization and weed control.

Grazing

Flash grazing gives cattle limited access to the enhanced vegetative strip and is accomplished by fencing off the EVS, allowing cattle stocked at a relatively high density to graze the area for a period of two to four days at a time with approximately 30 days between grazing periods. This short grazing period allows the producer to graze livestock, maintain a healthy stand of forage, and periodically remove vegetation. This method also allows the livestock to remove the excess nutrients that are contained in the vegetation while not adding an excessive amount back through defecation. Depending on the size of the enhanced vegetative strip and the number of grazing animals, the enhanced vegetative strip could be split into multiple paddocks for grazing smaller portions at a time in order to increase vegetation removal. After a killing frost, grazing should be avoided until the plants are dry. The livestock producer should wait at least five to seven days to graze the forage again to ensure that the cyanide released from the grass by the frost has time to dissipate.

Fencing

When an enhanced vegetative strip is open to periodic grazing, a temporary electric fence should be used to simplify the process of opening and closing the strip area. If the livestock are not familiar with electric fencing, a thicker strand of wire should be used, such as polytape. With the thick, ribbonlike fence, one strand hung approximately 3 feet high is sufficient for restricting livestock. For animals that have not been exposed to electric fencing, visibility is important. White fencing shows up the best against a green background and can been seen better than other colors from farther away. For fenceposts, fiberglass or plastic fence rods that contain hooks to hold up the fence strand can be used. Spacing between posts should be based on the terrain and the number of posts needed to properly support the wire.

Several choices are available to power the electric fence. The source can vary based on fence length and amount of power needed to deter the animals. Fence supply stores can help decide what is right for the job. For a location far from an electric power source, solar-powered fences are an option. When building the fence, use durable materials so that periodic installation and removal of fencing does not wear out the equipment.

Harvesting

If the strip is not accessible to livestock, it should be cut for hay. Ideally the area would be cropped with corn, alfalfa, or a similar crop that removes a large quantity of nutrients. However, areas that are targeted for enhanced vegetative strips receive drainage, which makes them less than ideal for cropping, as they remain wet during periods when crops are being established. Exotic grass species, such as those discussed in this publication, tolerate wet conditions, remove large amounts of nutrients, and can be used as forage. For these reasons, this publication highly recommends their use in enhanced vegetative strips.

Other Management Options

Often systems that could be improved with an enhanced vegetative strip could also be improved by implementing stormwater diversion best management practices (BMPs). Guttering roofs and redirecting clean water away from the production area can reduce the amount of runoff that needs to be managed by enhanced vegetative strips. For more information about stormwater BMPs, see University of Kentucky Cooperative Extension publication *Stormwater BMPs for Confined Livestock Facilities* (AEN-103).

Resources

Cost-share programs are also often available to offset some of the cost of installing and maintaining an enhanced vegetative strip. Check with your local conservation district for such opportunities.

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