

Managing Manure: The Role of Riparian Buffers

Fact Sheet

Equine Facilities Manure Management Practices

June 2003

Equestrians have become aware of the potential environmental impacts that may be caused by their horses and are actively seeking solutions to minimize these problems. A typical 1,000 pound horse may produce 0.75 cubic feet per day of solid waste plus urine, therefore appropriate manure management practices must be implemented at equestrian facilities in order to control runoff containing wastes and thereby protect water quality in nearby streams.¹

A number of management practices to store, compost and recycle horse manure to help reduce its environmental impact have been developed and are discussed in other fact sheets and conservation practice manuals for horses (see references at the end of this fact sheet). Riparian Buffers- strips of dense, vegetative cover which include grasses, soft stemmed plants (forbs), shrubs and trees growing in streamside areas- are one of the most effective tools to help assure clean runoff from horse facilities. Buffers can be considered a last line of defense against the natural downslope flow of runoff down streambanks before that runoff reaches the creek. As with all horse keeping practices, buffers should be integrated with other proven pollution control and management practices and incorporated into a facility's conservation plan to maximize their effectiveness in protecting overall water quality. Contact your local RCD office for conservation planning assistance.☼

Types of Buffers

While there are many types of buffers used in conservation practices, their functions are much the same: to improve and protect ground and surface water quality, reduce erosion, and provide protection and cover for wildlife and aquatic life. Filter strips, swales, grass waterways, and shelterbelts (rows of trees serving as windbreaks) or hedge-rows (plantings along fence lines to shelter wildlife), are all examples of conservation buffers that may be applied to specific site conditions. Buffers slow water runoff, catch sediment and enhance water infiltration in the buffer area itself. Buffers can trap particles of soil and organic material, utilize the nutrients from fertilizers and manure, absorb runoff into the soil to break down pesticides, pathogens, and other constituents of runoff, thereby minimizing the chances of these potential pollutants reaching creeks. One of the most important types of buffers are

Riparian Buffers, because of their multiple values to humans and wildlife.



Proper drainage & buffer alongside pasture.

A Riparian Buffer is an area of permanent vegetation located adjacent to a stream or creek, that is managed to maintain the integrity of the waterway, to reduce pollution, and to provide food, habitat, and thermal protection for fish and wildlife. Riparian buffers often act to provide stream bank stabilization because of their extensive plant cover and

associated root systems. Rivers and larger streams with year round flows may support a full sized forest on the banks and floodplain. Smaller perennial creeks with lower flows may have limited tree growth which closely

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hugs the bottom and lower sides of the creek channel. Flow and flood conditions can vary widely, and it is wise to be familiar with current and past flow events in your stream when establishing a riparian buffer zone is being considered.

Depending upon what the land can naturally support, riparian cover may consist of a dense mix of grasses, grass-like plants, forbs (soft-stemmed plants), shrubs such as berries, vines such as wild grape, and/or trees such as willows, red alders, sycamores, maples, and other native plants typically found along streams in the Bay

Area. Riparian areas are typically rich in wildlife due to the complex, layered habitat which,



Grassed drainage area.

if fully developed, includes a leafy forest canopy to shade

shrubs, groundcovers below and creekwater. Some plants and trees are dependent on year-round water in the root zone and grow close to the banks of the creek; others prefer positions higher on the bank or flood-plain. Therefore soil moisture and shade conditions can vary greatly in the streamside area. This is important to understand when choosing plants if new plantings are planned for the riparian buffer.☀



How Riparian Buffers Work to Enhance the Streamside Area and Protect Water Quality.

Sediment and pollution filter

Riparian vegetation slows down runoff, allows water to infiltrate, and causes the sediment (particles of soil and organic material) and pollutants to settle out of the water and deposit in the buffer. Grass and stems of forbs and shrubs slow the rate of flow of water down streambanks (through the buffer) thereby increasing infiltration of water into the soil. Soil sediments and pollutants are then trapped, modified by soil bacteria, or used by the various plant root systems for growth. Nutrients from manure dissolved in runoff can be taken up and used by plants that are vigorous and actively growing. Other contaminants in runoff from horse facilities can include pesticide residues (fly sprays and wormers) herbicide residues, chemicals from soaps and other horse-care products, and pathogens. The processes of particle trapping, infiltration,

utilization and soil storage followed by breakdown, minimizes the amount of sediment and pollutants that could enter the waterway.

Streambank and bed stabilizer

Plant roots hold bank soil together and plant stems protect banks by deflecting the cutting action of storm runoff. The vegetation helps stabilize banks and reduces erosion. Riparian Buffers also reduce the amount of scouring because the vegetation absorbs surface runoff, which slows down water velocity.

Water Flow Regulator

With the vegetation slowing down the velocity of the runoff, the Riparian Buffer allows water to infiltrate the soil and recharge the groundwater supply. Another positive

environmental benefit is that near-surface groundwater will reach the waterway at a much slower rate over a longer period of time than if it had directly flowed into the waterway. Water infiltration helps control flooding and maintains water flow even during dry periods.

Water holding capacity

Riparian Buffers benefit aquatic habitat by improving the quality of nearby waters through shading, filtering, and moderating stream flow. Shade provided by the plants maintains cooler, more even water temperatures. Cooler water holds more oxygen that helps reduce stress on fish and other aquatic animals. Plant debris also contributes to a more complex food web providing a food source to microbes, insects and other invertebrates benefiting all fish and wildlife.

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Wildlife Habitat

The distinctive habitat offered by riparian buffers provides food, water and homes to a multitude of plant and animal species, including those rarely found outside this narrow band of land. The layers of vegetation in a riparian zone include a leafy canopy which is home to many birds, including flycatchers, owls and raptors which are helpful to equestrians in insect and rodent control. Many shrubs provide cover and food; notably seeds and berries for birds. On the forest floor are flowering annual and perennial plants which support numerous beneficial insects. Layers of decomposing leaves from plants amend the soil, and host

innumerable bugs and other soil-dwelling animals. Continuous stretches of Riparian Buffer also serve as safe wildlife travel corridors, and if oriented across the path of prevailing winds, can serve as a windbreak. The trees and tall shrubs in a buffer can also absorb or collect airborne dust particles.

Aesthetic

The biological complexity and natural beauty resulting from a Riparian Buffer are visually pleasing. Riparian Buffers are especially valuable in providing a green screen along waterways, blocking views of nearby neighbors, and providing privacy. Having a Riparian Buffer along

your creek adds to the value of your land because it improves the environment.☀



Vegetated slope to drainage.



How to Create or Improve a Riparian Buffer

Many coastal streams flow through narrow valleys where usable land is at a premium. The minimum width of a Riparian Buffer will be dependent upon a number of factors specific to a property such as the size of the stream, slope of the stream bank along individual reaches, the total amount of land available, existing land uses, and economic factors. Generally, the wider the buffer, the greater the environmental benefit. Narrow buffers require careful consideration of slope and selection of vegetation to insure effectiveness and have reduced wildlife habitat benefits.

Slope and soil conditions must be considered in order to maximize water infiltration in the soil. Surface runoff may be carried downward or infiltrated into the soil if the water is flowing slowly in a very thin (shallow) layer called 'sheet flow'. Generally, buffers with

gentle slopes and even surfaces result in greater sheet flow of water through the buffer, thereby maximizing benefit. Wider buffer strips have longer flow lengths for treating runoff. This combined with nearly flat to very gently sloping stream sides and dense ground cover vegetation will allow maximum infiltration. Greater width may be required for steeper slopes, because the faster rate of runoff flow through the buffer means less opportunity for particles to be trapped and water to be infiltrated. Wider buffers are needed if sediment loads are high in runoff flowing into the buffer.

Selection of appropriate plant materials including the right mix and percentage of grasses, forbs, shrubs and trees determines the effectiveness of the buffer and therefore the benefits to be achieved. For example, grasses have a high benefit for sediment trapping, filtration

and utilization of nutrients, but a low benefit for bank stabilization and flood protection. Trees have a high benefit for flood and bank stabilization because of their deep and extensive anchoring root system, but no ability to filter sediments. Always use local native vegetation, and plant at the appropriate time of the year. Be aware of the amount of sunlight that is available below the tree canopy (if present), as some plants and most grasses require sunny conditions. Evergreen trees keep their leaves year round, so they may block needed sunlight during the winter months. However, evergreen trees provide good wildlife habitat during those months. Plant some of each if possible, such as a mix of life (evergreen) and deciduous oaks.

When establishing a new buffer, the choice of plants may also depend upon the availability of irrigation for the first two to

three years of plant growth. If irrigation is present, plantings of trees and shrubs can be done year round, however late fall is usually the best time to plant. Without irrigation, grasses and wildflowers can be planted from seed in October, oak acorns can be planted in chicken wire baskets to protect them from gophers, and willow cuttings can be placed into soils that are naturally damp or wet most of the year. Check with local native plant experts or trained nursery staff for further ideas about non-irrigated planting methods. Horses and livestock should be fenced out of riparian areas. Finally, you may also be advised to remove non-native vegetation from the riparian

zone. However, native vegetation in the buffer zone should not be removed and grading should not be done in stream-side areas without permission.

A first step in creating or improving a riparian buffer is to contact your local Resources Conservation District (RCD) to obtain general assistance through the Natural Resources Conservation Service (NRCS). Alternatively, you may contact a private, NRCS approved technical assistance provider who can help answer questions specific to your land and stream bank situation. They can also help evaluate the existing riparian area to identify needed repairs such as eroding streambanks,

potential management issues and constraints such as stream-bank crossings for horses, or fencing needed to keep horses and other livestock out of the area. The NRCS and RCD can also explain the value of conservation plans. ☀



Paddock separated from road by vegetated strip.

Maintenance Tips

To maintain their effectiveness, Riparian Buffers need to be managed. Regularly scheduled maintenance should be implemented right after the buffer has been planted. This may include weed control, replanting trees and shrubs that did not survive the initial planting, reseeding bare areas, pruning, thinning, mulching and irrigation system monitoring. Riparian Buffers should be carefully inspected annually or after major storm events for any damage or problems that may have occurred. A key concern is making sure that runoff to be “treated” in the buffer is flowing through it in a shallow, slow-moving layer and not in channels or tiny channels called “rills”. This can best be seen during or just after a storm when flow patterns are obvious. Repairs should be made as soon as possible to insure proper buffer function.

Grass and forbs in a Riparian Buffer can benefit from mowing during the early years after planting. Mowing increases the vigor of grasses, and encourages new blades of grass and more stems at ground level – which increases density and hence sediment trapping capacity. Grasses and forbs often grow slowly above ground during the first year or two after establishment because much of their energy is put into producing a root system. During this time annual weeds can grow rapidly. Mowing just before annual weeds produce their seed keeps the seed from maturing and producing more weeds. If trees or tall shrubs begin to shade out soil-hugging grasses and forbs, the runoff-slowing and particle-trapping work of the groundcover plants will be limited.

Replacing dead or dying trees and shrubs and reseeding bare soil are important maintenance practices during the first few years following establishment. An annual inspection should be made to identify areas in need of replanting/reseeding. Replanting can be done in the spring or fall. Trees should be pruned during late fall, winter, or early spring while the plants are dormant. Thinning should take place in late spring if tree or shrub growth is too dense and groundcover plants are being shaded out. This can be done systematically by removing every other row of branches or every other tree. ☀



How Can Riparian Buffers Help Horse Stables and Ranches?

As part of your overall conservation plan, Riparian Buffers will help improve water quality through filtering processes, provide erosion and sediment control through appropriate vegetation, create suitable habitat for wildlife, and add to the value of your property aesthetics. Both horses and their owners will end up with better drinking water as surface and ground water sources are protected. Riparian Buffers, used in concert with other conservation measures to reduce the

amount of contaminants in runoff, can provide a final point of protection to keep manure, urine, and other chemicals, out of surface waters. Riparian Buffers provide erosion control by stabilizing banks with vegetation. This means less land is lost or washed downstream and more land is available for growing and grazing. Riparian buffers also provide beautiful landscapes, which supply privacy, shade, windbreaks and other environmental qualities that we associate with a good

quality of life. And these qualities add value to your property.☀



Well vegetated riparian zone keeps creeks healthy.

Resources and References

¹ The volume of manure produced daily has been estimated by various writers and researchers. This figure does not include bedding. The figure used in this fact sheet, .75 cubic foot per day per 1000 lb. Horse, corresponds with that in the *Horse Keeping: A Guide to Land Management for Clean Water*. The source for the figure is *Livestock Waste Facilities Handbook*, 1985, Midwest Plan Service-18, Iowa State University, Ames Iowa.

National Conservation Buffer Council: <http://www.buffercouncil.org>

Natural Resources Conservation Service: <http://www.nrcs.usda.gov/feature/buffers/>

Riparian Herbaceous Cover, Technical Standard 390

<http://efotg.nrcs.usda.gov/treemenuFS.aspx?StateName=California&MenuName=menuCA.zip&MenuType=2>

The following Fact Sheets were developed by the Council of Bay Area RCDs and are available from your local RCD office:

- Land Application of Horse Manure, CBARCD, October, 1999
- Manure Storage for Horse Facilities, CBARCD, June, 2003
- Equine Facility Site Assessment Checklist, Available from the San Mateo County RCD
- Composting Horse Manure, CBARCD, June, 2000
- Horse Manure Management, CBARCD, June, 2000
- Photographic Monitoring, CBARCD, June, 2000

See "Riparian Buffers" section in *Horse Keeping: A Guide to Land Management for Clean Water*, 2002. Manual available from Council of Bay Area RCDs.

RCD Websites: 1) Marin RCD and Southern Sonoma RCD - www.sonomamarinrcd.org

2) Alameda RCD - www.acrcd.org

3) San Mateo RCD - www.sanmateorcd.org☀

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