

Pasture Feeding, Streamside Grazing, and the Kentucky Agriculture Water Quality Plan

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Kentucky's abundant forage makes it well suited for grazing livestock, but the pasturing and pasture feeding of livestock need to be managed. Otherwise, the land and water that make Kentucky great can quickly degrade. Allowing cattle to behave as they would naturally can lead to overgrazing, congregation in sensitive areas, buildup of mud, loss of vegetation, compaction of soils, and erosion. High activity causes manure, urine, and mud to accumulate, which results in high nutrient pathogen and sediment concentrations. When high activity takes place in or near sensitive areas, surface and ground water quality can be negatively impacted. Adaptive management and best management practices (BMPs), particularly those that take into account cattle behavior, can help lessen the effect of livestock grazing on soil and water quality. This publication is intended to provide an overview of the impacts associated with pasture feeding areas and grazing cattle along Kentucky streams (riparian areas) as well as highlight the Kentucky Agriculture Water Quality Plan (KAWQP) and the BMPs it recommends.

Grazing Behavior

How cattle graze and where they congregate are dictated mainly by cattle preferences. By having a better understanding of cattle behavior and those preferences, producers can more effectively incorporate BMPs into grazing systems so that cattle behavior is redirected and environmental impact is minimized.

Cattle grazing patterns are controlled largely by the surrounding environment, with topography, water accessibility, forage quality, salt or mineral location, and shade being key factors. Other contributing factors may include pasture shape, direction of prevailing wind, and time of the year.



Figure 1. Improper grazing use and lack of nutrient management next to a stream.

Cattle prefer to forage on summits and valley bottoms. Cow-calf pairs especially avoid steep slopes. Cattle also typically do not travel over 600 feet from a water source and like to congregate near shade and water sources, so off-stream water and shade sources are recommended to minimize impact to riparian systems.

Riparian Areas

In Kentucky, pasture-based grazing systems mainly use water from streams, although other natural sources, such as rivers, lakes, and springs, or manmade sources, such as ponds, are also used. The lands immediately adjacent to these water bodies, where the vegetation is often more lush, green, and abundant, are called riparian areas (the terms "riparian buffers" and "riparian zones" are also used). With their thick vegetation, gentle slopes, and proximity to water, riparian areas are attractive grazing areas for cattle.

Riparian areas are also more attractive to black-coated cattle and cattle that are experiencing the effects of endophyte in tall fescue. Endophyte fungus produces alkaloids that become concentrated in the seed head. When eaten, the fungus restricts blood flow to the extremities of the cattle, making it more difficult for the cattle to dissipate heat. This effect increases the need for cattle to seek the cooling effects of shade, drinking, or wading in water.

The grazing and congregation of cattle in riparian areas for extended periods of time can cause the denuding of vegetation, loss of soil structure, accumulation of manure and urine, and alteration of stream morphology or shape, all of which contribute sediment, nutrients, and pathogens to surface water (Figure 1). Although riparian areas often represent only a small portion of the total production area, the polluted runoff from overgrazed, over-congregated, and

unmanaged riparian areas can contribute a large amount of pollutants such as sediment, nutrients, and pathogens to waterways. When properly managed, riparian areas provide a number of water quality benefits such as trapping and storing sediments, filtering nutrients and pathogens from runoff, recharging aquifers, providing habitat, and helping reduce the water temperatures through shade.

Grazing Mechanics, High Traffic, and Soil Structure

Grazing mechanics refers to the method by which cattle bite and ingest forage. Since cattle have an upper dental pad, they graze by wrapping their tongue around forage and then cutting the forage by jerking their head forward. While such grazing mechanics mean that cattle cannot graze as close to the ground as horses, they can still remove the entire plant, including the roots and soil attached to the roots. In addition to grazing mechanics, foot traffic affects soil condition. The amount of force applied to the soil by cattle hooves is approximately 26.8 pounds per square inch (psi). To put

that in perspective, a D9 dozer weighing 52.5 tons applies only 16.1 psi. The point is that the pressure from cattle hooves can greatly exceed the strength of the soil and can lead to the chipping of dry soils and compaction of moist soils. That the ability of cattle to tear up an area of soil and vegetation is comparable to the ability of a bulldozer should be no surprise to an experienced cattle producer. Decreased infiltration rates, low levels of vegetation cover, and inhibited regrowth lead to a loss of soil structure, which can cause increased levels of polluted runoff and soil erosion.

The Kentucky Agriculture Water Quality Act

In order to protect water quality, the Kentucky Agriculture Water Quality Act (KRS 224.71-100 through 224.71-145) was passed in 1994. It was written as a guide for reducing water quality impacts associated with agriculture and silviculture activities. The main focus of the act is to protect surface and groundwater resources, primarily through the use of best management practices (BMPs). The Kentucky Agriculture Water Quality

Plan (KAWQP) is a product of the act and is a statewide guide for developing individual water quality plans for use on individual farms. All agriculture or silviculture operations on 10 or more contiguous acres of land have been required to have a fully implemented water quality plan since 2001.

KAWQP Best Management Practices

For pasture feeding areas and grazing operations that include streamside access, producers are encouraged to implement BMPs that restrict or limit cattle access to streams and other water bodies. At a minimum, livestock producers should implement at least one of the BMPs listed in Table 1 where streamside grazing is practiced; however, trapping, controlling, and preventing pollution usually requires more than one BMP, and producers must consider site-specific conditions when choosing and implementing any BMP.

Table 1. KAWQP streamside grazing BMPs and recommended resources.

Streamside Grazing BMP	KAWQP BMP Number	Resources for Implementation ¹
Planned Grazing Systems	Livestock #1	<ul style="list-style-type: none"> • <i>Rotational Grazing</i> (ID-143) • <i>Planned Fencing Systems for Intensive Grazing Management</i> (ID-74) • <i>Using a Grazing Stick for Pasture Management</i> (AGR-191)
Proper Grazing Use	Livestock #2	<ul style="list-style-type: none"> • <i>Planned Fencing Systems for Intensive Grazing Management</i> (ID-74) • <i>Using a Grazing Stick for Pasture Management</i> (AGR-191)
Riparian Area Protection	Livestock #3	<ul style="list-style-type: none"> • <i>Riparian Buffers: A Livestock Best Management Practice for Protecting Water Quality</i> (ID-175) • <i>Planting a Riparian Buffer</i> (ID-185) • <i>Shade Options for Grazing Cattle</i> (AEN-99)
Limiting Access to Streams by Fencing with Alternative Water Systems, Limited Access Points, or Stream Crossings	Livestock #4	<ul style="list-style-type: none"> • <i>Alternative Water Source: Developing Springs for Livestock</i> (AEN-98) • <i>Stream Crossings for Cattle</i> (AEN-101) • <i>Drinking Water Quality Guidelines for Cattle</i> (ID-170)
Nutrient Management	Livestock #11	<ul style="list-style-type: none"> • <i>Nutrient Management in Kentucky</i> (IP-71) • <i>The Agronomics of Manure Use for Crop Production</i> (AGR-165) • <i>Managing Liquid Dairy Manure</i> (AEN-91) • <i>Sampling Animal Manure</i> (ID-148) • <i>Potential for Livestock and Poultry Manure to Provide the Nutrients Removed by Crops and Forages in Kentucky</i> (IP-57) • <i>Using Animal Manures as Nutrient Sources</i> (AGR-146)
Filter Strips	Livestock #13	<ul style="list-style-type: none"> • <i>Vegetative Filter Strips for Livestock Facilities</i> (ID-189)
Feeding and Heavy Use Area Management	Livestock #14	<ul style="list-style-type: none"> • <i>Reducing Mud Using Highway-Type Filter Materials</i> (AEU-68) • <i>Using Geotextiles for Feeding and Traffic Surfaces</i> (AEN-79) • <i>Using Dry Lots to Conserve Pastures and Reduce Pollution Potential</i> (ID-171) • <i>High Traffic Area Pads for Horses</i> (ID-164) • <i>Using Soil Cement on Horse and Livestock Farms</i> (ID-176) • <i>Winter Woodland Feeding</i> (ID-187)

¹ All of these resources can be found at <http://www.ca.uky.edu/agcomm/pubs.asp>.

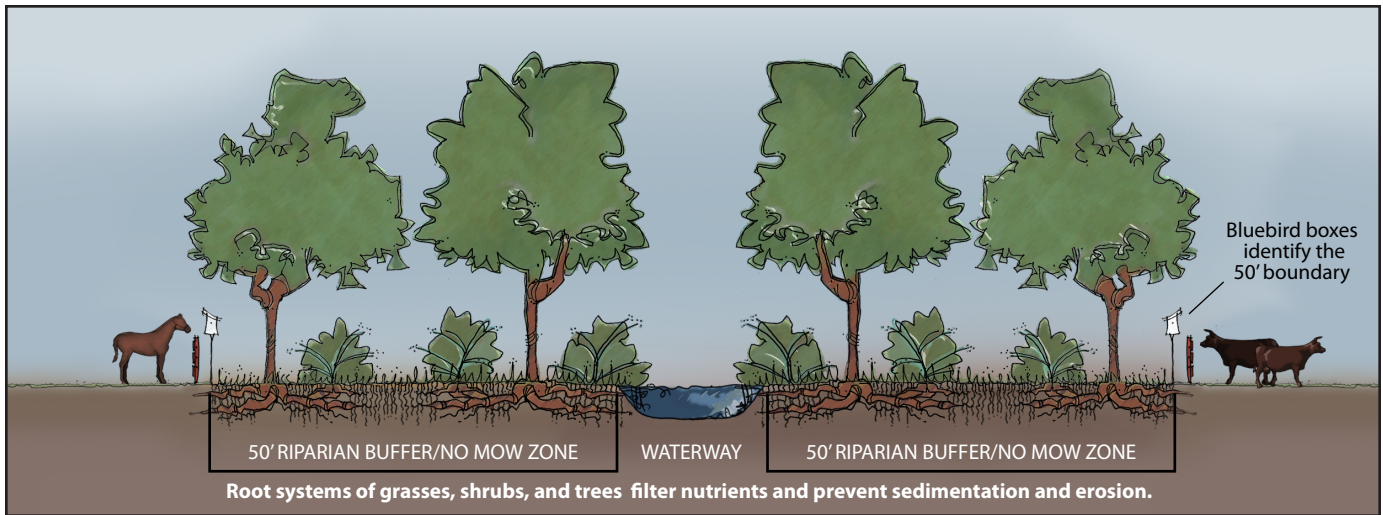


Figure 2. Livestock BMP 3—Streambank Area Protection. The area should be planted with trees, shrubs, and/or grasses. Vegetation is used to control soil erosion and provide filtering. Livestock are restricted.

Each of the BMPs listed in Table 1 can be used individually or in combination to protect riparian areas from grazing. These BMPs, if implemented, will improve water quality, but they may also increase herd productivity by encouraging more uniform grazing, providing cleaner drinking water, and reducing energy lost to walking in and being covered in mud and manure (tags).

Livestock BMP #1: Planned Grazing Systems

A planned grazing system, also known as rotational grazing, is a practice in which two or more pastures are alternately rested and grazed in a planned sequence for a period of years in order to maintain minimum recommended grazing coverage, typically measured by height. Rest periods may be scheduled throughout the year or during the growing season of key plants. To implement a planned grazing system, divide larger pasture fields into small pasture units with temporary or permanent fences. Rotate animals from one pasture unit to another on a pre-arranged schedule based on forage availability and livestock nutrition needs. Allow rest periods so each pasture unit will have adequate time to recover during the growing season to promote plant growth and prevent ero-

sion. A water supply will be necessary, which may include, but is not limited to, a spring development, pond, pipeline and tank, or temporary water system. Consider using dry lots in conjunction with rotational grazing to hold animals in order to preserve pastures and reduce the creation of mud during drought, unseasonable wet periods, or winter months.

Livestock BMP #2: Proper Grazing Use

Proper grazing use is the practice of grazing at an intensity that will maintain enough cover to protect the soil and maintain or improve the quantity and quality of desirable vegetation and crop residues. It may include matching stocking rates to maintain cover when planned grazing systems are not implemented. To implement proper grazing use, identify the kinds of soils and the adapted plant species. Estimate the forage yield or the pasture carrying capacity. Then make a realistic estimation of the kinds and numbers of livestock on the farm and their estimated pastureland and hayland needs. In general, implement grazing and pasture management practices that improve the quantity and quality of the forages and maintain adequate vegetative cover. The amount of animal manure and nutrients reaching streams will be reduced by the filtering effects of the

vegetation and by the increased uptake of nutrients. If vegetation cannot be maintained, consider implementing conservation buffers such as filter strips, grass waterways, and riparian area buffers around streams to filter contaminants.

Livestock BMP #3: Riparian Area Protection

A protected riparian area is an area of trees, woody shrubs, grasses, and other vegetation located adjacent to or up-gradient from water courses, wetlands, and impounded water bodies (Figure 2). These areas are protected from livestock or are managed in a way to protect the area. A protected riparian area reduces sediment, organic material, nutrients, and pesticides in surface runoff and shallow groundwater flow. Benefits of this practice include enhanced wildlife habitat, reduced stream water temperature, streambank protection, and erosion control. To implement this BMP, select plantings of hardwood trees, shrubs, and grass/legume species (ground covers) that are adapted to the soils, function of the riparian area, and other site-specific factors. Ground cover should be established and/or maintained with at least one quick cover (annual) species to provide erosion protection and additional filtering and uptake benefits.

Livestock BMP #4: Limiting Access to Streams by Fencing with Alternative Water Systems, Limited Access Points, or Stream Crossings

This BMP requires carefully managing livestock around bodies of water or streams where their presence may seriously contribute to nonpoint-source pollution. Adequate vegetative cover should be maintained on the land area affected by livestock along the stream edge. Fencing of these areas is not required; however, the selection and management of vegetation must be sufficient to adequately control or significantly abate potential soil erosion and provide adequate filtering and uptake benefits from the affected areas. If vegetation is not capable of withstanding grazing pressure, livestock should be excluded except at designated crossing areas and watering sites. To maintain the effectiveness of the practice, temporary fencing may be used to generally exclude livestock from zones that are temporarily grazed. Alternative water systems, such as spring development, a pipeline and tank, and temporary water systems, can be used instead of the water body or stream to provide water to livestock that are excluded from surface water. Limited access points and stream crossings can also be used to restrict the access of livestock to streams and provide a low-impact crossing for livestock.

Livestock BMP #11: Nutrient Management

Nutrient management is one of the more important conservation practices protecting our natural resources. It involves carefully monitoring all aspects of soil fertility and making necessary adjustments so that crop needs are met while minimizing the loss of nutrients to surface or ground water. This includes management of all plant nutrients associated with animal manure, commercial fertilizer, legume crops, crop residues, and other organic wastes. Nutrient management provides the crop with the correct amount of nutrients at the optimum time and location so they are

utilized efficiently. This limits the amount of plant nutrients lost to leaching, runoff, and volatilization. This BMP is relatively easy to implement, tremendous benefits to water quality can be achieved, and it can increase profits.

To implement nutrient management, an operation must comply with the USDA Natural Resources Conservation Service (NRCS) Kentucky Standards and Specification for Nutrient Management, Practice Code 590. Elements included in the practice code include:

- Maintaining an adopted sequence of crop rotations to utilize nutrients
- Taking soil tests to determine the pH (buffer), pH (water), phosphorus, potassium, zinc, magnesium, and calcium needed to optimize plant production
- Analyzing animal manure for total nitrogen, phosphate, potash, calcium, and magnesium prior to land application to establish nutrient credits and to formulate application rates
- Managing animal manure in a manner that prevents degradation of water, soil, air, and protects public health and safety
- Making sufficient land available for a disposal area without overloading soils or exceeding crop requirements for nutrients
- Minimizing edge-of-field delivery of nutrients where no setbacks are required

Any method of temporary storage of poultry manure must meet or exceed the NRCS (interim) Standards and Specifications in the Waste Field Storage Code 749, which includes storing the poultry manure in a manner that prevents water from coming in contact with the litter storage area and prevents the migration of nutrients to surface and ground waters.

Livestock BMP #13: Filter Strips

A filter strip is a strip of close growing, dense vegetation that filters sediment, nutrients, and pathogens. Ideally, filter strips are established down slope of animal production areas to capture and treat runoff before it reaches environmentally

sensitive areas, protecting water quality by reducing soil movement. Potential sites for filter strips include areas directly below manure management systems and adjacent to perennial streams, farm ponds, and lakes. To establish a filter strip, plant or maintain a dense grass sod in strips. When there is little or no existing vegetation, follow pasture and hayland planting or forage and biomass best management practices. Leave existing natural vegetation along streams or lakes if it is effective in removing sediment and manure. Filter strips can also provide additional forage for hay production when needed if properly managed.

Livestock BMP #14: Feeding and Heavy Use Area Management

This BMP concerns managing heavily used livestock areas in a manner that protects areas prone to soil erosion by establishing vegetative cover, surfacing with suitable materials, or installing needed structures such as high traffic area pads. Feeding and heavy use area pads are structures specifically designed, using rock and geotextile fabric, to avoid the creation of mud. These structures are not created by adding a layer of gravel to an area; instead, they are constructed areas that must be correctly installed. Otherwise, the expense of the rock and the time spent placing the rock is wasted. The topsoil from the area must be excavated down to a clay layer or B horizon to provide a suitable foundation. Geotextile fabric must be placed over the clay layer (or B horizon) to separate the soil from the rock, or the soil will permeate the created rock matrix and limit the structure's lifespan. This BMP is applicable in any area particularly susceptible to erosion, including those around feeding and watering facilities. These facilities should also be located up-gradient from streams, drainageways, and other water bodies. Portable shades, hay feeding racks, and similar facilities should be periodically moved about the pasture area to prevent overgrazing and denuding of any area.

Other BMPs

In addition to the BMPs recommended by the KAWQP, other practices that avoid or control possible pollution sources associated with streamside grazing and pasture feeding should be considered.

- Avoid stocking rates that create holding areas rather than pastures. If livestock are to be confined in smaller pastures during the winter months, consider locating these areas away from streams, sinkholes, abandoned wells, and drainageways. For more information about winter woodland feeding and abandoned wells, see University of Kentucky Cooperative Extension publications *Woodland Winter Feeding of Cattle* (ID-187) and *How to Close and Abandoned Well* (AEN-104).
- Periodically move mineral supplements, feeders, and shelters to redistribute cattle throughout the pasture, thus avoiding manure accumulation.
- Provide summer shade (trees or shade structures) and insecticides. Shade will reduce heat stress so cattle spend less time in or near the water, and insecticides will lessen the need for cattle to rub against soil or trees. For more information about providing shade for livestock, see the University of Kentucky Cooperative Extension publication *Shade Options for Grazing Cattle* (AEN-99).
- Don't allow fallen stock to decompose next to a stream or environmentally sensitive area or float down a creek. Properly dispose of dead or fallen stock by practicing one or a combination of the legal options, which include composting. For more information about mortality disposal and composting, see University of Kentucky Cooperative Extension publications *On-Farm Disposal of Animal Mortalities* (ID-167) and *On-Farm Composting of Animal Mortalities* (ID-166).

- Winter feeding areas should be well thought out from an environmental standpoint. Contact the NRCS for site selection and guidance for structures and water quality BMPs. For more information about woodland winter feeding, see University of Kentucky Cooperative Extension publication *Woodland Winter Feeding of Cattle: Water Quality Best Management Practice* (ID-187).

Cost-Share Assistance

Cost-share assistance for the BMPs listed in the KAWQP may be available through the NRCS and/or the Kentucky Division of Conservation. In many cases, this assistance can help to offset the majority of the expense of limiting or restricting cattle from a riparian area. For more information, contact the local offices of the U.S. Department of Agriculture Farm Service Agency (FSA) or the local conservation district.

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