Managing pastures for water quality

Strategies for Seasonal Livestock Use

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Managed summer grazing allows for good residual cover in this horse pasture, and ensures that this stream contributes cleaner water downstream where people fish and swim. Inset: Serious erosion from unlimited stream access.

Riparian areas are the narrow green zones of land adjacent to streams, rivers, lakes and other water bodies. They consist of unique plant communities, soils and topography shaped by the availability and actions of water.

Approximately 18% of Wisconsin land areas are identified as riparian, with approximately 50% of such riparian areas further classified as wetlands. Livestock grazing is one of the agricultural uses that can occur in riparian areas, but unmanaged grazing can result in damage to riparian areas and water quality. In this publication, we will explore practical seasonal grazing management strategies that livestock producers can use to protect and enhance Wisconsin's riparian areas.

Unmanaged grazing can cause loss of riparian vegetation and wildlife habitat, increased soil erosion and impaired surface water quality. Soils and banks can also be physically damaged by compaction and trails from uncontrolled livestock access. Non-point source pollution can result from livestock manure being deposited in or near surface waters, and may add excess nitrogen, phosphorous, and pathogens to the water body.

The simplest way to protect a riparian area may be to prevent livestock grazing entirely by installing a fenced buffer or corridor. However, completely preventing access to a riparian area might not be feasible and does not always yield the desired results. In

This fenced riparian buffer prevents cattle access to the stream, thereby protecting the banks while allowing productive pasturing adjacent to the riparian area.

many cases, development of a riparian pasture system that controls livestock access but allows grazing as needed is a more practical method to achieve the stabilization or improvement goals desired.

To provide more management flexibility and decrease potential damage, a riparian pasture will be somewhat larger than the actual riparian area. Paddock size and layout will be determined by surrounding topography, riparian management goals, and livestock access needs for water and movement to adjacent pastures. Separation of the riparian pasture areas from upland grazing paddocks can be accomplished through well-placed permanent and/or temporary fences. For a more detailed overview of riparian area fencing design, see UW-Extension publication A3699, *Grazing Streamside Pastures.*

Appropriate management of grazing and animal behaviors in riparian systems can prevent or minimize the potential negative livestock impacts, and may even improve riparian conditions through vegetation protection and management.

Seasonal grazing strategies and methods

The main feature that differentiates riparian areas from upland pastures is the continual presence of water, which affects both soil and vegetation. While water provides an opportunity for substantial forage production throughout the growing season compared to drier upland pastures, it also creates additional management challenges: periodic flooding of the adjacent riparian pasture, wet soils that may be prone to compaction damage, stream banks that are vulnerable to erosion, and fencing issues, to name a few. The boundaries of a riparian pasture can be established to include these areas so that livestock can be easily managed to minimize disturbance during high-water periods and to allow appropriate grazing management during drier soil conditions.

Livestock find their own favorite areas to graze, drink, congregate, and rest within a riparian area. Without management, some areas will be overused and the resulting impacts will impair or destroy the riparian system. Management strategies that address livestock distribution, timing of grazing, access to water, supplemental feeding locations, and intensity and duration of use will protect wet soils and riparian vegetation during vulnerable periods.

A combination of seasonal riparian management strategies can be used to develop a plan that best fits each farm's riparian resources and livestock forage needs. This increases management flexibility across the farm.

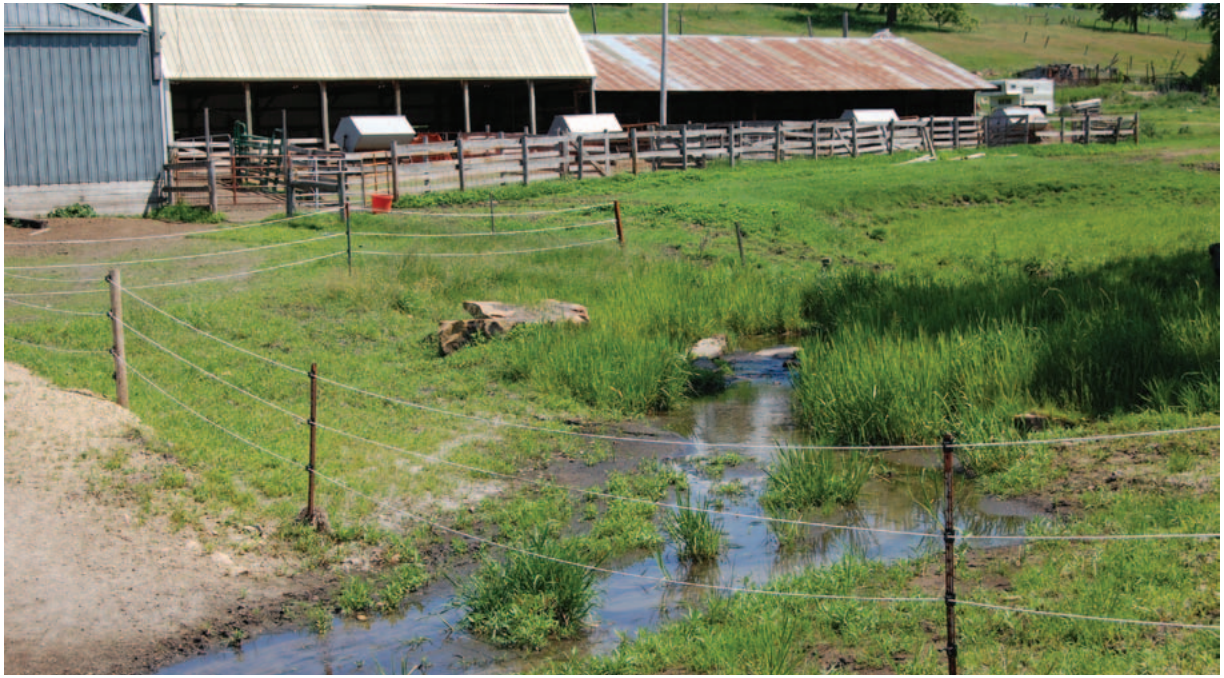
Grazing management principles that are familiar to livestock producers practicing managed grazing can also be applied to riparian pastures:

- **Avoid/minimize livestock access during vulnerable (wet) periods**
- **For each grazing cycle, balance animal nutritional needs with available forage and manage livestock distribution accordingly**
- **Leave adequate residual dry matter (stubble) after each grazing event**
- **Provide a rest interval between grazing events**

Understanding the unique properties of the riparian ecosystem is the key to learning how to apply these same principles to riparian pastures:

Seasonal timing of grazing considers soil and vegetation characteristics and livestock behaviors to protect riparian areas by manipulating livestock use and distribution. To aid producers in making grazing decisions, the table on page 11 provides a summary of positive and negative grazing impacts when using riparian pastures during spring, summer, fall or winter periods.

In any season, prevent livestock access to riparian areas when soil conditions are wet to prevent damage due to



This riparian fence limits livestock access during high-water periods to prevent compaction and erosion, but could easily be removed to allow some grazing when stream banks are less prone to damage.

compaction and erosion. These conditions will most often be present in late winter through spring, but may occur during other times of the year following heavy precipitation events.

Within any given season, graze only when desired plant species are in a growth stage that will enable plants to quickly recover from grazing while providing adequate forage quality and quantity for livestock. Allow riparian vegetation to reach a mid-to-late vegetative growth stage before each grazing event and leave adequate residual dry matter (RDM) after grazing so that plants recover quickly.

Because various herbaceous and woody plants found in riparian areas may be more sensitive to defoliation at different

Dan Schaefer photo

With uncontrolled or continuous grazing, cattle congregate in the water during hot days, causing excessive bank trampling and manure deposition in the stream.

Water quality is protected where streambank cover remains vigorous due to a well-managed stocking rate and use of rotational grazing.

times of the year, applying grazing pressure at a particular time can be used to favor desired plant species over undesired, weedy or invasive species. Resting riparian pastures during seed set of desired species can also maintain or improve the composition of riparian vegetation. Observe the life cycle of different plant species in your riparian pasture and use that information to improve your grazing management strategies.

Deferred rotation is one method of strategic timing of grazing and rest for a riparian area that considers individual seasonal impacts. For example, a riparian pasture can be rested during early rotation cycles in the spring due to wet soils, and included in later grazing rotations as soil moisture conditions change. Deferment of grazing can also be considered during flowering and seed set of desirable riparian plant species. Depending on yearly conditions, the timing of deferment can be adjusted from year to year.

Use short grazing periods in riparian areas. During periods of active vegetative growth, livestock may graze regrowth on individual plants within 3 to 4 days, so move animals more often. At the same time, uniform grazing is necessary so that less palatable plants are also grazed. Matching livestock numbers to available forage encourages more uniform grazing during short grazing periods, and is more successful than simply limiting

Cattle are moved through these three pasture subdivisions (paddocks) frequently, providing rest intervals that enable plants to recover from grazing. Erosion is prevented with management of residual dry matter to maintain vegetative cover on upland slopes.

livestock numbers but not the amount of time spent in the riparian pasture. If necessary, adjust paddock size with temporary electric fencing to match available forage to livestock numbers.

Provide adequate rest between grazing events. Rest periods will vary among seasons and depend on weather events, vegetation, soils, topography and other characteristics of a riparian system. Rest enables plants to recover from defoliation, set seed and replenish root reserves for later growth and winter dormancy. As with residual dry matter (RDM), rest intervals and timing of grazing within the season need to be managed primarily with the most sensitive of the desired riparian plants in mind.

Allow adequate residual dry matter (RDM) to remain following each grazing event. RDM, or stubble, is the amount of vegetation remaining after grazing. Leaving at least 3 to 4 inches of RDM provides vegetative cover to protect soil from erosion and ensures adequate leaf area for photosynthesis as each plant recovers from grazing. Plant species differ in their tolerance to grazing and the amount of RDM needed for recovery. As with other pastures, riparian RDM targets should be developed for the desired plants that are most sensitive to defoliation within the pasture.

Tools for managing riparian pastures

Fencing can be a mixture of permanent and temporary fencing materials, depending on the size and management needs of the riparian pasture. To prevent stream bank damage, fencing should be placed to discourage livestock trails along the water's edge. Permanent fencing should be installed outside the flood-prone areas to minimize fence damage during storm and/or flooding events. Temporary fencing materials can be used in addition to permanent fences to subdivide large areas into smaller paddocks that encourage short grazing periods and more uniform grazing.

Develop watering sources that limit access to surface water. Using livestock watering sources that are offsite or providing improved watering site access also decreases potential livestock damage to riparian areas by limiting access to surface waters. Management of water sources is also important to animal health: studies indicate that animals that have access to clean water will drink more. If offsite water is not available, keep in mind that livestock prefer to water from areas where their footing is secure. Develop shallow watering areas with a graveled or hardened base to encourage livestock use at the improved access point and limit damage to other areas along the water's edge.

Place salt, minerals, and supplemental feeding areas away from the riparian area. Supplement locations are natural congregation sites for livestock. Keeping them away from the riparian area will result in less damage to vegetation and soils, decreasing potential for erosion and nutrient/manure movement into surface waters. The supplement location can also improve grazing distribution by encouraging animal movement away from water and toward the supplement site in the adjacent upland pasture areas. Frequent movement of supplement locations also minimizes disturbance to upland soils and encourages livestock distribution around the pasture.

Permanent and temporary fencing materials are useful tools for livestock management in and around riparian areas.

Water crossings may also need to be developed or improved for small streams that meander across a riparian pasture. Like water access, crossing areas should be shallow with firm footing

USDA Natural Resources Conservation Service photo

Providing water sources and mineral supplements away from the stream naturally encourages cattle movement off of fragile streambanks to more stable upland ground.

Stream crossings designed for livestock and machinery access funnel traffic to a stabilized area, protecting nearby streambanks. Technical assistance can be requested from local USDA-NRCS and Land Conservation Department staff for many riparian improvements.

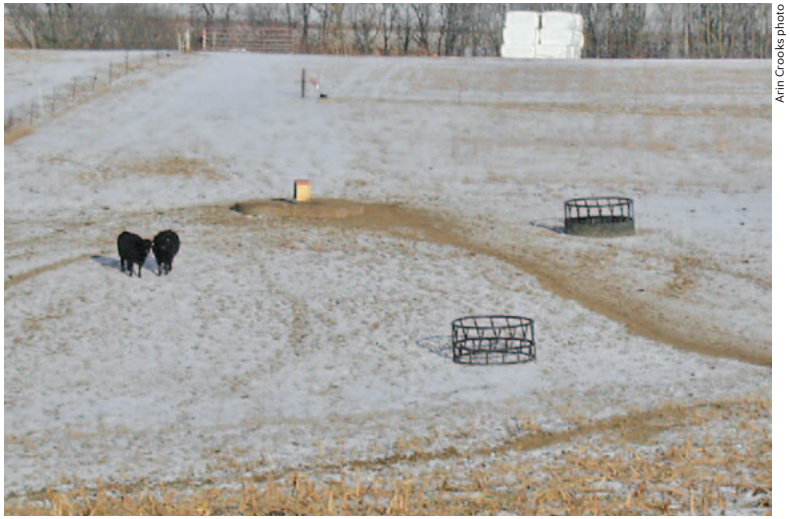
underneath, but not so comfortable that livestock will linger in the water during warm weather.

Subdivision of the riparian area into multiple paddocks is often done in larger streams, so consider location of water and crossing access when locating fences for subdivisions. Also consider whether improved access points are needed for farm machinery for mowing or other activities. Such crossings can be planned for both machinery and livestock use. Technical assistance from local USDA-Natural Resources Conservation Service and county Land Conservation Departments can provide guidance on determining appropriate locations and installation of improved water access and crossings, and cost-share funds might be available.

Shelter and shade should also be available away from the riparian area to discourage overuse and damage to the site. If shelter and shade are only available in the riparian area, limit use of this area for only the most necessary times. For example, plan on grazing riparian paddocks only during the warmest of summer days and dry soil conditions, resting these paddocks when temperatures are more moderate.

Move winter feeding locations away from riparian areas. Historically, the location of winter feeding areas near water

sources was fairly common. Unfortunately, winter feeding in riparian areas concentrates animal numbers and results in damage to both soil and vegetation. Research and practical observations indicate that winter feeding in riparian areas increases surface runoff, soil erosion, and nutrient/pathogen loading into adjacent waters. Locate winter feeding areas on upland pastures and away from steep slopes where snowmelt and spring runoff may also impact nearby riparian areas. If winter watering locations in the riparian area are necessary, develop improved watering sites and limit access to the remainder of the riparian pasture to decrease potential for damage.



Arin Crooks photo

Winter feeding areas are best located away from the stream to prevent soil compaction, bank trampling and manure deposition that contributes to increased nutrient runoff during snowmelt.

Uncontrolled access and winter feeding in this riparian area results in severe bank and vegetation damage with increased sediment and nutrient delivery to the stream. These negative effects continue to impact the stream and the pasture even during the summer grazing season.

Riparian Pasture Season-of-Use Considerations

SEASON OF USE	WORKS BEST WHEN...	ADVANTAGES	DISADVANTAGES
Spring	• Upland forages are succulent and abundant • Cool temperatures and wet riparian soil conditions discourage overuse • Coarse textured (sandy) soils reduce chance of compaction	• Reduced stream bank impacts • Early vegetative growth stages • Opportunity for rest later • Less damage to woody species	• Soil erosion and compaction may be a concern, especially for steep banks and fine-textured soils • Grazing may affect wildlife by reducing nesting cover & disturbing brooding use
Summer	• Conditions are closely observed • Grazing is limited in duration and frequency • Timing of animal rotation provides adequate forage rest and regrowth • Adjacent upland species are warm season species that are at their peak of forage quality	• Drier soil conditions reduce erosion and compaction concerns • Availability of water allows for vegetation regrowth after grazing • Riparian vegetation is more palatable than uplands • Substantial growth occurs in early grazing season before grazing begins	• Hot weather encourages livestock use (shade, water) • Overuse can damage immature seed heads, remove growing points • Damage to riparian trees and shrubs by livestock seeking shade and relief from insects
Fall	• Riparian area consists primarily of herbaceous vegetation • Upland vegetation is more palatable due to regrowth from timely rains • Off-stream water sites draw livestock away from riparian area • Cooler temperatures discourage loitering	• Herbaceous species have set seed and are less impacted by defoliation • Drier soil conditions reduce erosion and compaction concerns • Fewer wildlife impacts	• Little or no vegetative regrowth after grazing in the fall • Woody riparian vegetation is more susceptible to injury from grazing in the fall
Winter	• Adjacent upland pastures provide forage and/or space for winter feeding areas away from the riparian pasture • Riparian area temperatures are colder than adjacent upland sites • Frozen soils decrease chances of compaction and bank damage • Adequate RDM can be left prior to spring runoff	• Minimal compaction and limited bank damage due to frozen soil conditions • Dormant season grazing does not harm herbaceous vegetation • Livestock distribution can be managed through location of winter watering and feeding areas	• Overgrazing eliminates RDM and reduces ability to trap sediments during spring runoff • Browsing and physical damage to riparian trees and shrubs can be a problem • Compaction and bank damage during thaw events

Adapted from R.C. Ehrhart and P.L. Hansen. 1998 *Successful Strategies for Grazing Cattle in Riparian Zones*, Montana Bureau of Land Management, Riparian Technical Bulletin #4, Montana Forest & Conservation Experiment Station, 48 pp.

For further reading:

Bellows, B.C. 2003. *Managed grazing in riparian areas.* ATTRA, National Center for Appropriate Technology, 28 pp.

Fitch, L., B. Adams, and K. O'Shaughnessy. 2003. *Caring for the green zone: riparian areas and grazing management,* 3rd edition. 47 pp. Lethbridge, Alberta: Cows and Fish Program, Alberta Riparian Habitat Management Society
http://www.cowsandfish.org/pdfs/greenzone3rd.pdf

Hoorman, J.J. and J. McCutcheon. 2005. *Livestock & streams: best management practices to control the effects of livestock grazing riparian areas.* Ohio State University Extension fact sheet LS-4-05 6 pp.
http://ohioline.osu.edu/ls-fact/pdf/0004.pdf

Undersander, D.J. and B. Pillsbury, 1999. *Grazing streamside pastures.* UW Extension publication A3699, 16 pp.
http://learningstore.uwex.edu

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