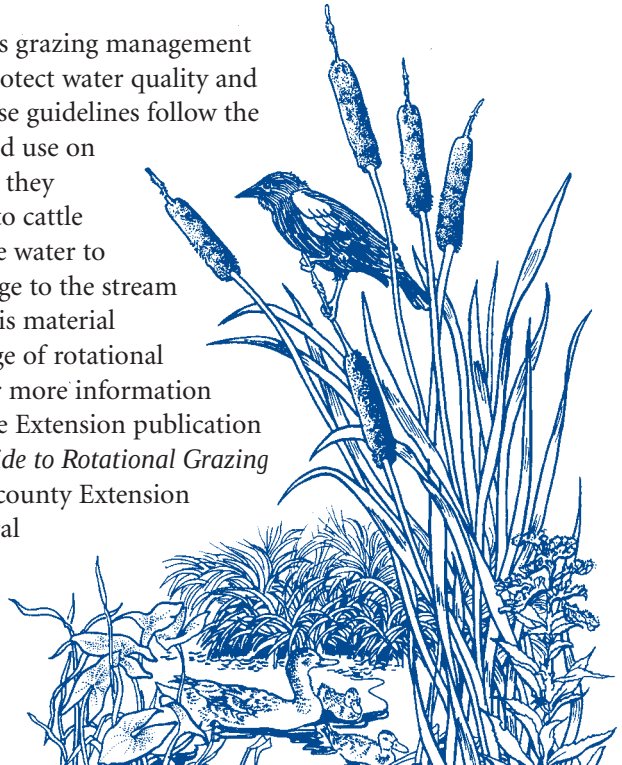
A3699

Grazing streamside pastures

Dan Undersander and Brian Pillsbury

Wisconsin's streams are one of our most precious natural resources, providing clean water for a variety of human uses as well as habitat for wildlife and aquatic communities. When streams cut through pasture land, good grazing management practices are needed to prevent erosion and protect water quality for ourselves, our livestock, and our society while maintaining the productivity of the pasture.

This publication describes grazing management practices that will help protect water quality and pasture productivity. These guidelines follow the same principles you would use on the rest of your farm, but they require special attention to cattle activity in and around the water to minimize potential damage to the stream bank or water quality. This material assumes a basic knowledge of rotational grazing management. For more information about grazing systems, see Extension publication *Pastures for Profit—A Guide to Rotational Grazing* (A3529) or contact your county Extension agent or the USDA Natural Resources Conservation Service (NRCS) office.



Basic management principles

The overall goal of grazing streamside pastures is to develop and maintain a healthy sod on stream banks to hold soil in place. Stream banks that are not grazed will grow up in brush unless mowed, sprayed, or burned. The principles of rotational grazing—avoiding overgrazing and allowing adequate rest periods between grazing—are particularly important for streamside pastures.

Overgrazing keeps grass too short, preventing plants from building root reserves and developing a healthy sod. A good goal is to leave at least 4 inches of stubble after grazing and when going into winter. The practice of "taking half and leaving half" is a good one to follow in streamside paddocks. This allows enough of a rest period for grass to grow larger deep-rooted plants and accumulate above-ground growth and residue to hold soil in place.

Before grazing a stream bank that has been severely disturbed or re-graded, it may be necessary to seed and temporarily fence cattle out until a healthy sod is formed. See table 1 for seed recommendations.

Managing livestock activity

Understanding livestock behavior is essential for developing a successful management strategy for streamside grazing. Stock will do what is convenient for them and this can cause problems around streams. Animals should have access to streams for only a limited amount of time (see "When to remove stock from streamside paddocks" on page 4) and the access should minimize bank damage. Animals should be able to get to water easily, drink, and leave rather than remain in the stream.

Large streams (wider than 15 feet) pose different management challenges than small streams. In some ways large streams are easier to manage because they usually have more defined banks and are more likely to be treated as a barrier by livestock. With large streams, stock tend to cross or drink at defined spots. Small or intermittent streams are often more accessible to stock and thus get more traffic and bank damage along greater lengths of stream. Small streams may need fencing to restrict access when soils are wet and cattle traffic can cause damage.

Table 1. Recommended mixtures for seeding stream banks

Seeding recommendations are based on soil moisture conditions and location. If planting in southwestern Wisconsin, choose from mixes 1, 2, 3, and 7; in the rest of the state any of the mixes can be used. (For details on planting, see NRCS Standard 512, *Pasture Planting*.)

Soil moisture needs	Recommended mix	Amount of seed[a] (weight)
1 Very droughty	Reed canarygrass Oat	12 lb/acre 32 lb/acre
2 Very droughty	Switchgrass[b]	10 lb/acre
3 Moderate to well drained	Smooth bromegrass Red clover Italian ryegrass[c]	60% 25% 15%
4 Moderate to well drained	Smooth bromegrass Ladino clover Alsike clover Italian ryegrass[c]	60% 20% 5% 15%
5 Cool, wet	Timothy Red clover Italian ryegrass[c]	50% 35% 15%
6 Cool, wet	Timothy Ladino clover Alsike clover Italian ryegrass[c]	50% 25% 10% 15%
7 Very wet	Reed canarygrass Ladino clover Alsike clover Italian ryegrass[c]	60% 20% 5% 15%

[a] For very droughty soils only, rates are given as lb/acre since the seed must be spread separately; for all other mixes, rates are listed as percent seed by weight.

[b] Switchgrass is recommended for the sandy soils of central Wisconsin. It should be grazed only once or twice a year with very non-intensive management.

[c] Italian ryegrass provides rapid groundcover until the rest of the mixture is established.

When designing the layout of paddocks and stream crossings, the strategy is to make it easy for animals to get as much water as they need, but to discourage them from spending time in the stream. Portions of the bank may need to be fenced out to keep cattle from approaching the water in areas that would damage the bank. Fence lines should be designed so that cattle trails do not border on or include the stream bank.

Managing livestock activity is the key to protecting stream banks and water quality as well. Managed grazing can be used as a tool to thicken the sod and help stabilize stream banks, but be aware that not all erosion problems can be avoided even by the best management.

When to remove stock from streamside paddocks

During the grazing season, graze pastures five to eight times for periods of 12 to 24 hours for dairy cows and 3 to 4 days for beef and sheep. Streamside pastures may need to be grazed somewhat less frequently because livestock need to be kept out during wet periods. However, managed streamside pastures are an extremely important source of good-quality forage in the summer when forage growth of other pasture is reduced.

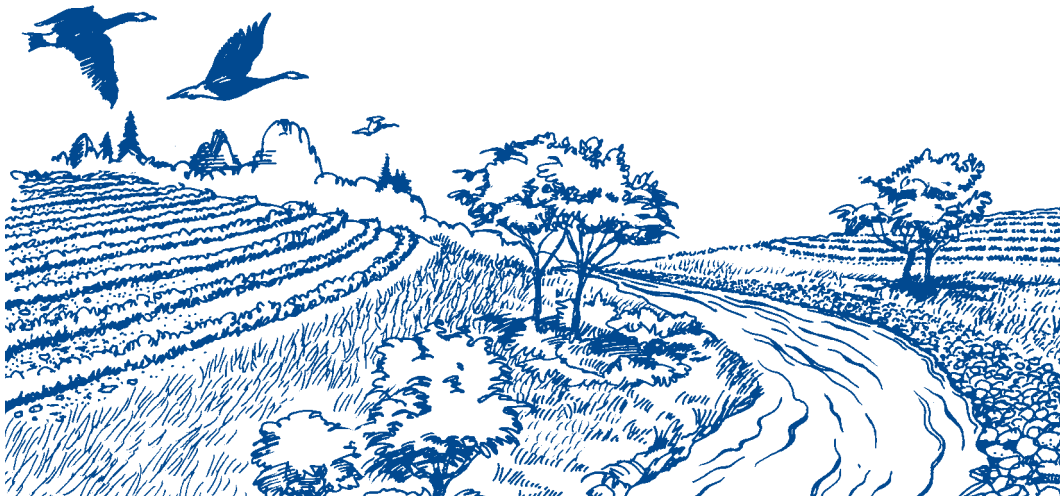
Under normal conditions cattle can graze streamside paddocks without damage for up to 3 to 4 days. However, when the soil is wet you may need to limit grazing to 1 day or less, depending on soil type. Grazing wet soils for longer periods can cause severe damage to the sod. Shorter grazing times and longer rest periods will maximize pasture productivity as well as protect stream banks. Here again, good bank protection coincides with good grazing management.

There are times when stock should be kept off streamside paddocks because damage is more likely. These include periods when banks are unstable due to wet weather or early spring during thaw, during droughts when grass is slow to recover, and on hot days when cattle will stand in the stream.

Management during freezing and thawing

Freezing and thawing is one of the main causes of erosion problems around streams. Because of this, grazing and trampling damage to banks that occurs in the fall is worse than spring damage. Fall damage leaves the stream open for serious erosion problems through the winter and spring thaw period. Pasture growth over the summer can help heal spring damage before the winter "erosion season." Thus, proper management in the fall is an important way to safeguard stream banks. Treating streamside paddocks as a fall stockpile area is a good idea to help protect the banks. This means avoiding fall grazing so that plants have plenty of stubble going into winter.

Stock should be kept off streamside paddocks in winter. If the stream is used for watering stock in winter, use a well-constructed stream crossing with limited access (see "Stream crossings"). A better alternative is to provide another water source for cattle over winter. Contact NRCS for technical and financial assistance.



About streams

Stream temperature. Wisconsin streams are classified as cold or warm water streams. Cold water streams are usually spring-fed and have maximum summer temperatures of 72°F. These are ideal conditions for trout. In contrast, warm water streams regularly exceed 78°F in summer and provide habitat for a fish community that can include smallmouth bass, black crappie, and bluegill. Absence of appropriate fish from a stream may indicate either lack of good habitat or poor water quality.

Stream speed and erosion potential. The speed of a stream and its erosion potential depends on the terrain. (Stream speed is discussed in detail on page 13.) Slow-moving streams occur in relatively flat landscapes (low gradient) and have fairly uniform stream width and depth. Such streams flow through areas with sandy, silty, or clayey soils. These soil types allow the stream to meander, slowing the water down, and reducing its erosive potential. Often the paths of such streams have been channeled out, or straightened, to "reclaim" land for crop production. Straightening a stream tends to increase the speed of the water and will create erosion problems not only in the area that has been altered, but upstream and downstream as well.

Fast-moving streams often occur in areas with gravelly or rocky soils or on steeper terrains (high gradient). They tend to be very erosive. These streams have alternating sections of riffles that are swiftly flowing, shallow, and rocky, and pools that are usually wider, deeper, and slower moving. The combination of swiftly flowing water and loose sediment makes for inherently unstable banks. Many of these streams have the potential to be high-quality trout water, but special care must be taken to stabilize stream banks and reduce erosion. When high-gradient streams flow through areas with silty soils—as they do in the Driftless Area in southwestern Wisconsin—serious erosion problems can arise. Valleys in the Driftless Area are still filled with thick layers of sediment that washed down from the hillsides as a result of poor cropland management practices in the early 1900s.

Land use and erosion. Some agricultural practices, such as unrestricted grazing, have greatly increased erosion in many streams. Excessive erosion can be reduced through better grazing management. Remember, though, that streams are part of a dynamic, constantly changing system and will erode despite our best efforts. The changing stream conditions will require continual modification of the management plan. The goal should be to help protect against erosion by maintaining good sod cover and stable banks.

Many factors influence the erodibility of a stream, including stream gradient, soil type, topography, and upstream land management.

Flooding. While flooding is a natural phenomenon, CRP and improved management of forested hillsides in recent years have reduced the severity of flooding in many areas of the state. Conversion to grass farming can greatly reduce flooding problems on a farm but it cannot eliminate them altogether because of upstream effects.

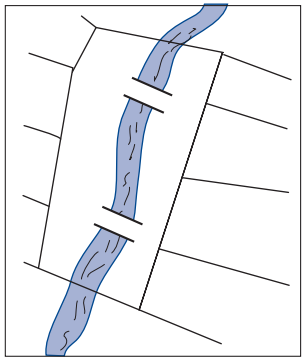
Upstream land use affects both high- and low-gradient streams. Cropland, especially on sloping ground, tends to deliver much more water to streams than does natural vegetation or well-managed pastures. Runoff from upstream cropland can greatly affect the volume of water in the stream, how swiftly it flows, and how serious flooding becomes.

Larger streams typically have more severe flooding problems than small ones.

Springs and seeps. Springs and seeps are a major source of water for streams in many parts of the state. They provide relatively pure, unpolluted groundwater, but are sensitive areas and should be protected. Animal traffic in the springs or seeps should be minimized. Managed grazing should produce enough additional forage for your stock that you can afford to fence out and protect sensitive areas. If springs are needed as a source of water for your stock, consider pumping water from the spring into a tank (see "Watering systems").

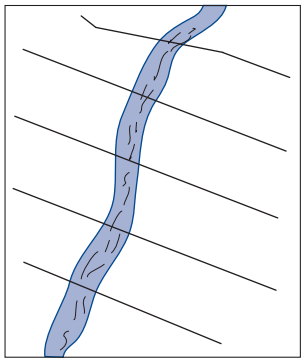
Paddock layout

There are two basic ways to lay out streamside paddocks. You can either fence the stream bank and some surrounding pasture area as a separate paddock or you can include the stream in adjacent paddocks. There are advantages and disadvantages to each strategy and the decision of which to use will depend on your management style and the layout of your stream.



Separate streamside paddock

A separate streamside paddock can be managed differently from the rest of the pasture system. This system lets you put stock into streamside paddocks only when banks are less vulnerable. In most years you will be able to graze creek paddocks almost every rotation; but with them fenced separately, you'll be able to skip grazing when conditions are bad. This option will probably require more fencing and you'll need to provide water for the stock when they are not in the streamside paddocks but it results in better stream management. When laying fence lines that parallel the stream, place them at least 10 to 16 feet away from the stream to keep cattle from creating a trail along the top of the bank.



Adjacent paddocks that include the stream

Including the stream in adjacent paddocks allows you to integrate the streamside pasture more fully into your system, but it will probably cause more wear and tear on stream banks. Land on both sides of the stream should be fenced into the paddock unless the stream is too big to cross.

Making the stream a pasture boundary will increase traffic along the stream bank, increasing erosion. By fencing the stream into the pasture, the stream can be a source of drinking water for more of your paddocks, but you will probably have more crossing areas. To protect stream banks, each section of stream should be accessible from only one paddock.

Fencing

Good fencing is worth the price. Interior fencing currently costs about $0.10/foot. Fencing for 40 acres costs about $1000 and will be easily paid back in greater yield of higher quality forage. Streamside paddocks may require additional fencing to protect sensitive areas or fragile banks.

A perennial problem with fencing around streams is losing the fence in floods. Before you lay out your streamside paddocks, you need to know how the stream behaves under flood conditions. Where does the flood water go? How high can it get? Where is fencing most likely to stay in place and where will you lose it?

To ensure that you have a consistent power supply to your fences on the far side of the stream, you need to place your fence crossing the stream in a secure location. If possible, choose a high spot to install a permanent fence to carry electricity to the far side of the bank. Run high-tensile wire from the top of the bank on one side to the top of the bank on the other at a level above normal flood stage. This wire will transmit the current across and be less susceptible to being washed out in a flood. Below the top fence and at other paddock divisions, run a polywire (not necessarily electrified) down to the edge of the water and across the stream to keep the stock from getting into the next paddock through the stream. This lower, portable fence can be removed when stock are not present to avoid losing it during floods.

Watering systems

Water quality

In many cases, streams provide the most convenient and economical source of water for livestock in riparian pastures. However, before using water from the stream, have it tested for pollutants. Highly polluted water can make animals sick; lower levels of toxic compounds may cause poor performance in livestock while not causing any obvious health problems. For example, if animals find the water unpalatable, they may drink less, reducing milk production or growth. If the water quality of your stream is poor, you may want to provide an alternative source of water. Streamside paddocks are relatively easy to provide with an alternative water source because they are often downhill from the well, allowing gravity to do most of the work.

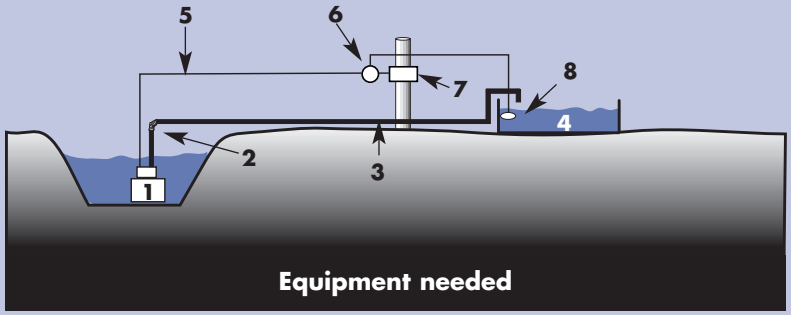
Access points

Try to minimize the length of stream that's accessible to the stock. To encourage stock to drink from certain points, cover other access areas with rock that is at least 2 inches in diameter to discourage animal use. Monitor streamside areas that are used for drinking and remove stock if they are damaging the stream bank or bed. You may need to install a stream crossing to provide safe access to streams for watering purposes.

Alternative sources of water

If stream water quality is an issue or if animal access to the stream will damage the stream bank (generally where the slope is steeper than 2 to 1), you may need to provide an alternative source of water. A fairly simple system for pumping water from the stream can be constructed with a bilge-type pump (see figure 1). Another alternative is to install self-pumping watering systems (see figure 2). This system works best where some stock return the next year to teach new animals how to use the pump.

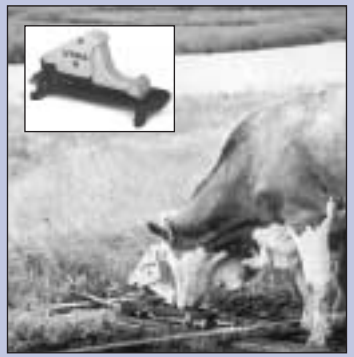
Figure 1. Pumping water from streams using a bilge pump



1. *bilge pump*
2. *flexible hose*
3. *1-inch black poly pipe*
4. *water tank (100 to 150 gallons for 250 stocker cattle)*
5. *14-gauge outdoor extension cords*
6. *relay switch*
7. *12-volt marine battery*
8. *float*

A fairly simple system for pumping water from the stream can be constructed for about $300 using the equipment listed above. To set up the system, first submerge a bilge pump in the stream. Use a pump that can provide approximately 20 feet of head and has high water volume (1,000 gallons/hr at 10 ft head). Attach the power source, a 12-volt marine battery, to a fence post near the stream bank. Use a short section of flexible hose to connect a 1-inch black poly pipe to the pump. To control the water level in the drinking tank, use a float that trips a relay switch connected to the pump. Use 14-gauge outdoor electrical extension cords and be sure the connections are waterproof. The hose and extension cords may be left on the surface or buried to protect them from livestock.

Figure 2.
Self-watering pasture pump



This Utina Model M pump will lift water up to 26 feet from either an underground water table or surface water source and deliver over level ground a distance of up to 126 feet. The pump requires no electrical power. Cattle move the pump arm and provide their own water. A simple non-return valve is available for suspension in surface water sources.

Stream crossings

A stream crossing allows you to control where the cattle cross and where they drink. If you are already grazing your streamside paddocks, your stock have probably chosen a spot to cross. This is generally the best place to put the crossing. Improving this spot with a focus on livestock convenience will encourage them to use it. If the streambed is composed of coarse gravel, it may not be necessary to build a crossing.

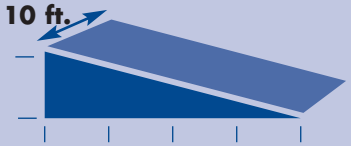
Livestock look for two basic things when crossing a stream or approaching it to drink: they need to be able to see the bottom and they need a firm bed to walk on. Most animals will avoid soft, muddy areas and rocky areas whenever possible. We can use these tendencies to minimize damage to the streambed.

Specifications for building a stream crossing

Location: Select a site where minimal stream bank damage will occur. Look for an area with a gentle slope, shallow, slow-moving water, and a firm base.

Width: At least 10 feet wide.

Ramp slope: No greater than four horizontal to one vertical.



Base thickness: Use at least 18 inches of crushed (angular) or quarry-run rock. Only 9 inches of rock is needed if a geotextile base is used below the rock. Rock size required will depend on velocity of stream (contact NRCS for engineering specifications). If stream speed dictates using rock larger than 1.5 inches, switch to rounded stone or else cattle will avoid the crossing.

The primary component of a stream crossing is a layer of gravel thick enough to support the weight of the animals. The size of the gravel or aggregate affects how long the cattle spend in the crossing. Aggregate with 1.5-inch diameter is large enough that it is uncomfortable underfoot and the stock will not be tempted to stand around in the water but not so large as to keep animals off. This assumes that the stream is moving slowly enough that this size aggregate will not be washed away. If the streambed is unstable, place a layer of fiber cloth (geotextile) under the rock base. This is especially useful when springs are near the crossing.

Technical assistance to help plan and design stream crossings is available from your local NRCS office (look under USDA in the telephone listing) or the local County Land Conservation Department (listed under your county name). Cost-sharing may be available in some areas. Contact your local NRCS representative for details.

How fast is your stream flowing?

STREAM FLOW RATES are difficult to determine because of great variation along any length of stream. Flow rates vary inversely with stream width (the narrower the stream, the faster the flow). However, for purposes of managing the stream, things can be simplified to whether the flow rate is faster or slower than 1 foot/second. To determine flow rate, put a floating item such as a piece of wood on the stream and measure how long it takes to travel 10 feet. If it takes less than 10 seconds, the stream is a fast stream and should be treated carefully to reduce erosion potential; if the item takes more than 10 seconds to float 10 feet, the stream is a slow stream with reduced management requirements. Do not measure flow rate over ripples. Most streams will have some lengths of both fast and slow flow rates. To decide the management requirements, determine which occurs for the greatest proportion of the length.

Shaping and stabilizing stream banks

Fisheries managers have developed a number of methods to improve the habitat for fish. These include shaping banks, stabilizing banks with rock, and providing instream habitat using wooden structures or rocks. All of these practices are compatible with managed grazing and cost sharing may be available for installation. Shaping and stabilizing banks, in addition to improving fish habitat, can minimize erosion problems, improve forage productivity, and reduce management worries. Design needs will vary based on stream characteristics. For more information and design details, contact NRCS. Note that WDNR permits are required for most of these activities and should be obtained before beginning any project.

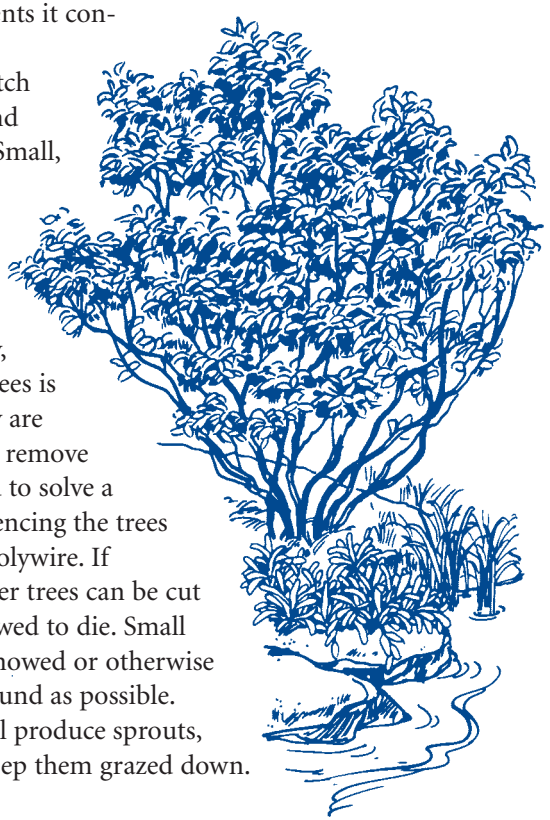
Shaping steep stream banks can be very effective, but costly unless you have access to a back hoe or other earth-moving equipment. The target slope will depend on your situation, but reducing a bank to a 1:1 slope (1 foot horizontal change to 1 foot vertical change) will alleviate most erosion problems. A 4:1 slope will practically eliminate them. Shaping should be done in late spring to allow establishment of a good sod before the end of summer. Once the bank has been shaped, it should be seeded with a mix of pasture grasses and legumes (see table 1 for a list of recommended seed mixes). Be sure to include some Italian ryegrass in the mixture at about 2 lb/a. It germinates quickly and will hold the soil while the slower germinating grasses establish.

Stabilizing banks with large rocks (riprapping) can help reduce bank cutting and erosion on stream curves. However, avoid using so much rock at the water's edge that stock are unable to reach weeds growing among the rocks. Keeping rock at or below the surface of the water allows cattle to graze up to the stream edge and keep weeds and brush down. Rocks should be fist-sized to football-sized, with larger rocks in high velocity streams. Placement should deflect the stream velocity from the bank.

Managing trees

Trees can contribute to the health of the stream ecosystem. The shade that they create can help keep the water cool and reduce nuisance aquatic plant growth. The leaves and woody debris that fall into the stream provide a habitat for fish as well as food for aquatic insects (which in turn become food for fish).

But, trees and the shade they create can influence livestock behavior and can be detrimental to maintaining a good, thick sod in riparian areas, especially on stream banks. A single, large tree or cluster of trees will attract animals to its shade, causing bank damage. As the trampled groundcover thins, soil is more likely to erode into the stream. Also, as animals gather in the shade, manure becomes concentrated, rather than spread across the pasture. Increased manure density near the stream will increase runoff of manure and the nutrients it contains into the stream. Additionally, trees can catch debris during flooding and cause erosion problems. Small, fast-growing trees like willow and boxelder often attract beavers.



Because of their value to the stream community, the best approach with trees is to do nothing unless they are causing a problem. Don't remove more trees than you need to solve a problem. First consider fencing the trees out of the pasture with polywire. If removal is necessary, larger trees can be cut down or girdled and allowed to die. Small trees should initially be mowed or otherwise cut off as close to the ground as possible. Many of these species will produce sprouts, but most livestock will keep them grazed down.

Other resources

Technical assistance

Several agencies offer technical assistance to help protect stream banks. Contact the USDA Natural Resources Conservation Service (NRCS), your local Land Conservation Department, and Wisconsin Department of Natural Resources for information.

Additional information

For more information on related topics, see the following publications, available from your county Extension office or you can view them on the web at www.uwex.edu/ces/pubs/.

Determining Pasture Condition (A3667)

Identifying Pasture Grasses (A3637)

Pastures for Horses (A3680)

Pastures for Profit—A Guide to Rotational Grazing (A3529)

Sampling Soils for Testing (A2100)

The following NRCS grazing standards are available on the web at www.wi.nrcs.usda.gov/tech.html.

Access Roads (Stream Crossings) (560)

Animal Trails and Walkways (575)

Fence (382)

Pasture Planting (512)

Pipeline (516)

Prescribed Grazing (528a)

Streambank Protection (580)

Trough (614)

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Authors: Dan Undersander is professor of agronomy, College of Agricultural and Life Sciences, University of Wisconsin-Madison and University of Wisconsin-Extension, Cooperative Extension; and Brian Pillsbury is the statewide grazing lands specialist, USDA Natural Resources Conservation Service.

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