



Streambank Maintenance Guide

There are many reasons people enjoy living along streams and rivers. However, this can bring its share of challenges, such as eroding stream banks causing loss of land and threatening structures.

This guide will give tips on how to prevent stream bank erosion and steps that can be taken to correct erosion problems once they occur.

Table of Contents

Frequently Asked Questions	2
Types of Problems	3
Bank Erosion	3
Creating a Stable Bank Slope	4
Streambank Armoring	5
Obstructions	7
Obstruction Removal	7
Sediment Removal	8
Lack of Streamside Trees and Shrubs	9
Live Stakes	10

Stream Cross Section

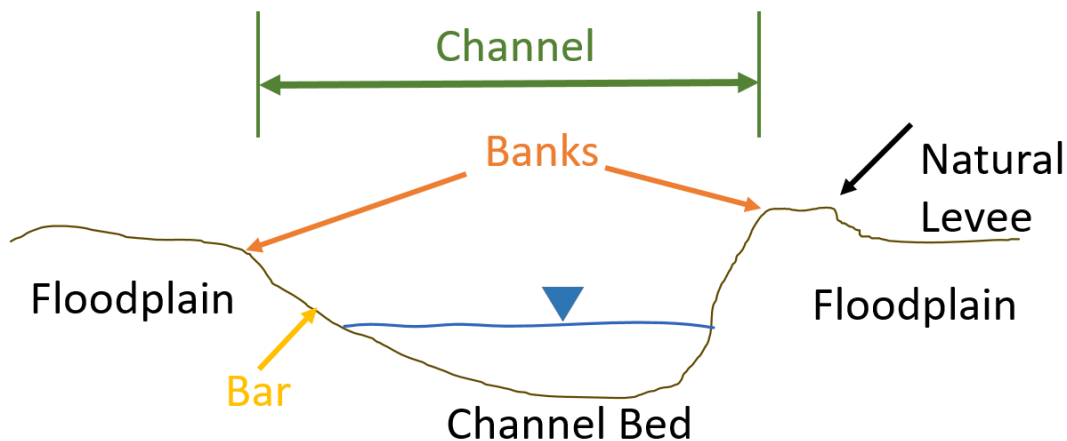


Figure 1 from Utah State University Extension (4)

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Frequently Asked Questions

Who owns the stream?

The water in the stream is a 'public good' and is not considered private property (e.g., people have the right to float on top of the water), but the land beneath the water is private property (e.g. when you stop floating and step onto the land, you are now trespassing). If two property owners own to the edge of a stream, then each owns to the center of the stream, unless a property deed specifies something else.

On large navigable waters, boaters have the right to navigate on the stream, regardless of who owns the land beside or underneath it. For more details, see Ohio Department of Natural Resources Fact Sheet called 'Who Owns Ohio's Streams?'. (2)

I have a bank erosion problem. How do I fix it?

Leaving vegetation intact is your first line of defense. Avoid the removal of existing shrubs and trees. Honeysuckle can be removed, as is it is shallow rooted, plus this invasive plant causes many other problems. Planting other shrubs in place of honeysuckle is recommended.

If the bank is completely void of vegetation, it can be temporarily stabilized by planting annual species such as rye, wheat or oats.

For long term protection, you can establish a wooded buffer by seeding and planting with fast growing, deep-rooted native trees and shrubs, or by doing nothing - let the area grow wild up to 25 feet or more from water's edge. If you can't do 25 feet, do less. Any buffer is better than none. The downside to this approach is that invasive plants such as honeysuckle can take over the area.

What should I look for when inspecting my stream?

Inspections of your stream are best done during low flow (typically in late summer/early fall). We recommend that you inspect your stream annually. When doing so, look for the following:

- Presence/absence of vegetation along the bank
- Is undercutting occurring at the bottom ("toe") of the bank? Are there overhanging banks?
- Have trees fallen into the creek, or are they leaning toward the creek?
- Are tree roots exposed?
- Is there at least 25 feet of wooded buffer along small streams? ** Look for plants taller than knee height, healthy shrubs and trees, no exposed soils, and no turf-grass to the edge of the stream.

**Larger streams and rivers will need wider stream buffers, up to 100 feet or more.



Types of Problems

The types of streambank-related problems can be divided into three general categories: bank erosion, obstructions, and lack of streamside trees and shrubs.

Bank Erosion

Erosion naturally happens at the outside of bends in the stream where water is moving quickly. Some erosion happens slowly and is not necessarily "bad" or in need of repair. Alterations to the landscape can cause erosion to happen more quickly. Signs of more serious problems include:

- banks with little to no vegetation
- vertical banks
- undercut banks
- a large amount of exposed/overhanging tree roots
- areas of sloughing banks.



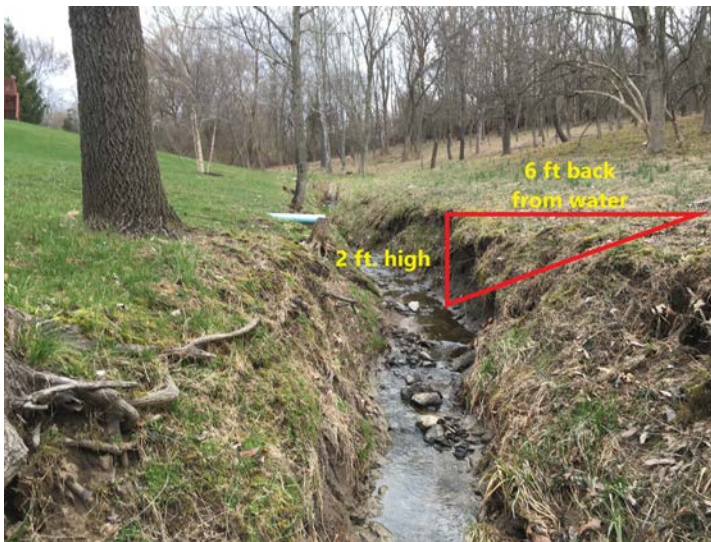
Even more serious problems may not need to be corrected if they are occurring in areas with poor access or where structures aren't affected. If not done correctly, bank stabilization efforts may cause more harm than good, and may cost more than the benefits gained.

If the bank is vertical or near vertical and there is room to work, you can re-grade the bank to a slope of 3:1 or flatter (this means the bank rises one foot over three feet of horizontal distance).

Calculating a 3:1 Slope for Streambank Grading

1. Measure vertically from the high water mark to the top of the bank.
Multiply this by 3.
2. Measure the multiplied distance from the bank into the landscape and flag it.
3. Grade between the landscape flag and the high water mark.

Temporary seeding will be needed along with other erosion control materials until trees and shrubs become established.



Example:

Place a flag where the bank meets the water's edge. Measure the bank height. For a bank that is 2' high, multiply by 3. $2' \times 3' = 6'$. Measure 6' back into the landscape and flag it. Grade between the landscape flag and the flag at the water's edge

Eroding vs. Stable Bank

Characteristics	Eroding Bank	Stable Bank
Bank Slope	Often vertical or close to vertical, mass of sod or failed material at toe	Not vertical, stable slope of 3:1 or lower (e.g., rise of 1 foot or less in elevation over a horizontal distance of 3 feet)
Bank Vegetation	Absence of trees and shrubs. Bare ground or only turf grass present	Variety of trees, shrubs, grasses and forbs on slope
Edge of Bank	Irregular	Relatively uniform or smoothly curving
Trees	Fallen or leaning toward channel, exposed roots	Trees upright on bank and at bottom of the slope, few exposed roots

Streambank Armoring

Placing stone or other hard armoring may help reduce bank erosion; however, it's imperative that this be done correctly, otherwise it could make the erosion problem worse or transfer the problem to a different location downstream. Two methods are presented here: rip rap revetments (2) and boulder revetments (5)

RipRap Revetments

A revetment is a facing of stone or other armoring material to protect a streambank. A riprap revetment consists of layered, various-sized rocks placed on a sloping bank. When using riprap, it is best to use rough angular rocks (crushed limestone) rather than smooth rocks, as the surfaces of the rough rocks allow them to lock together. The size of the riprap to use for a given stream depends on the velocity of the water, but ODOT Type D is most common.

Steps:

1. Place geotextile filter fabric on the prepared slope of 2H:1V minimum grade.
2. Place a bedding layer of #57 crushed limestone (6" depth) on the geotextile filter fabric.
3. Place a layer of riprap, 1.5 times the thickness of the largest stone in the under layer, on top of the crushed limestone. The heaviest rocks should be placed along the bottom of the bank. Riprap should be placed into position, not dumped over the streambank edge. When placed properly, most rock will be entrenched into the bank.
4. Extend the rock layer out into the channel, and entrench the bottom row of stone into the stream bed to prevent undercutting.
5. Extend the revetment beyond the area of active erosion and fully entrenched rock to prevent further erosion behind the ends of the revetment.



Before bank stabilization



Application of revetment



10 years after stabilization

Additional Considerations

Broken asphalt should never be used because it contains toxic chemicals that can leach out into the water. Slab concrete should only be used as an underlayer material and then only if it is broken and free of rebar.

Live stakes of willow or red-osier dogwood may be installed between the placed rock to provide further, long-term stabilization. The stakes should be installed perpendicular to the bank, and be long enough for the base ends to reach back-filled or undisturbed soil.

Boulder Revetments



Along streams, the most erosion prone area is the bottom, or toe, of the streambank. Failure at the toe can result in failure of the entire bank. A boulder revetment consists of a series of boulders placed along a streambank to prevent erosion of the toe of the bank. This is created by first excavating a trench below the bottom of the channel along the toe of the stream bank. In this trench, a series of generally large flat or rectangular boulders are placed as a foundation for the revetment stones. Once the foundation stones have been installed, the revetment stones are placed on top the foundation. If protection is needed higher on the bank, a second set of stone may be placed on top of the first. (5)

Why You Shouldn't Straighten a Creek

Straightening a creek will only make bank erosion problems worse. Artificially straightened streams result in swifter flowing water, which leads to increased stress on the streambank, and therefore greater amounts of erosion. Meanders in the stream naturally reduce the energy of flowing water, especially during floods. Slower water is less likely to erode the stream bank.





Obstructions

Obstructions, including those caused by log jams, falling trees, excess sediment and other debris, can cause water to back up, resulting in localized flooding. This is especially common at culverts and bridges. Obstructions in the stream channel can also redirect flow and place additional stress on the stream bank, resulting in erosion problems.

Obstruction Removal

Removal of log jams or other obstructions in a stream are the responsibility of the landowner, unless the obstruction lies within the road right-of-way. Some woody debris in a stream is good and should be left in place, as it provides good habitat for the aquatic life in the stream.



Removal should be limited to dead woody debris, loose debris, and/or live vegetation that is causing erosion or an obstruction (for example, at the upstream side of a culvert). Stumps and roots should be left in place, as these help anchor the bank in place. Obstruction removal should be done during periods of low or no flow, and fish spawning seasons should be avoided (March to mid-June). Any material removed should be disposed of outside the flood plain. Before removing a log jam, call Clermont SWCD for guidance.

Sediment Removal

First, it is important to note that anyone wishing to place fill in a stream or allow dredged materials to wash into a stream may need to obtain a permit from the U.S. Army Corps of Engineers. In Clermont County and the greater Cincinnati area, contact the Regulator Division Cincinnati Field Office.

Sediment tends to build up in a stream bed when the stream slope is low and the water moves slowly. If the sediment that has accumulated is not the result of an obstruction that can be eliminated, removing sediment buildup may only be a temporary solution, as the conditions responsible for this (low slope and velocity) have not changed.

Too much sediment removal may deepen the channel to the point that water cannot spill out into the flood plain during high flows. When flooding occurs, the water spreads out and slows down, thereby reducing much of the stream's erosive power. If, after sediment removal, the channel is so deep that the entire flow is contained in the stream channel, the force of that water can cause excessive stream bed and bank erosion.





Lack of Streamside Trees and Shrubs

The large root systems of trees and shrubs (especially native species) help hold the soil in place along the streambank. Turf grass has very shallow roots and does a very poor job of this. Mowing right up to the edge of the bank and eliminating the buffer of trees and shrubs can cause rapid erosion. Trees and shrubs along the stream also help filter pollutants before they enter the stream, provide food and habitat to wildlife, and keep streams cool during hot weather.

Plant Species That Work Well Along Streambanks

Trees

American Sycamore (*Platanus occidentalis*)
Black willow (*Salix nigra*)
Box elder (*Acer negundo*)
Eastern Cottonwood (*Populus deltoides*)
Hackberry (*Celtis occidentalis*)
Ironwood (*Ostrya virginiana*)
Shagbark Hickory (*Carya ovata*)
Silver Maple (*Acer saccharinum*)
Swamp White Oak (*Quercus bicolor*)

Shrubs

Bladdernut (*Staphylea trifolia*)
Buttonbush (*Cephalanthus occidentalis*)
Ninebark (*Physocarpus opulifolius*)
Redosier Dogwood (*Cornus stolonifera*)
Silky Dogwood (*Cornus amomum*)
Sandbar Willow (*Salix interior*)
Spicebush (*Lindera benzoin*)
'Streamco' Purpleosier willow (*Salix purpurea*)
Winterberry Holly (*Ilex verticillata*)
Witch hazel (*Hamamelis virginiana*)

Perennials

Canada Wild Rye (*Elymus canadensis*)
Fox Sedge (*Carex vulpinoidea*)
Gray's Sedge (*Carex grayi*)
Joe-Pye Weed (*Eutrochium maculatum*)
Little Bluestem (*Schizachyrium scoparium*)
Milkweed, Common (*Asclepias tuberosa*)
Milkweed, Swamp (*Asclepias incarnata*)
Mountain Mint (*Pycnanthemum virginianum*)
Obedient Plant (*Physostegia virginiana*)
Prairie Dock (*Silphium terebinthinaceum*)
Rush (*Juncus effusus*)
Sneezeweed (*Helenium autumnale*)
Switchgrass (*Panicum virgatum*)
Tall Coreopsis (*Coreopsis tripteris*)
Wild Blue Indigo (*Baptisia australis*)

Planting live stakes is a relatively inexpensive means of vegetating a stream bank. Live stakes are dormant, live woody cuttings of a species (such as willow or red-osier/silky dogwood) with the branches trimmed off. Live stakes can be purchased from some nurseries, but they can also be harvested directly from trees already on your property. The best time to harvest and plant live stakes is in the dormant season (November-February).

Directions for Harvesting and Planting Live Stakes

1. Cut stakes from long, upright branches (2-3 feet long x thumb-width in diameter). Remove no more than 30% of the parent plant.
2. Cut the bottom of the stake on an angle to form a point. This will help with inserting the stakes into the ground. It also helps you remember which end is which (if planted upside down, they will not grow).
3. Remove leaves and small branches after cutting stakes. Any extra pieces or “whips” can be pushed into the streambank as well.
4. Keep live stakes wet in a bucket until ready to plant. Never leave live stakes in the sun or let them dry out. For best results, plant live stakes within 24 hours of harvest.
5. Insert stakes into the bank, pointed end first, so that about 1/2 to 2/3 of the stake is in the soil. Stakes should be placed 2-3 feet apart in several rows along the stream bank. Don't plant stakes too high on the stream bank - they need to be in contact with moisture to survive.
6. After planting, there may or may not be some leaf growth on the stakes in the first growing season; however, the roots will have grown. Don't assume a stake didn't survive because there is no leaf growth during the first season.



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Contact List

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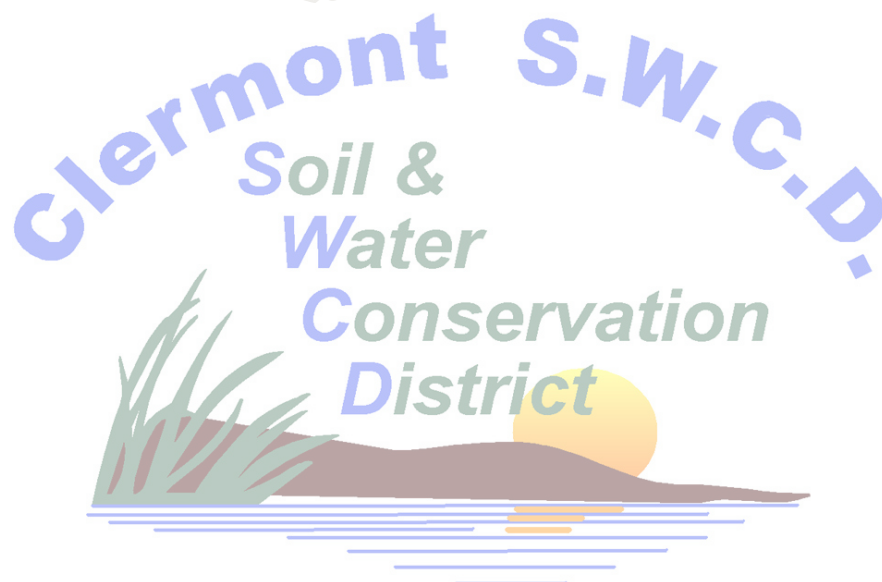
<https://permit.clermontcountyohio.gov>

U.S. Army Corps of Engineers - Huntington District

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Ohio EPA

Water Quality Certification and
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