Stream Maintenance Guide

A homeowners guide to streams, common concerns, and common solutions

BUTLER SOIL & WATER CONSERVATION DISTRICT

Ohio Environmental Protection Agency

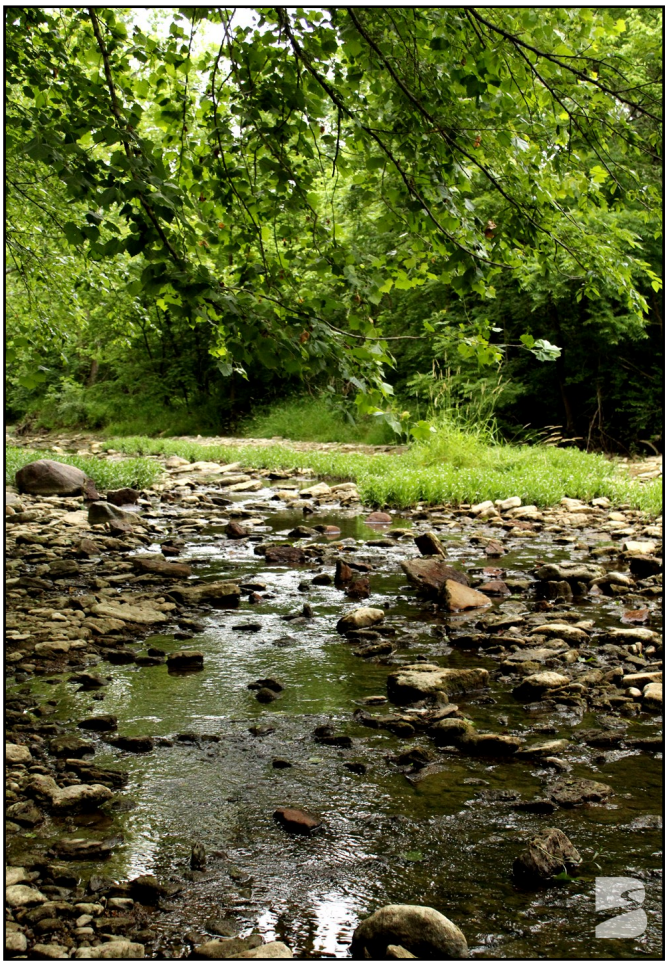
Contents

DISCLAIMER: This guide will go over a few methods of streambank stabilization and provide basic information on potential options, estimated costs, and the pros and cons of that stabilization option. This guide does not serve as step-by-step instructions and landowners should always consult with a design professional or engineer on their stabilization efforts before implementing them. Landowners should also always check permit requirements and contact their local floodplain administrator and city/township administrators for any other permits and/or requirements. Butler SWCD is not a regulatory agency and therefore, the following information is solely technical advice. Information in this document is not legal advice and any information used in this document shall be made entirely at the decision of its user. Butler SWCD will not be held responsible for intended use. Please contact Butler SWCD at 513-887-3720 for any questions or concerns. All images provided by Butler SWCD. This project was funded by the Ohio Environmental Education Fund (OEEF) grant to help communities learn stream maintenance to benefit both the stream and the homeowner by taking an environmentally friendly approach.

Introduction

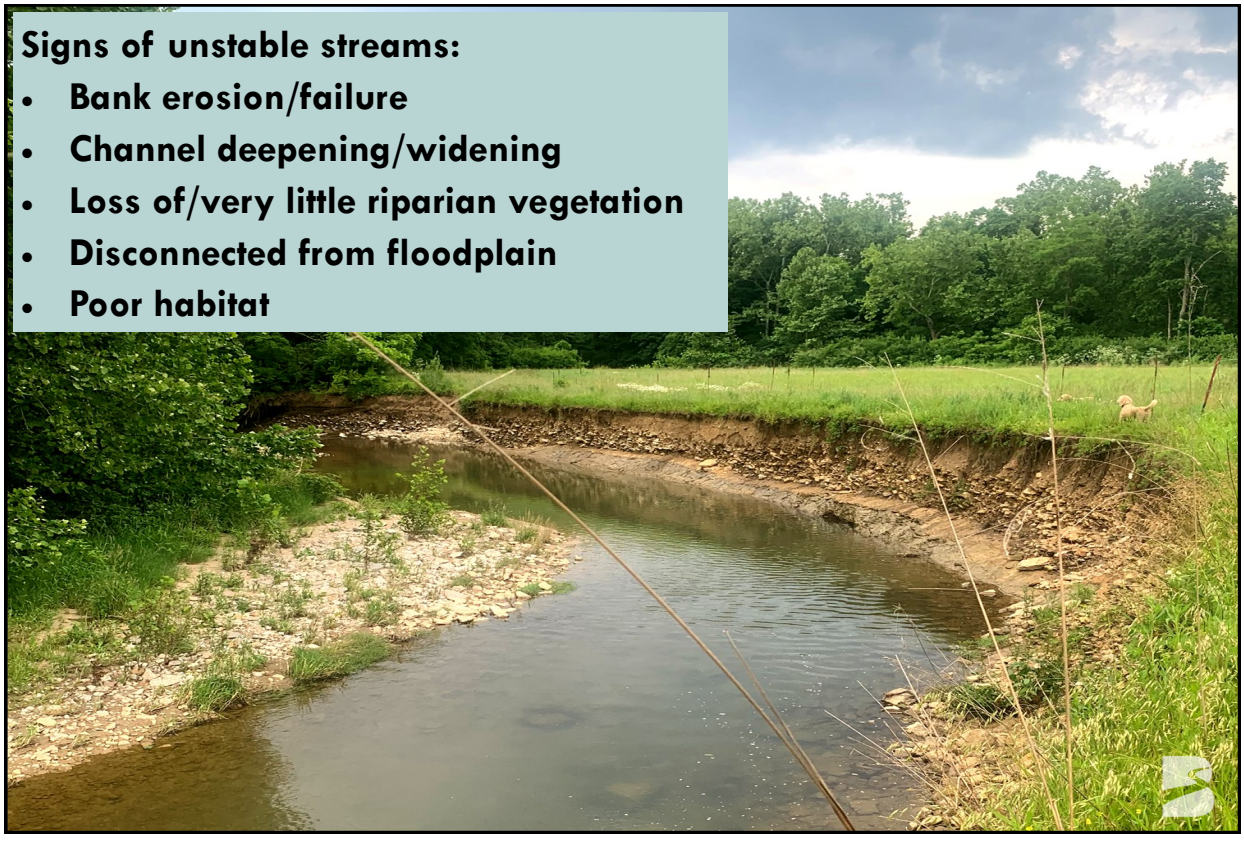
Butler County is home to several large streams and small tributaries, many of which flow through private property. Many homeowners today that have streams on their property deal with a number of issues, including flooding, obstructions, and stream erosion. Streams will naturally change and move over time, but human impacts have led to them changing faster than normal. As the county rapidly develops, this leads to an increase in impervious surfaces, or hard surfaces like pavement, that do not allow water to soak in. During precipitation events, water will run off of impervious surfaces and into storm drains as stormwater runoff. Most of these storm drains in Butler County lead to detention/retention basins, streams, and rivers. When stormwater enters streams and rivers, the volume and velocity of water increases, which may lead to the widening and deepening of the channel to accommodate for the increase in water. As the channel changes, stream erosion can occur. Stream erosion can threaten infrastructure and utilities and also results in eroded soils and sedimentation, one of the largest sources of pollution in freshwater streams and rivers in Ohio.

One of the goals of this guide is to direct Butler County residents in the right direction to address stream concerns, including responsibility, common issues, and solutions, while also protecting water quality, aquatic habitats, and aquatic wildlife. There are many components to addressing streambank erosion. There are also certain permit requirements from Ohio Environmental Protection Agency (OEPA) and U.S. Army Corps of Engineers (the Corps) as well as floodplain regulations that you may need to consider. We will discuss many options and steps to take when addressing stream concerns in this guide.



Stream Movement Basics

As mentioned before, streams will naturally move and change over time. As streams adjust, they attempt to reach a point of equilibrium, where the amount of sediment that is entering the channel will equal the streams ability to transport and discharge that sediment. For example, if a stream is eroding, more sediment is entering the channel than the stream can handle and will need to be deposited elsewhere in the channel. In an ideal system, equilibrium will mean there is no net erosion or deposition of sediment. However, many streams are influenced by human and other natural activities and as a result, are always changing. Heavy changes to the surrounding land use of the watershed may cause streams to change at a faster rate. The stream will continue to erode and deposit sediment elsewhere as it is attempting to stabilize. It is also natural for streams to adjust and change overtime on their own. However, streams often encroach on developed areas and threaten infrastructure and utilities. Streambank erosion can also result in sedimentation, which is a large source of pollution and can be detrimental to aquatic habitats and biological communities. In some cases, stream stabilization and maintenance can help reduce stream erosion and other concerns, benefiting both aquatic communities and protecting public and private developments.



Who is Responsible?

If you have a stream on your property, you do have specific rights to that stream. While you don't own the water that moves through the stream, you do own the land underneath and you do have rights to reasonable use of that water in Ohio so long as it does not cause harm or infringe on the rights of others. Reasonable use to water and landowner disputes are typically determined on a case-by-case basis in Ohio. When it comes to maintenance, a majority of the time, **if the stream is on your property that is privately owned, it will most likely be your responsibility to maintain.** This includes obstruction removal, erosion control, and other typical maintenance.

Other Circumstances - Drainage Easements

Sometimes in housing subdivisions, smaller streams or drainages are platted as "drainage easements." **You cannot place any structure, planting, or other material in these easements that may cause an obstruction or block the flow of water.** You can request a copy of your record plat through the County Recorder's Office to determine if the stream is platted as a private or public drainage easement.

Private Drainage Easements

- Usually for the purpose of stormwater conveyance.
- Maintained either by property owner or the Home Owners Association of the housing development.
- Cannot place any structure or material in the easement that may obstruct, retard, or change the direction of the flow of water.

Public Drainage Easements

- Usually for the repair, construction, and operation of stormwater infrastructure like storm sewers, culverts, etc.
- Maintained usually by Butler County with some stipulations.
- Allow for ingress and egress onto the property.
- Cannot place any structure within these easements.

Common Stream Issues

There are many streams, ranging from small to large, that flow through Butler County on property of local residents. Streams provide many benefits, including habitat to many aquatic organisms, flood relief, drinking water, source water for industrial and agricultural activities, recreation, and much more. While streams provide us with several benefits, many landowners express concerns with streams on their property. The main concern homeowners express when it comes to streams is erosion.

Stream Erosion

Stream erosion is a very common problem and typically occurs on outside bends of streams where the water flows the fastest. While stream erosion is a natural process, it can become troublesome when the stream encroaches onto developed properties and threatens infrastructure and utilities.

Signs to look for:

- Steep, undercut banks.
- Little to no vegetation on banks.
- Exposed, overhanging roots.
- Exposed soils void of vegetation or rocky substrate.
- Exposed wires/pipes/other utilities along stream.
- Banks sloughing off from the top.
- Changes in location of vegetation and roots following high rain events.

Common Stream Issues

Log Jams or Obstructions

Obstructions or blockages in streams are typically caused by downed trees, log jams, sediment build up, trash, or other debris. These obstructions can block the natural flow of water in the stream and cause flooding. Obstructions can even cause erosion as water will attempt to make its way around the obstruction. Obstructions are very common at constricted spaces along a stream, like culverts and bridges, as material can get caught, especially if there is fencing. Woody debris and downed trees in a stream provide habitat for fish and other aquatic communities and should only be removed if necessary. For example, if they significantly block flow, span an entire channel, or threaten infrastructure.

Flooding

Flooding is a very common issue if you live within the floodplain of a stream or river. Floodplains are areas of land adjacent to streams and rivers that are used to help disperse water during high rain events. Floodplains have several important functions, including flood control, groundwater recharge, sediment and nutrient storage, and filtering pollutants. If your property is adjacent to a river or stream or requires flood insurance, it is likely you are within a floodplain and may experience flooding. Unfortunately, flooding is difficult to mitigate on a single property and usually takes a watershed wide approach. Improving stormwater infrastructure, creating wetlands, buffers, or restoring floodplain connectivity can help alleviate flooding.

Stream Stabilization Solutions - Overview

Stream stabilization is typically used when a section of the stream is eroding and needs protection. Stabilization options can vary from soft, vegetative methods to hard armoring methods, and sometimes engineering methods to redirect and stabilize the stream flow and channel. Stream stabilization can be very costly and can require permits through Ohio EPA and the Corps. Complex solutions outside of plantings should not be attempted without consulting with a professional first.

Hard vs. Soft Techniques

While not the most ecologically friendly approach, the most popular and common stabilization method for homeowners includes hard armoring techniques. Hard armoring techniques are used to structurally protect eroding banks. These techniques are typically used when there are constraints to sloping back banks or on streams with high velocity flows and a high risk of erosion. Soft techniques involve natural materials and tend to aim at habitat creation using vegetation. Soft stabilization techniques can help filter runoff and protect water quality. Roots on the vegetation can help stabilize eroding and bare soils. There are benefits and downsides to both techniques depending on the stabilization needs of the stream.

***Long term maintenance may be required on occasion for all stabilization techniques for any failures.**

Hard Techniques

- Hard armoring techniques need to be installed correctly to be durable or they can fail.
- Hard armoring can result in faster water velocity and constrict the channel which can worsen erosion at downstream sites.
- Hard armoring also does not provide habitat and typically does not provide any ecological benefit unless used in conjunction with vegetative methods.

Soft Techniques

- Soft techniques should not be used where there is an immediate stabilization need or where there is high erosion risk.
- Soft techniques should be planned out and implemented properly as well.
- Soft techniques may require long term maintenance and challenges may arise with plant establishment.

Stream Stabilization - Hard Techniques

Rip-Rap

Rip-rap consists of layered, various sized rocks used to protect banks from erosion. It is recommended to use ODOT grade A-D rip-rap, depending on stream velocity. Large, angular rocks can interlock together and withstand extreme flows and stress along banks. You should **avoid concrete slabs, smooth and rounded stones, slab like material, broken asphalt, previously used construction materials, and material with rebar**. To use correctly, the banks will most likely need to be sloped back to a 3:1 slope. The rocks may need to be underlain with a layer of gravel or synthetic material to prevent soil slippage. The rocks should also be embedded into the bank to improve long-term stability. Installing rip-rap with live stakes or another vegetative method can also improve long-term stability.

PROS:

- Good to use with other stabilization techniques
- Can help protect infrastructure/utilities from fast stream flows

CONS:

- Could be labor intensive
- Doesn't provide habitat enhancement compared to vegetative methods
- Could increase velocity downstream
- Could narrow the stream channel

COSTS:

Moderate to high

EQUIPMENT NEEDED:

Hand tools or power machinery

Stream Stabilization - Hard Techniques

Gabion Baskets

Gabion baskets are coated wire baskets filled with stones that are placed along a streambank. Baskets are typically three feet high by three feet wide for each basket. Stones should be adequately sized compared to the holes in the basket. These baskets also need to be properly installed and pinned along the streambank. You can also utilize dormant cuttings of willow or other water-loving species to help the structural integrity of the streambank. Gabion baskets need to be inspected annually and after heavy flow events.

PROS:

- Work where streambanks can't be sloped back
- Can do well in submerged areas

CONS:

- May fail if not properly installed
- Wire baskets can deteriorate and may need replaced
- Can be labor intensive to install

COSTS:
High

EQUIPMENT NEEDED:
Hand tools or power machinery

Toe Protection

The "toe" of the stream, or where the bed of the stream meets the bank, is an area highly susceptible to erosion. Vegetation typically cannot survive in the toe of the stream due to constant inundation. Layered rock or rip-rap can help protect this area and works well with sloped back streambanks and when paired with other stabilization methods like plantings above the toe.

PROS:

- Low failure rate
- Can do well in submerged areas

CONS:

- Can be prone to erosion and scour
- Needs to be installed correctly to prevent failure

COSTS:
Moderate to high

EQUIPMENT NEEDED:
Hand tools or power machinery

Stream Stabilization - Soft Techniques

Live Stakes

Live stakes are dormant, woody cuttings from trees and shrubs that can be used to establish vegetation along a streambank. This practice is typically inexpensive and easy to install, but there are a couple things to take into account:

- Live stakes should be harvested and installed during the dormant season (October-March).
- The cutting should be 2-3 feet long, cut flat at the top, and cut at a 45 degree angle where installed.
- Stakes should be 1/2 to 2 inches in diameter.
- Note if the bank is shaded or sunny to help decide the best species of live stake.
- The streambank should not be too steep and should be a 2:1 slope or flatter.
- The soils should also be soft and not contain lots of rocks that could damage the live stakes.

During installation, the live stakes should be installed 1 to 3 feet apart in a zig-zag pattern. To be the most effective, live stakes must be planted in saturated soils close to the water so that they are able to access the water table. The cutting should be installed at a 90 degree angle with the soil. 75-80% of the live stake should also be in the ground with a few buds present above the soil.

PROS:

- Cost effective
- Easy to install
- Can use with other stabilization methods
- Growth can occur quickly

CONS:

- Should not be used on actively eroding banks with immediate stabilization needs
- Works best with frequent inundation and protection from wildlife

EQUIPMENT NEEDED:
Hand tools and loppers

COST:
Low

Stream Stabilization - Soft Techniques

Riparian Vegetation

Plants with deep root structures help stabilize streambanks by holding soils together. Keeping and maintaining a riparian buffer along a streambank with vegetation like trees and shrubs is one of the least expensive options to take for streambank stabilization. If you have room, planting vegetation is a great option for homeowners and also provides habitat for pollinators and other wildlife. Riparian vegetation also provides shade for the stream and will help filter pollutants from entering the stream. It is recommended to keep as wide of a vegetated buffer as possible, but if you don't have room to plant vegetation, then implement a no mow area adjacent to the stream to help stabilize banks. Below are a few tree, shrub, and grass species that work well along streambanks:

TREES
American sycamore (*Platanus occidentalis*)
Bald cypress (*Taxodium distichum*)
Eastern cottonwood (*Populus deltoides*)
Black willow (*Salix nigra*)
Swamp white oak (*Quercus bicolor*)

GRASSES
Little bluestem (*Schizachyrium scoparium*)
Sideoats gramma (*Bouteloua curtipendula*)
River cane (*Arundinaria gigantea*)

SHRUBS
Grey-twig dogwood (*Cornus racemosa*)
Buttonbush (*Cephalanthus occidentalis*)
Arrowwood (*Viburnum dentatum*)
Nannyberry (*Viburnum lentago*)
Common elderberry (*Sambucus canadensis*)
Pussy willow (*Salix discolor*)
Common ninebark (*Physocarpus opulifolius*)
Spicebush (*Lindera benzoin*)
Winterberry (*Ilex verticillata*)

Obstruction Removal

An obstruction occurs when there is material built up that is blocking the natural flow of water. The obstruction can consist of logs, branches, trash, sediment, or other debris. Obstructions tend to be more common along bridges, culverts, and other constrictions in the stream but can also occur within the stream channel.

When should I remove an obstruction?

An obstruction should be removed when:

- The obstruction is causing flooding or water backing up.
- The obstruction is causing erosion as the stream flows around the jam and into nearby banks, threating homes, infrastructure, and utilities.
- When the obstruction is blocking important infrastructure such as storm drains, culverts, and/or bridges.

Another note is to not remove log jams that aren't acting as obstructions because they serve as important habitat for fish and other aquatic organisms. It's also good to consider minimizing impacts to the stream bed and banks as much as possible as you may need a permit, and to conduct removal during low flow periods in the late summer/fall. See the permits section for more information.

Who is responsible for obstruction removal?

Obstruction removal will most likely be the responsibility of the landowner unless the obstruction is found within a public drainage easement or under a public bridge/culvert. In that case, it may be the responsibility of the city, township, county, or state to maintain. If you live in a subdivision, you can request a record plat from the County Recorder's Office to determine if the easement is the responsibility of the HOA or homeowner to maintain. If you have any questions, feel free to contact Butler SWCD for guidance.

*__SAFETY NOTICE:__ Please only remove obstructions that can be safely removed and safely accessed. Remove obstructions during periods of low flow.

Stream Permitting

When you are doing any type of work in or along a stream, there may be permit requirements to consider. Under the Clean Water Act (CWA), Section 404 gives the Corps regulatory authority over certain activities in waters of the United States (**WOTUS**) and requires authorization (e.g. permit) be obtained from the Corps prior to putting anything into a stream that may be considered **dredged and/or fill material**. Part of the permit process may involve obtaining a water quality certification under Section 401 of the CWA from the Ohio EPA, who regulate stream permitting in Ohio. This document will not cover all permit requirements and it is **highly recommended** that you check with the Corps or Ohio EPA before commencing with any activity that could disturb the stream.

Terminology

WOTUS: The term "waters of the United States" is a legal term used in federal regulations for the purposes of defining a category of aquatic resources subject to federal law. WOTUS is thought of as things like rivers, streams, wetlands, lakes, ponds, drainages, but it is important to be aware that not all of these in Ohio meet the definition of WOTUS and/or fall under federal jurisdiction of the Corps (33 CFR 328 and 329).

Ordinary high water mark: the OHWM typically defines the boundaries of regulatory jurisdiction the Corps has on non-tidal WOTUS in the absence of adjacent wetlands, identified by certain physical characteristics in a stream, etc. Understanding and identifying this feature requires a high level of expertise and knowledge.

Aquatic resource: Aquatic resources is a catch all term for streams, rivers, creeks, tributaries, ditches, lakes, etc., but this term is not used in the definitions and limits of federal jurisdiction found in the CFR and are often used when a homeowner is not certain what is found on their property that would be regulated by the Corps and requires a permit.

Stream Permitting

What are fill/dredge materials?

Section 404 of the CWA requires a permit be obtained from the Corps prior to conducting any activity that would discharge dredged and/or fill materials into WOTUS. The regulatory authority of the Corps is specific and limited under the CWA to the following definitions (found in 33 CFR § 323.2):

- Dredged material: material that is excavated or dredged from WOTUS.
    - Examples include rocks or other materials that were removed from within the WOTUS and not from an upland location.
- Fill material: materials that replace any portion of WOTUS with dry land or changes the bottom elevation of any portion of WOTUS.
    - Examples of fill material include but are not limited to: rock, rip-rap, bricks, sand, soil, concrete, culverts, pipes, drainage pipes, and utilities.

What does discharge mean?

- Discharge of dredged materials: means any addition of dredged materials into WOTUS, including redepositing dredged materials in WOTUS other than incidental fall back.
- Discharge of fill materials: means the addition of fill materials into WOTUS. This does not include plowing, cultivating, seeding, and harvesting for the production of food, fiber, and forest products or fills placed by hand.

Activities that could create a discharge of fill and/or dredged materials includes (but not limited to): filling a low spot, mechanized land clearing, grading, moving any materials in the stream from one side to the other, or placing rip-rap.

Stream Permitting

Steps to take before implementing a project:

Any activity that may involve dredge/fill materials in streams may require a permit from the Corps depending on location and nature of the activity. Any time you plan to put anything into a stream, **it is recommended to first contact the Corps to discuss your project and/or request a pre-application meeting.**

If you are unaware of what water resources may be on your property, one of the first places to start is with a "desktop review," where you can use existing mapping resources on the internet. The United States Geological Survey (USGS) Topographic Quad map will show if you have a "blue line stream." Large rivers and streams will most likely also be mapped on Google Earth.

Most of the time, though, field determination by a trained professional will be required to identify aquatic resources on your project site. This will result in a delineation report that would identify the type, size, and location of an aquatic resource on the site. This report may also conclude with a recommendation to which aquatic resources would meet the legal definition of WOTUS and may be determined jurisdictional and regulated by the Corps.

To determine if an aquatic resource is jurisdictional and regulated by the Corps, you would need to submit a delineation report to the Corps along with a request for a jurisdictional determination (JD). The Corps will review your information and issue you a JD letter identifying what aquatic resources are WOTUS and regulated by the Corps. This information can be found on their website (see contacts).

What to do after a WOTUS determination

Once you determine that there are WOTUS on your property and you would like to do a project, first determine as best you can what Nationwide Permit may be needed (see page 18). Complete and submit the Corps ENG 6082 form and a pre-construction notification (PCN) if required based on the activity proposed and permit needed, and any other forms to the Corps at LRH.permits@usace.army.mil or by mail (see contacts) to request authorization for your project proposal. Complete the form as best as you can and submit what you have. The Corps may also contact you following project review to discuss the project if needed.

Stream Permitting

USACE Permits

General (Nationwide) Permits are issued for projects that are expected to have minimal impacts, while Standard (Individual) Permits are issued for larger projects with an expected larger impact. Nationwide Permits (NWPs) are the most commonly used permit type by the Corps for minor stream maintenance, stabilization, stream restoration, or residential type activities.

The NWPs are activity specific and based on your project purpose. The following are commonly used NWPs in Ohio:

- **NWP 3:** Maintenance of culverts/bridges/etc. and associated removal of sediment
- **NWP 13:** Bank stabilization
- **NWP 18:** Minor discharges
- **NWP 19:** Minor dredging
- **NWP 27:** Aquatic habitat restoration, enhancement, and establishment activities
- **NWP 29:** Residential development

All permits have specific thresholds, terms and conditions that must be met in order to qualify for authorization. In addition, all permits issued by the Corps will have project specific special conditions that must be followed. In some cases, you may also need to acquire a 401 Water Quality Certification from the Ohio EPA as part of the Corps permit and based on the terms and conditions within the applicable NWP.

*For assistance, you can contact the Corps prior to submitting and request a pre-application meeting if needed. Ohio falls under the Huntington District based out of Huntington, West Virginia (see contacts).

Questions and Other Considerations

Typically asked questions:

Do I need a permit to plant vegetation?

Establishing vegetation along streambanks typically does not require any permitting as long as no heavy machinery is being used and there is no fill/discharge being placed in the stream that is not being placed by hand (recall that the definition of "discharge of fill material"). If you are pulling up large amounts of roots, removing large trees, using heavy machinery or disturbing the soil on the stream bed/banks through any planting/removal activity, you may need a permit. It is also wise to check local zoning/other regulations before a planting/removal activity.

What about to remove debris/obstructions from a stream/culvert?

If you are removing small obstructions consistent of woody debris/trash built up in a stream, culvert, or bridge, it is typically stated that you may not need a permit if the obstruction is small and can be removed by hand tools or manual labor.

However, if the removal involves large log jams, requires heavy machinery in the stream, or involves any potential dredging/removal of sediment, it is best to check with the Corps (see contacts). If heavy machinery is needed to remove the debris from the stream but is not placed in the stream and can be done using the "one-step removal" method, then you may not need a permit from the Corps as long as the material that is removed from the obstruction is properly disposed of and not placed in WOTUS or the floodplain (check floodplain regulations).

Can I just dump concrete over my eroding bank?

It is recommended to not use concrete slabs, cinder blocks, bricks, or broken concrete, but these can be used if free of rebar. Asphalt pieces are not allowed. Concrete that are flat can be easily picked up and carried away, worsening the erosion problem. Proper installation is required and does not include material that is dumped from the top of the bank, resulting in uncontrolled spilling into the waterway. In addition, retaining walls should also be a last resort as this does not provide any ecological uplift and could increase stream velocity, and you must submit pre-construction notification to the Corps prior to construction.

Questions and Other Considerations

Who else do I need to talk with for a stream stabilization project?

It is also recommended to check with the Butler County Floodplain Administrator for other floodplain requirements as well as checking on your local city or township regulations. If you are working with heavy machinery and disturbing large amounts of soil, contact the Butler County Planning and Zoning or Engineer's Office for sediment and erosion control guidelines.

How else can I help protect the streams in Butler County?

- Try to keep a large vegetated buffer adjacent to the stream. Plant native species that are suited to riparian areas and have deep root systems to help hold soils together.
- Keep a no-mow zone adjacent to the stream and let grasses grow, only mowing 2-3 times a year to keep invasive species at bay.
- Keep lawn clippings off of streambanks. This can cause vegetation to die and can worsen erosion. Lawn debris can also pollute streams and clog culverts and bridges.
- Be cautious with your application of chemicals like fertilizers and pesticides.
- Install a rain barrel or a rain garden to help cut back on potential stormwater entering nearby streams.
- Routinely check for blockages under bridges or culverts that could potentially back up streams. Remove blockages when needed.

References

Scan the QR code below or visit https://www.butlerswcd.org/streammaintenance to get the references for this document!

Contacts

U.S. Army Corps of Engineers

Huntington District, Regulatory Division, North Branch (Ohio)
502 Eighth Street, West Virginia 25701-2070
304-399-5210
https://www.lrd.usace.army.mil/Missions/Regulatory/Ohio/

Cincinnati Field Office—10557 McKelvey Road, Cincinnati, OH 45240-3929
513-825-2752

Butler County Planning and Zoning

130 High St., Hamilton, OH 45011
513-887-3205
Floodplain Administrator: 513-887-3608
https://bcohio.gov/board_of_commissioners/commissioner_departments/

Butler County Engineer's Office

1921 Fairgrove Avenue (Ohio 4) Hamilton, OH 45011
513-867-5744
https://www.bceo.org/

Ohio EPA Water Quality and Isolated Wetlands Permits

https://epa.ohio.gov/divisions-and-offices/surface-water/permitting/water-quality-certification-and-isolated-wetland-permits