

WATERSHED FRIENDLY

STREAM MAINTENANCE



A GUIDE FOR COMMUNITIES

Stream Maintenance

Communities are often responsible for flood protection and water conservation but lack a specific program for dealing with stream maintenance. This project was initiated by an Ohio Environmental Education Fund (OEEF) grant to help guide communities in stream maintenance practices that will benefit both the communities and local streams. Often stream maintenance projects create new problems while attempting to solve others. A watershed-friendly stream maintenance program can help communities provide flood management and erosion prevention to protect existing community structures all while protecting aquatic habitat, improving water quality, and enhancing riparian buffers. This manual seeks to help communities establish a watershed-friendly stream maintenance program and provides suggestions for how to deal with typical maintenance issues.

Keys to Stream Maintenance

- ✓ Identify issues
- ✓ Locate issues
- ✓ Solve issues

This manual describes common stream maintenance issues in Northeast Ohio, suggests how and when to inspect streams for maintenance issues, and details solutions for those issues.

In Northeast Ohio most stream maintenance issues will be related to streambank erosion, stream channel conveyance, and loss of riparian buffers. These issues all contribute to flooding and erosion which are primary landowner concerns. Streambank erosion threatens infrastructure as urban streams cope with increased runoff from land use changes. Excessive sediment from streambank erosion can negatively impact navigation, aquatic habitat, and water quality. Stream channel blockages restrict flow and conveyance of natural streams, which can contribute to increased flooding, destruction of habitat, as well as increased erosion and sedimentation. Loss of vegetated riparian buffers contributes to streambank destabilization, loss of surface water quality treatment opportunities, and the loss of aquatic and wildlife habitat. Each of these maintenance items are described in further detail on the next page.



Stream Maintenance Issues

Streambank Erosion & Sedimentation:

Streambank erosion is a natural process of stream stability; however changes to a natural stream channel and/or its watershed often cause an acceleration of the erosion process. Increased erosion significantly impacts aquatic resources. Water quality, aquatic habitat, stream recreation, and industry are all affected by increased sediment loads from erosion. Sediment can carry nutrients, pesticides, and toxic compounds which all lower water quality. Unnatural erosion contributes to increased turbidity which reduces visibility for aquatic organisms that need to see to eat. Erosion can cause sedimentation that contributes to stream channel embeddedness which clogs important spawning habitat. Excessive stream channel sedimentation can lead to costly dredging to maintain appropriate water depths for industrial navigation.

Stream Channel Conveyance:

Stream channel conveyance is the ability of a stream to move water from upstream to downstream without impedence. The loss of conveyance can increase flooding and property damage in urban environments. Log jams, fallen trees, sediment, debris, garbage, and other materials can build up and obstruct flow in streams during periods of heavy rainfall. Obstruction is especially prevalent near small culverts and bridges in stream channels whose drainage areas have increased due to land use changes. While some of these obstructions pose a threat, natural debris and sediment are important to aquatic ecosystems.

Loss of Riparian Buffers:

Riparian buffers are the vegetated area running parallel to streambanks. Riparian buffers promote streambank stabilization, wildlife habitat, and water quality improvement. Vegetation in the riparian buffer increases streambank soil retention, filters and removes nutrients from runoff, increases the infiltration of water, and cools stream temperatures. Riparian buffers should consist of three zones including a stabilization zone near the stream edge, a tree and shrub area, and an area of dense grass (Source: Iowa DNRs 2006 How to Control Streambank Erosion). Many riparian areas in Northeast Ohio are not functioning properly. Streamside landowners often remove vegetation from the riparian buffer to maximize space, improve their view, or to build water access. It is important to work with and educate streamside owners to ensure proper vegetated riparian buffers are established and maintained for the health of the stream and protection of their property.

Components of a Community Stream Maintenance Program

Once communities have an understanding of typical stream maintenance issues, it is important to inspect streams to identify and track those issues for future management efforts. This section of the manual discusses the suggested frequency and types of inspections that should be done.

Regular Inspections

All stream reaches in the community should be inspected within a reasonable amount of time. Depending on the number of miles of stream in a community, this may range from once per year to once every three or four years. Known problem areas may need to be inspected more frequently, such as following storms of a particular magnitude. Since the majority of stream miles in most communities are located on private property, notice of any stream walks or similar inspections should be given to the property-owners in advance.

Maintenance Policy

A community should have a policy in place about how it will address stream maintenance issues. This will provide consistency and clarity for the community and its residents, while promoting the efficient use of community resources. There is no right or wrong policy for a community, so long as it is clear and followed consistently. According to Ohio Drainage Law, the property-owner is responsible for any desired improvements to the stream, so the community is not responsible for any stream maintenance activities unless it is the property-owner. However, a community may decide to undertake stream maintenance activities on private property for any number of reasons. Some guiding principles for Stream Maintenance Policy options include:

- The community will address maintenance problems on public property only.
- The community will address maintenance problems on private property if they threaten community infrastructure.
- The community will address maintenance problems on private property if they are considered “Severe.”
- The community will address maintenance problems on public property only, but will provide guidance to private landowners, or connect them with resources.

Types of Inspections:

Stream inspections should be visual in nature with a focus on priority items (streambank erosion, stream conveyance, and riparian buffer issues) along uniform stream segments (sections of stream that look and function the same). All stream inspections should occur during late spring or early summer during low “base-flow” conditions. A sample inspection data sheet is provided on page 15. The sheet includes a section for inspection details like the date, weather, inspector, and location etc. as well as three sections specific to each inspection type. The inspector may use all three sections of the data sheet on an area of the stream, or may just use one section dependent on what is being assessed. The following sections describe streambank erosion, stream conveyance, and riparian buffer inspections in detail.

Streambank Erosion Inspection:

When assessing a stream for streambank erosion there are several items that can set a flag for potential issues. A rapid visual inspection of streambank erosion should consider the questions in the box on page 5.

Components of a Community Stream Maintenance Program

YES		NO		Streambank Erosion Inspection	
<input type="checkbox"/>	<input type="checkbox"/>	Does the streambank have less than 50% protection? i.e. is more than 50% of the streambank soil void of rooted, vegetated, or embedded protection (like embedded boulders, strong bedrock material, or manmade streambank protection like gabion baskets)			
<input type="checkbox"/>	<input type="checkbox"/>	Is more than 50% of the streambank exhibiting an undercut of 0.5 foot or more?			
<input type="checkbox"/>	<input type="checkbox"/>	Is more than 50% of the bank exhibiting overhanging roots?			
<input type="checkbox"/>	<input type="checkbox"/>	Is more than 50% of the bank void of vegetation?			

In general if the answer to two or more of these questions is yes, then erosion potential is moderate to extreme for that streambank. Streambanks exhibiting Very High (Figure 1) to Extreme (Figure 2) erosion potential should be a priority for action. Communities can quickly identify these streambanks if one of the following is true:

- 1) Surveyors answer yes to three or more of the questions above
- 2) Surveyors answer yes to two questions from above, and the streambank does not display evidence of a functioning riparian buffer supporting the streambank (i.e. roots in the streambank are limited to the top 25% of the streambank, and roots are less than 15% of the total streambank material)

See the Cuyahoga SWCD website for additional inspection details.

If time and staffing are available a formal Bank Erosion Hazard Index (BEHI) assessment can be performed which ranks potential for streambank erosion based on root depth, root density, bank angle, streambank protection, bank materials, and stratification. A detailed description of how to perform BEHI in Northeast Ohio is available on Cleveland Metroparks website.



Figure 1. Example Streambank Exhibiting High - Very High Erosional Potential (<50% streambank protection, overhanging roots, <50% vegetation)



Figure 2. Example Streambank Exhibiting Very High - Extreme Erosional Potential (<50% streambank protection, undercut, overhanging roots, <50% vegetation)

Components of a Community Stream Maintenance Program

Stream Channel Conveyance Inspection:

Walking the stream annually to identify problem stream channel obstructions is suggested to prioritize community removal. The American Fisheries Society has identified five stream obstruction conditions (American Fisheries Society 1983 Stream Obstruction Removal Guidelines). Conditions rank from 1 (a stream segment with acceptable flow that may contain small amounts of instream debris, but that is not impeding flow at a problem level) to 4 (a stream segment characterized by major blockages causing unacceptable flow problems), and also include unique or sensitive stream segments that require case-by-case consideration in condition 5. Inspectors should look for blockages that span the entire width of the stream and are significantly impeding flow as identified in Figure 3. These segments would be considered condition 3 or 4 and should be a priority for action. See the Cuyahoga SWCD Website Page for additional figures of conditions 1-3.

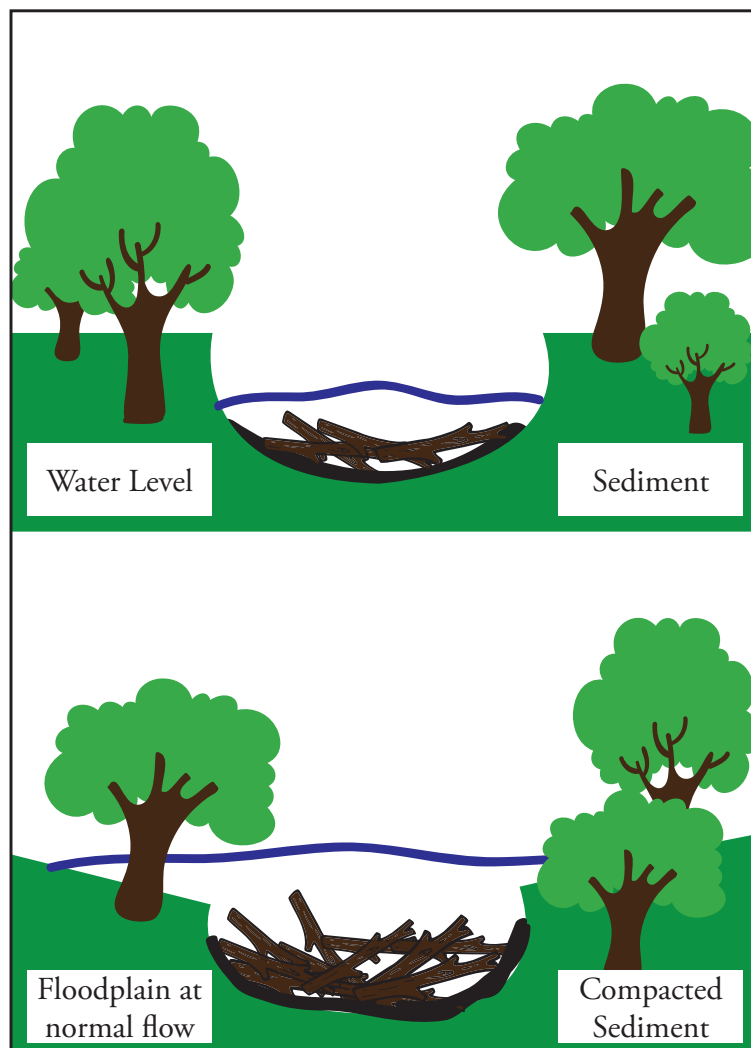


Figure 3. Stream Obstruction Conditions 3 and 4 (Source: American Fisheries Society 1983 Stream Obstruction Removal Guidelines)

Components of a Community Stream Maintenance Program

Riparian Buffer Inspection:

Stream walks and aerial photo analysis can be used to identify where riparian buffer vegetation improvement is needed. This manual suggests a quick visual inspection (based on the British Columbia Ministry of Agriculture, Food and Fisheries 2003 Riparian Factsheet) as outlined below to identify priority areas for riparian buffer enhancement.

Through the use of 10 questions your inspection can determine if the riparian area is functioning and healthy, or if it is not functioning properly. The questions focus on whether there is a variety of vegetative species along the bank, if vegetation is primarily native or invasive (e.g. Japanese knotweed, buckthorn, common reed grass [phragmites], or purple loosestrife), and if streambanks are stable or eroding. For inspectors without significant plant knowledge questions 9 and 10 may be skipped. If an inspector answers **Yes** to 7 or more of the statements from the chart below, and the riparian area looks to be vegetated with stable streambanks, it is likely that the riparian area is healthy and functioning well. If the inspector answers **No** to 3 or more of the statements, and the riparian area is sparsely vegetated with eroding streambanks, it is likely that the riparian area is unhealthy and not functioning properly.

Answer the ten questions below to find out how healthy your riparian area is. If you are unsure about an answer, leave it blank.

1. 85% or more of the riparian area is covered with vegetation (of any kind). Yes ___ No ___
2. More than 50% of the riparian plants are taller than knee height. Yes ___ No ___
3. Healthy shrubs are growing along or near the stream edge. Yes ___ No ___
4. There are young trees and shrubs that will replace the older ones over time. Yes ___ No ___
5. There are no exposed and eroding soils or slumping banks due to recreational activities, lawn equipment, or deer paths. Yes ___ No ___
6. The stream does **NOT** appear ditched or entrenched and is able to flow over its banks. Yes ___ No ___
7. Water in the stream is clear and **NOT** cloudy or full of sediment. Yes ___ No ___
8. There are **NO** retaining walls, rip-rap or other bank stabilizing structures. Yes ___ No ___
9. Invasive weeds make up less than 15% of the plants growing in the riparian area. Yes ___ No ___
10. Native plants dominate the area (over 50%). Yes ___ No ___

Stream Maintenance Regulations

Once a community inspection has identified areas needing erosion prevention, obstruction removal, or riparian enhancement, there are many maintenance options. This manual summarizes regulations for typical stream maintenance Best Management Practices (BMPs) in Northeast Ohio and provides guidelines for choosing watershed-friendly BMPs.

Regulations:

Several types of permits may be required for stream maintenance activities. Before performing stream maintenance, communities should check local ordinances applicable to working in the stream. In addition to local ordinances, national and state permits are required for some activities. Summaries of national and state permit types applicable to stream maintenance are listed below and requirements for typical stream maintenance are summarized in Table 1, pg 13.

Army Corps of Engineers (USACE) Clean Water Act (CWA) Section 404 Permits. The USACE issues permits for discharging dredged (materials excavated from waters) or fill material (material placed in water which replaces water with dry land/materials, or changes the bottom water elevation) into waters of the U.S. The program issues both individual and general permits based on environmental impacts. *Individual permits* are needed for projects which exceed minimal impacts to waters of the *United States General Nationwide Permits (NWP)* cover minor activities with minimal environmental impacts (i.e. impacting less than 300 feet of stream or 1\10 acre or less of a water of the U.S.).

Pre-construction notice (PCN) to USACE is required under certain circumstances outlined in Table 1 for general NWPs, however, many minor activities can occur under NWP coverage without notifying the USACE (i.e. maintenance of previously authorized structures or fills). NWP terms and conditions will always apply, along with

Ohio EPA (OEPA) 401 Water Quality Certification conditions. The five NWPs directly applicable when doing stream work are: NWP 3: Maintenance, NWP 13: Bank Stabilization, NWP 18: Minor Discharges, NWP 19: Minor Dredging, and NWP 27: Stream Restoration (More information on NWPs can be found online at: <http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/NationwidePermits.aspx>)

Ohio EPA (OEPA) 401 Water Quality Certification (WQC). The OEPA CWA 401 Water Quality Certification (WQC) ensures that permits issued by the USACE comply with Ohio water quality standards. When an Individual 404 permit is required, an Individual WQC (IWQC) will also be required. IWQC may also be required for NWPs under certain conditions outlined in Table 1. (More information on Ohio EPA 401 WQC can be found online at: <http://www.lrb.usace.army.mil/Missions/Regulatory/ApplicationForms.aspx> and <http://epa.ohio.gov/dsw/401/permitting.aspx#149524498-water-quality-certifications>)

Stream Maintenance BMP Guidelines

The following stream maintenance BMP guidelines are provided to assist communities in their choice of BMPs from the extensive options that exist for targeting streambank stabilization, obstruction removal, and riparian buffer enhancement. See the Resources Page (14) for a list of documents with stream maintenance BMP options and details that will address common Northeast Ohio stream maintenance issues.

Streambank Stabilization BMP Guidelines:

Watershed-friendly streambank stabilization BMPs should mimic natural stream channel characteristics. Both streambank restoration and soil bioengineering BMPs are good choices that imitate a natural channels' preferred path, angle, and vegetative state.

Streambank Restoration

- Projects should seek to create a more stable streambank angle (ideally a 3:1 slope or lower)
- Avoid project areas that would require the removal of existing trees, shrubs, or their roots
- Bankfull benches (flat floodplain areas) should be constructed so that the top of the bench is roughly the same height as the top of nearby sand or gravel bars in areas where the streambank is being excavated to relax the slope
- Seed and plant new streambanks with fast-growing, aggressively rooting native trees and shrubs

Soil Bioengineering Practices

- Use plant materials that root easily to reinforce and stabilize streambanks
- For simple projects, dormant willow or dogwood cuttings can be planted directly in the streambanks
- For more structural support, live fascines or cribwalls can be installed



Fascines are live branches that are bound together in long tubular bundles, then placed in shallow trenches across the slope of the streambank.



Cribwalls are wooden log cabin-type structures built into the streambank and filled with rock, soil and willow cuttings.

Stream Maintenance BMP Guidelines

Obstruction Removal BMP Guidelines

When addressing flow obstructions it is important to remember that most debris and sediment in the stream channel should be left in place. Woody debris is an important aquatic habitat feature. Dredging sediment from streambeds provides only limited, temporary conveyance benefits. Since it concentrates more water and energy in the stream channel, dredging often promotes further stream channel down-cutting and streambank erosion. When a stream has the ability to access its floodplain, it also has the ability to store floodwaters, filter pollutants and dissipate energy. Therefore, any blockages that enhance the streams ability to access its floodplain during storm events should be left in place. The goal of any stream maintenance program should be to increase the streams' capacity to store floodwater in the floodplain, not in the stream channel. Obstruction removal is only recommended when debris, sediment or other materials are blocking culverts or other transportation crossings, causing flooding of adjacent buildings or infrastructure, or causing erosion that threatens adjacent infrastructure. Use of the following obstruction removal guidelines (based on the Kentucky Division of Water 2010 Guidelines for One-Step Removal of Stream Flow Obstructions) will help ensure that the maintenance is watershed-friendly:

- Place removed material outside of the floodplain to prevent it from re-entering streams during flood events
- Do not dispose materials into streams or against streambanks
- Limit vegetation removal to dead snags, loose debris and live vegetation which obstructs stream flow
- Leave stumps and roots in place to protect against erosion
- Minimize disturbance to the floodplain and riparian areas from access routes
- Perform all work outside of the stream (from the bank or a temporary access point) if at all possible
- Use equipment which can scoop or lift material out of the channel from the stream bank or a temporary access point
- Perform removal during low or no flow conditions (during late summer or fall)
- Do not perform removal during the fish-spawning season (March through April)

Mechanized Sediment Removal BMP Guidelines

If sediment accumulation is causing flooding or loss of navigation, minor dredging may be needed. When performing sediment removal the same guidelines outlined for obstruction removal apply. Additional sediment removal specific guidelines are provided below (based on Napa County 2012 Stream Maintenance Manual):

- Sediment should be removed with a long-reach excavator located on an access road adjacent to the channel or a temporary access point
- Place excavated sediment directly into dump trucks parked on the access road

Stream Maintenance BMP Guidelines

- If dredging equipment is operated in a way that loose sediment may enter the channel, install erosion control fabric or silt fences at the toe-of-slope or along the edge of the active channel to keep sediment out of the channel
- If equipment must be used within the channel, isolate the work area from flowing stream segments using silt fences, wattles, and/or cofferdams (dewatering)

Riparian Buffer Enhancement Guidelines

Communities need to consider existing riparian ordinances when identifying the potential for riparian buffer enhancements. Many Northeast Ohio communities follow model riparian setbacks developed by NOACA on designated streams, which are established as follows:

- A minimum of 300 feet on both sides of streams draining areas greater than 300 square miles
- A minimum of 120 feet on both sides of all streams draining an area greater than 20 square miles up to and including 300 square miles
- A minimum of 75 feet on both sides of all streams draining an area greater than one half square mile up to and including 20 square miles
- A minimum of 25 feet on both sides of all streams draining an area less than one half square mile and having a defined bed and bank
- Where the 100-year floodplain is wider than a minimum riparian setback on either or both sides of a designated stream, the minimum riparian setback shall be extended to the outer edge of the 100-year floodplain

While riparian setbacks prevent the use of riparian land for building, they do not usually have vegetative or maintenance requirements. Through educational outreach targeting the following guidelines, communities can help residents establish a healthier riparian buffer.

- Adopt a “no-mow” zone throughout the riparian setback and encourage the planting of a variety of trees and shrubs to help ensure the riparian zone is performing properly and preventing erosion and flooding.
- Inform residents that trash, grass clippings, and lawn debris should not be disposed of within the stream or along streambanks.
- Where feasible communities should seek to establish 100% vegetative cover in the riparian area.
- Vegetation should keep a minimum height of four inches and be mowed no more than two to three times per year
- Riparian plantings should target species that develop a dense, fibrous root system that help hold soil in place.



Native Ohio plants that grow well in the riparian buffer area (that isn't always wet) include: Sycamore, Black Willow, Pin Oak and Red Maple.

Table 1: Summary of USACE and OEPA Maintenance Regulations (2012)

Desired Maintenance	NWP Permit	PCN Requirements	Permit Limits	NWP Information	OEPA 401 WQC Conditions
Removing sediment or debris from (or near) stream culverts and bridges, resulting in discharges	NWP 3: Maintenance	PCN required for all activities	200 feet from structure; minimum necessary to restore capacity intake or outfall or associated canal	Does not authorize: maintenance dredging for the primary purpose of navigation; beach restoration; or new stream channelization or stream relocation projects.	Removal of accumulated sediment shall occur only once per year and shall be limited to low-flow conditions, except in cases of emergency situations that threaten life or property
Stabilizing eroding streambanks	NWP 13: Bank Stabilization	PCN required if: <ul style="list-style-type: none"> > 500 linear feet in Length > 1 cubic yard per running foot along bank below OHWM or HTL discharges into special aquatic sites* 	<ul style="list-style-type: none"> 500 feet along the bank (unless waived by DE) 1 cubic yard per running foot (unless waived by DE) 	Activity cannot impair surface water flow into or out of waters of the U.S. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations.	<ul style="list-style-type: none"> IWQC required if stream has special designations (see OEPA 2012) Bioengineering techniques shall be utilized, if practicable Material for stabilization shall be free from toxics, asphalt and tires are explicitly excluded as materials suitable for bank stabilization See OEPA 2012 for Vertical bulkhead requirements
Sediment removal or other activities resulting in small channel disturbances or sediment discharges.	NWP 18: Minor Discharges	PCN required if: <ul style="list-style-type: none"> > 10 cubic yards discharged below plane of OHWM/HTL discharges into special aquatic sites* 	<ul style="list-style-type: none"> 25 cubic yards discharged below plane of OHWM/HTL 1/10-acre of waters of the U.S. 	Does not authorize discharges for stream diversions.	<ul style="list-style-type: none"> IWQC required if stream has special designations (see OEPA 2012) NWP does not authorize disposal of dredged material into Lake Erie where that is the primary project purpose
	NWP 19: Minor Dredging	PCN not required	25 cubic yards below plane of OHWM	Does not authorize dredging or degradation through siltation of coral reefs, submerged aquatic vegetation beds, anadromous fish spawning areas, or wetlands.	No additional requirements

Desired Maintenance	NWP Permit	PCN Requirements	Permit Limits	NWP Information	OEPA 401 WQC Conditions
Sediment removal or other activities resulting in small channel disturbances or sediment discharges.	NWP 27: Aquatic Habitat Restoration, Establishment, and Enhancement Activities	PCN required for most activities, except for those activities that require reporting and a 30-day review period (e.g., activities under a binding agreement between the landowner and an agency)	None	Does not authorize stream channelization. Does not authorize relocation or conversion of tidal waters. Does not authorize conversion of natural wetlands or streams, except for relocation activities.	<ul style="list-style-type: none"> Bank stabilization activities must utilize bioengineering techniques Does not authorize impacts to more than one-half acre of category 2 forested wetlands associated with the construction of a wetland mitigation bank Temporary or permanent impacts to category 3 wetlands are not authorized except for impacts to Lake Erie coastal wetlands under specific conditions outlined in the 2012 Ohio State Water Quality Certification
Removing limbs, waste, and debris from stream channels (does not apply to removing live trees, brush, or other vegetation)	N/A	No USACE permit needed if removing waste and debris with manual labor, or with equipment that is not placed or operated in water of the U.S.			
Establish vegetative cover on streambanks and riparian zone	N/A	No USACE permit needed to establish vegetation on streambanks and within the riparian zone			
Removing downed live trees from stream channels	N/A	No USACE permit needed if removing trees with manual labor, or with equipment that is not placed or operated in water of the U.S.			

Table Notes: NWP= Nationwide Permit; PCN= Pre-construction notice; DE= district engineer; WQC= Water Quality Certification; IWQC= Individual Water Quality Certification; OEPA= Ohio Environmental Protection Agency; BMP = Best Management Practice; OHWM= Ordinary High Water Mark; HTL= High Tide Line; N/A= not applicable; OEPA 2012 = Ohio EPA 2012 NWP 401 WQC Recertification; *Special Aquatic Sites are outlined in Subpart E of USEPA Part 230-Section 404(b)(1) Guidelines for specification of disposal sites for dredged or fill material and include Sanctuaries & Refuges, Wetlands, Mud Flats, Vegetated Shallows, Coral Reefs, and Riffle& Pool Complexes

Resources

Cuyahoga SWCD

Glossary, Inspection Aids, Additional Information:

<http://www.cuyahogawcd.org/programs/watershed-friendly-stream-maintenance-guide-for-communities>

Example Stream Maintenance Programs

Napa County: <http://www.countyofnapa.org>

British Columbia: <http://www.env.gov>

Illinois Watersheds: <http://www.flintcreekwatershed.org>

Streambank Stabilization BMP Information Sources

Iowa DNR Streambank Stabilization BMPs: <http://www.iowadnr.gov>

Woody Stakes: <http://soilandwater.ohiodnr.gov>

Fascines: <http://www2.ohiodnr.com>

Cribwalls: <http://soilandwater.ohiodnr.gov>

Obstruction Removal BMP Information Sources

Obstruction Removal Guidelines: <http://www.flintcreekwatershed.org>

Kentucky Division of Water Guidelines for One-Step Removal of Stream Flow Obstructions: <http://water.ky.gov>

Riparian Buffer Enhancement BMP Information Sources

Northeast Ohio Riparian Plantings: Woods for Waters: A guide to planting riparian buffers for healthy streams, produced by Cuyahoga ReLeaf

ODNR Stream Management Guide Fact Sheets

Fact Sheets can be found at: <http://soilandwater.ohiodnr.gov/water-conservation/stream-restoration#PUB>

- **An Introduction to Stream Management**
- **Who Owns Ohio's Streams?**
- **Natural Stream Processes**
- **Ohio Stream Management Guides:**
- **Permit Checklist for Stream Modification Projects**
- **Restoring Streambanks with Vegetation**
- **Trees for Ditches**
- **A Stream Management Model**
- **Forested Buffer Strips**
- **Live Fascines**
- **Gabion Revetments**
- **Riprap Revetments**
- **Live Cribwalls**
- **Stream Debris and Obstruction Removal**
- **Deflectors**
- **Eddy Rocks**
- **Large Woody Debris in Streams**
- **Gravel Riffles**

Watershed-Friendly Community Stream Maintenance Inspections	
Date:	Weather:
Stream Name:	Inspection Number:
Personnel:	Left Bank, Right Bank, Center of Stream:
Upstream GPS:	
Downstream GPS:	
Upstream Picture Number (s):	Downstream Picture Number (s):
Obstruction Picture Number (s):	Riparian Picture Number (s):
Other Picture Number(s) and note(s):	
Comments:	
Streambank Erosion Inspection: Answer Yes or No Questions below	
Streambank Erosion Inspection Questions:	Yes/No
Does the streambank have less than 50% protection? (embedded rocks, wood, vegetation)	
Is more than 50% of the streambank exhibiting an undercut of 0.5 foot or more?	
Is more than 50% of the bank exhibiting overhanging roots?	
Is more than 50% of the bank void of vegetation?	
Streambank Erosion Follow Up Questions:	Yes/No
Yes to three or more Streambank Erosion Inspection questions?	
If yes to two questions: Does the streambank display evidence of an improperly functioning riparian buffer? i.e. lack of streambank root structure support	
Streambank Stabilization Needed?	Yes/No
If Yes to one of the follow up questions, streambank stabilization may be needed.	
Obstruction Inspection: Check the appropriate condition. Conditions 3 & 4 may require intervention	
Condition One: Acceptable flow, minor debris/obstruction	
Condition Two: No currently major flow impediments, future obstruction likely to occur	
Condition Three: Unacceptable problems, large debris accumulations impeding flow	
Condition Four: Major blockage causing flow problems	
Condition Five: Unique, sensitive, or valuable resource that requires specialist attention	
Type of Obstruction (Insert description of obstruction):	
Riparian Inspection: Answer Yes or No Statements below (leave blank if unsure)	Yes/No
85% or more of the riparian area is covered with vegetation (of any kind)	
More than 50% of the riparian plants are taller than knee height	
Shrubs are growing near or along the stream	
There are young trees and shrubs that will replace old ones over time	
No exposed soils and slumping banks due to recreational activities, yard equipment, or deer paths.	
The stream does not appear ditched, channelized, entrenched, and can flow over its banks	
Water in the stream is clear and not cloudy or full of sediment	
There are no retaining walls, rip-rap or other bank stabilization structures	
Invasive weeds make up less than 15% of the plants growing in the riparian area	
Native plants dominate (50% or more) the riparian area	
Number of Yes Statements:	If No to 3 or more then riparian buffer enhancement is likely needed.
Number of No Statements:	
Riparian area looks to be vegetated with stable streambanks?	

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