

2016 Erosion Prevention and Sediment Control Field Guide for the TMACOG Region



Erosion Prevention and Sediment Control Field Guide for the TMACOG Region

This field guide was reviewed by members of TMACOG's Stormwater Action Group and reflects best management practices (BMPs) for erosion and sediment control for private and public construction projects. The document was originally developed by the Kentucky Division of Water (KDOW), Nonpoint Source Section and the Kentucky Division of Conservation (KDOC) and modified to reflect the State of Ohio NPDES Construction General Permit (OHC000004) issued on April 11, 2013. This guide is provided as guidance only and may not include all permit requirements. Please refer to the Ohio Construction General Permit (OHC000004) for full permit requirements.

For detailed regulatory information visit the Ohio EPA Stormwater Program at:

<http://www.epa.ohio.gov/dsw/storm/index.aspx>

Or Call the OHIO EPA office in your region –

Central District Office - (614) 728-3778

Northeast District Office - (330) 963-1200

Northwest District Office - (419) 352-8461

Southeast District Office - (740) 385-8501

Southwest District Office - (937) 285-6357

Many local governments have requirements that are more stringent than those in the Ohio EPA Construction General Permit. For information about local requirements contact your local review agency at the number listed on the back of this guide.

For information on TMACOG region site plan requirements visit –

<http://www.tmacog.org/storc/swp3.htm>

or call TMACOG at (419) 241-9155.

Regulatory Requirements for Construction

Under the federal Clean Water Act, construction projects one acre or larger must be covered by a NPDES permit for construction issued by the Ohio EPA. If a project smaller than one acre is part of a larger development that exceeds one acre, it also must be covered by a NPDES permit. Following the erosion and sediment control recommendations in this guidebook will help you meet most of the permit requirements. The main goal of the permit program is to keep sediment and other pollutants out of lakes, rivers, streams, and wetlands.

If you're working in designated urban areas, you need to file a construction site stormwater pollution prevention plan (SWPPP) with the local government before you begin work. The plans require you to note which of the erosion and sediment control measures you will use during construction. Plans are also required for Ohio Department of Transportation construction projects.

Subcontractors and Utilities

General contractors are responsible for ensuring that all utilities and subcontractors are aware of and adhering to the site's SWPPP. The general contractor will be held legally liable for violations of the SWPPP, and should make sure that subcontractors and utilities are using the designated construction entrance and not tracking mud out onto paved roads. If subcontractors or utilities disturb areas that have already been stabilized, they should replace any mulch, sod, seed, blanket, matting, rock, or other material disturbed. Failure to properly grade, seed, and stabilize work sites may violate permit requirements. Some jurisdictions may require that subcontractors and others conducting excavation or fill activities sign an agreement that they will follow the site's SWPPP.

Permits for wetlands and streams

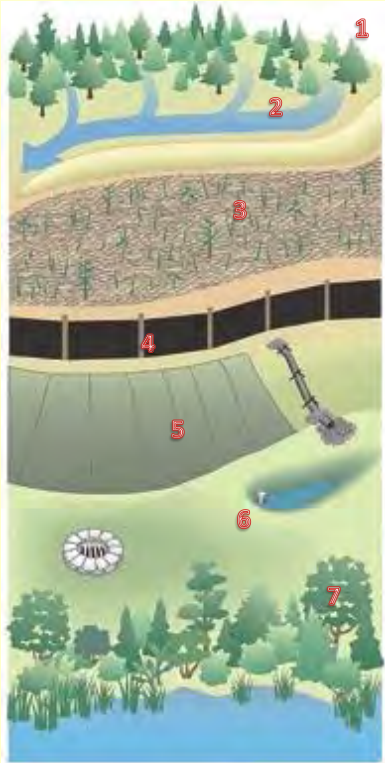
Projects along or in waterways and wetlands, are regulated by the U.S. Army Corps of Engineers under Clean Water Act Section 404 and require Section 401 Water Quality Certification. See the Ohio EPA website for more information.

<http://www.epa.ohio.gov/dsw/401/permitting.aspx>

Clean runoff starts with you.

This field guide will take you through the construction site erosion and sediment control process. The guide starts out with sections on pre-project planning and operational activities. The rest of the guide discusses erosion prevention and sediment control by starting at the top of the hill, above the project site, and proceeding down the slope through the bare soil area, ditches and channels, traps and basins, and on down to the waterways below. The drawing below summarizes this approach.

1. Preserve existing vegetation
2. Divert upland runoff around exposed soil
3. Seed/mulch/cover bare soil immediately
4. Use sediment barriers to trap soil in runoff
5. Protect slopes and channels from gullying
6. Install sediment traps and settling basins
7. Preserve vegetation near all waterways

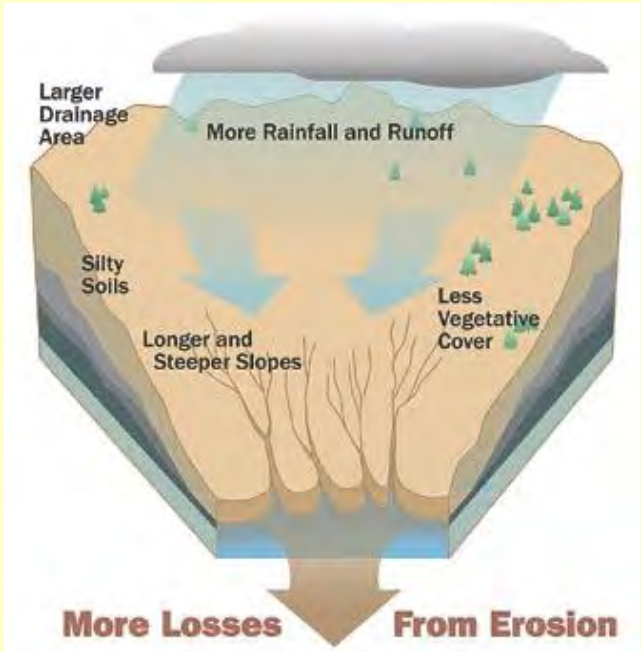


Why do we need to control erosion and sediment losses from construction sites?

Sediment washing into streams is one of the biggest water quality problems in Ohio. Sediment muddies up the water, kills or weakens fish and other organisms, and ruins wildlife habitat. It is not difficult to reduce erosion and prevent sediment from leaving construction sites. Follow the basic approach shown above. Sites with steep slopes near waterways need more controls than flat sites farther away.

What factors influence erosion?

- Rainfall frequency and intensity
- Slope (steep = more; flat = less)
- Soil structure and type of soil (silty = more erosion)
- Vegetation (more vegetation = less erosion)



How does construction contribute to erosion?

- Removing vegetation
- Removing topsoil and organic matter
- Reshaping the lay of the land
- Exposing subsoil to precipitation
- Failure to cover bare soil areas
- Allowing gullies to form and grow larger
- Removing vegetation along stream banks

How does construction BMPs help prevent erosion?

- Soak it in—maximize seeding and mulching
- Sift it out—use silt fences or other filters
- Slow it down—don't let gullies form
- Spread it around—break up concentrated flows
- Settle it out—use sediment traps and basins

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**APPENDIX A Erosion Prevention and Sediment
Control Site Inspection Check List**

**APPENDIX B Construction Site Inspection
Report**

SECTION 1

Pre-Construction Planning

Planning your construction project can help you avoid costly mistakes in controlling erosion and sediment loss to nearby waterways. Follow the steps below before you begin clearing, grading, and excavation work.

Obtain Ohio EPA permit coverage and develop SWPPP

If your project is one acre or larger, the developer or landowner will need a stormwater permit from the Ohio EPA before clearing, grading, or other cut/fill activities start.

Erosion and sediment controls are required for all construction sites one acre or larger under federal, state, and local regulations. Stormwater pollution prevention plans (SWPPPs) must be designed by a



qualified professional engineer before the project begins. Site plans and the complete SWPPP must be kept on site and available for inspection.

Assess soils and slopes on the construction site

If your construction site has highly erodible soils and steep slopes, you will need maximum erosion and sediment control protection. See the table below.

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (2:1 or more)	<i>Very high</i>	<i>High</i>	<i>High</i>
Steep (2:1–4:1)	<i>Very High</i>	<i>High</i>	<i>Moderate</i>
Moderate (5:1–10:1)	<i>High</i>	<i>Moderate</i>	<i>Moderate</i>
Slight (10:1–20:1)	<i>Moderate</i>	<i>Moderate</i>	<i>Lower</i>

2 Pre-Construction Planning

Identify nearby streams and drainage control points

Walk over the site and find where ditches or other concentrated flows leave the site. These are the final sediment control points. Sediment traps or basins should be installed just above these control points. Your site may drain to an underground storm sewer system. In this case, the storm drain inlets that drain runoff from your site are the control points and must be protected (see Section 7). These are also the compliance points for any permits issued for the site. Low spots—where rain water ponds—are good places for sediment traps (see Section 9).






Install clean water diversions, sediment traps/basins, grassed ditches, check dams, and sediment barriers before clearing and excavation work begins.

Preserve existing vegetation wherever possible

Minimize clearing and grading to preserve mature vegetation and save money. Limiting the amount of bare soil by phasing your project and preserving existing vegetation will work better and be less expensive than installing large stormwater control basins or ponds.

Only dig or grade where necessary. Preserving existing vegetation helps to minimize erosion, saves money by reducing clearing, excavation, and erosion control expenses, and makes the final development more attractive.

Prioritization of erosion and sediment controls for construction sites

Practice	Cost	Effectiveness
Limiting disturbed areas through phasing	\$	
Protecting disturbed areas through mulching and revegetation	\$ \$	
Installing diversion around disturbed areas	\$ \$ \$	
Sediment removal through detention of all site drainage	\$ \$ \$ \$	
Other structural controls to treat sediment-laden flow	\$ \$ \$ \$ \$	

Pre-Construction Planning 3

Protect large trees by marking off a no-dig root protection zone that is twice as large as the outer perimeter of the branches. Plan your project to limit the amount of bare soil area exposed to the weather, and limit the amount of exposure time. Be sure to mark off protected areas with colored ribbon or stakes and warn equipment operators of their location.



Only dig or grade where necessary. Preserving existing vegetation helps to minimize erosion, saves money, and makes the final development more attractive.

Follow Stormwater Pollution Prevention Plan (SWPPP)

The project designer has developed a written site plan and SWPPP for your project that shows the drainage patterns and slopes, areas of disturbance (cuts/fills, grading), location of erosion and sediment controls, location of surface waters and wetlands, and the location of stormwater drainage control points. These documents have been reviewed and approved by the local engineer's office and may only be modified by the qualified professional listed on the site plan. Any changes to sediment and erosion controls or the post construction BMPs must be documented in the site's modification log and made available on site. Prior to beginning work, review the SWPPP and walk the site with staff to become familiar with sediment and erosion controls and all good housekeeping measures planned for the site.

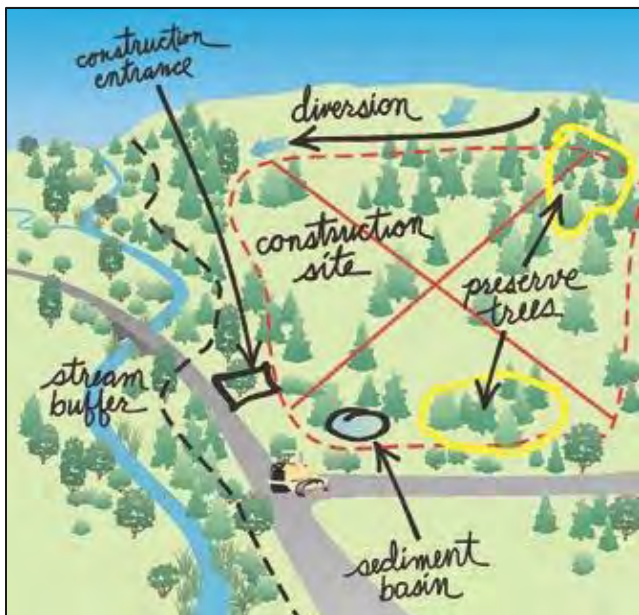
SECTION 2

Construction Phase Operations

Divide your construction site into natural drainage areas, so you can deal with each one individually. You will be controlling erosion on bare soil areas by applying seed, mulch, or sediment filters, and minimizing the time bare soil is exposed to the weather. Control points for sediment in runoff will be at the curb inlets or in the ditches, channels, or sediment traps/basins installed where concentrated flow leaves the site.

Install clean water diversions, sediment traps/basins and stabilize drainage channels with grass, liners, and check dams before excavation, fill, or grading work begins (see Sections 8 and 9). Install silt fences and other sediment barriers downhill from bare soil areas before clearing or excavation work begins (see Section 5).

Identify drainage areas and drainage ditches and channels. Install diversions, grassed channels, sediment traps/basins, downslope sediment barriers, and rock construction entrance before beginning work.



Phase your construction work to minimize exposed soil areas

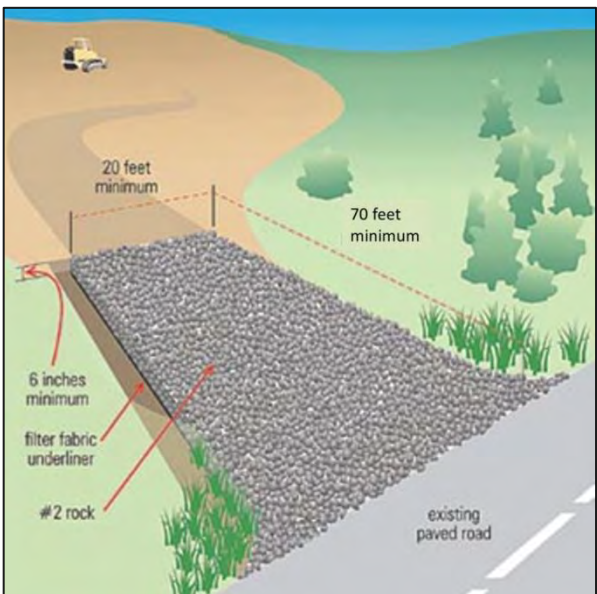
Excavate or place fill material at the site in stages, to avoid exposing large areas of bare soil to the elements. Establish final grade quickly, then seed, mulch, or cover bare soil. Require utilities and subcontractors to grade their work sites and seed, mulch, or cover excavated areas promptly. You should require subcontractors to sign a form assuring compliance with your SWPPP if their work is covered under your permit.

If work will proceed over several weeks or months, apply temporary seeding or mulch until final grade work is completed. Regulations require seeding or mulching all bare soil areas that are not being worked after 14 days.

Excavation and grading work should be done during dry weather if possible. Prepare for rainy weather forecasts by making sure sediment controls are in place and that mulch or grass is on bare areas that are at final grade.

Install construction entrances and control dust

Mud tracked onto paved roads is the number one complaint from citizens regarding construction site operations. A construction entrance/exit pad must keep



Construction entrance

6 Construction Phase Operations

mud from tracking onto paved roads. Use #2 (4- to 8-inch) rock—not 57s or 410 “traffic bound”—for entrance/exit pads leading to paved roads. Pads should be 20 feet wide, 70 feet long, and 6" thick. Install filter fabric under the rock to keep it from sinking into the soil below. Rake rock with a grubbing attachment or add new rock if the pad fills with sediment. Inspect regularly to ensure that the construction entrance is preventing mud from tracking onto paved roads. Control dust during hot, dry weather by seeding or mulching bare areas promptly, wetting haul roads as needed, or applying approved chemical soil binders.

Dewatering operations and discharges

Muddy water pumped from collection basins or other areas must not be pumped into storm sewers, streams, lakes, or wetlands unless sediment is removed prior to discharge. Allow discharge to soak into the ground if possible. Do not pump discharge from dewatering operations into curb inlets, storm sewers, creeks, lakes, streams, or wetlands without an Ohio EPA NPDES permit.

Use sock filters or sediment filter bags on discharge pipes, discharge muddy water into silt fence enclosures installed in vegetated areas away from waterways, or discharge muddy water into a sediment basin. When discharging from a sediment basin, Ohio EPA requires that you use devices that withdraw water from the surface and properly dispose of accumulated sediments (see Section 8). Remove accumulated sediment after water has dispersed and stabilize or seed the discharge area. Dispose of sediment in areas where it won't wash into waterways, then grade the area and seed.



Dewatering using a sediment filter bag

Inspection and maintenance of erosion and sediment controls

For sites one acre or larger, state and federal regulations require that you inspect and repair/ replace silt fences, vegetated buffers, berms, check dams, channels, and other erosion and sediment controls every 7 days and after each rainfall of 0.5 inch or more. Remove accumulated sediment from behind silt fences before it reaches half the silt fence height. Remove sediment from pipe or curb inlet ponding dams or filters as it accumulates. Clean mud off paved roads immediately. Your inspection reports must be in writing, and kept on file at the site.

Check dams in ditches and sediment traps/ basins also require periodic sediment removal. Remove sediment from traps and basins before they are halfway full. Dispose of removed sediment in areas where it will not wash into waterways. Seed or mulch bare soil areas, as soon as possible.

Keep written records of these inspections, including dates, observations and corrective actions taken, with your erosion and sediment control plan and Stormwater Pollution Prevention Plan, or BMP Plan. See Section 5 for information on installing and maintaining overland sheet flow sediment filters. See Sections 7, 8, and 9 for information on handling concentrated flows in ditches, channels, and other areas.



Rock Sizing and placement look adequate and very little mud appears on the pavement. However, the pad is too thin. Track marks near curb indicate that drivers are not using it. Entire area needs seed and mulch.

8 Construction Phase Operations



Rock pad was installed properly with right sized rock, but lack of filter fabric underliner is causing rock to spread and sink into the soil. Note tracking of mud onto paved road.



Rock sizing, placement, and pad sizing are good, but sediment from unprotected slopes and ditches is washing onto paved highway.



Construction entrance rock pad is poorly constructed; rock is too small. Use filter fabric under rock and larger sized rock, such as #2. No mud should be tracked onto paved roads open for traffic.

Section 3

Diverting Upland Runoff around Exposed Soils

Keep clean upland runoff from flowing through your construction site, or route it through stable ditches so it won't get muddy. Below are some simple approaches for dealing with uphill sources of runoff.

Diversion berms

A diversion berm is a long, mounded “collar” of compacted soil located uphill from the excavated area. The berm is designed to



intercept overland runoff and direct it around the construction site. This prevents “clean” water from becoming muddied with soil from the construction site. Berms can be temporary or permanent landscape features of the site.

Berms should be located so that stormwater flowing along their uphill face follows a gently sloping path (i.e., less than 5 percent channel slope). Turf reinforcement mats, erosion control blankets, or rock protection might be needed for berms that channel water at a slope of 5 percent or more (see Section 4). Berm side slopes should be 2:1 or flatter, 10 to 14 inches high, and seeded immediately after construction. Extend the downhill end of the berm so it directs overland flow to areas of thick vegetation or flat surfaces to promote dispersal and infiltration. Seed and mulch berms after construction to minimize erosion.

Diversion ditches

Diversion ditches are similar to berms—they are designed to intercept and divert upland runoff around bare soil areas. Ditches are cut above cleared or fill

10 Diverting Upland Runoff

areas and designed with a gentle slope to carry water away from work areas. Ditches should be 8 to 12 inches deep and seeded. Side slopes should be 2:1 or flatter.

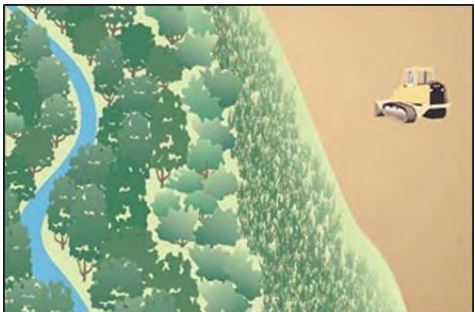
Stabilized, lined ditches can also be used to move upland water through your site without getting muddy. Construct and line “pass-through” ditches before general clearing or grading work begins.

Ditches should discharge to areas with thick vegetation or flat surfaces to promote dispersal and infiltration. Gullies must be repaired as soon as they appear. Ditches with slopes less than 5 percent may be heavily seeded, mulched, and maintained without additional protection if stabilized quickly after construction. Ditches with slopes of 5 percent or more, need erosion control blankets, turf mats, or rock liner protection. Diversion ditches should be lined with grass at a minimum, and blankets if slopes exceed 10:1 (10%) (see Section 8).

Vegetated buffers

Grass, shrubs, trees, and other vegetation located above or below excavated areas should be preserved if possible. Vegetation above construction sites prevents high volume sheet runoff flows from moving across cut or fill areas. Vegetation below the construction site helps filter and trap sediment before it can move into ditches, channels, and streams. All vegetated areas help to promote infiltration of stormwater, which is a key objective in preventing erosion and controlling sediment movement off the construction site. Maintaining a buffer of at least 100 feet will protect water quality and aquatic habitat. Clearing or working in vegetated buffers within 25 to 50 feet of channels or streams may require approval from your local review agency and Ohio EPA.

Check with your local review agency to find out what regulations apply to your site.





Well-built vegetated berm diverting runoff from wooded stream. Diversion berms and ditches should be seeded after construction. Use blankets if slopes are steep.



Good installation of rock-lined berm to divert rain runoff around residential construction site on steep slope near a river. Diversion ditches can be lined with grass if channel slopes are 20:1 or less, and with blankets or turf mats if they are steeper.



Good example of construction, seeding and stabilization of diversion berm. Note that diversion ditch is lined with grass on flatter part of slope, and with rock on steeper part.

SECTION 4

Protecting Soils with Seed, Mulch, or Other Products

Seeding or covering bare soil with mulch, blankets, mats, or other products as soon as possible is the cheapest and best way to prevent erosion. Grass seeding alone can reduce erosion by more than 90 percent. Sod, mulch, blankets, and other products can further increase protection.

Erosion reduction by cover type

Soil covering	Erosion reduction
Mulch (hay or straw)	
1/2 ton per acre	75 percent
1 ton per acre	87 percent
2 tons per acre	98 percent
Grass (seed or sod)	
40 percent cover	90 percent
60 percent cover	96 percent
90 percent cover	99 percent
Bushes and shrubs	
25 percent cover	60 percent
75 percent cover	72 percent
Trees	
25 percent cover	58 percent
75 percent cover	64 percent
Erosion control blankets	95–99 percent

Soil cover requirements

Bare soil in excavated or fill areas must be seeded, mulched, or covered immediately after final grading work is completed or when work is temporarily suspended. The tables on the next page show the timeframes for permanent and temporary stabilization requirements.

Permanent stabilization

Area requiring <u>permanent</u> stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more	Within seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the state and at final grade	Within two days of reaching final grade
Any other areas at final grade	Within seven days of reaching final grade within that area

Temporary stabilization

Area requiring <u>temporary</u> stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the state and not at final grade	Within 2 days of the most recent disturbance if the area will remain idle for more than 14 days
For all construction activities, any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the state	Within 7 days of the most recent disturbance within the area. For residential subdivisions, disturbed areas must be stabilized at least 7 days prior to transfer of permit coverage for the individual lot(s).
Disturbed areas that will be idle over winter	Prior to the onset of winter weather

Seed Types and Application

Prepare bare soil for planting by disking across slopes, scarifying, or tilling if soil has been sealed or crusted over by rain. Seedbed must be dry with loose soil to a depth of 3 to 6 inches.

For slopes steeper than 4:1, walk bulldozer or other tracked vehicle up and down slopes before seeding to create tread-track depressions for catching and holding seed. Mulch slopes after seeding if possible. Cover seed with erosion control blankets or turf mats if slopes are 2:1 or greater.

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Other suggested seeding rates, soil conditions, and other information for various species and seed mixtures				
Seed species & mixtures	Seeding rate/acre	Per 1000 sq. ft.	Soil pH	Other information
Seed and seed mixtures for relatively flat or slightly sloping areas				
Perennial ryegrass + tall fescue Tall fescue + ladino or white clover	25 to 35 lbs.	1 lb.	5.6 to 7.0	Apply lime at 2 tons per acre if soil pH is below 5.5; use 400-800 lb. fertilizer (10-10-10) on poor soils. Use wildflower or "no mow" mixes to save on mowing and watering costs.
	15 to 30 lbs. 40 to 50 lbs. 1 to 2 lbs.	1 lb. 1½ lb. 2 oz.		
Steep slopes, banks, cuts, and other low maintenance areas (not mowed)				
Smooth brome + red clover Tall fescue + white or ladino clover Orchardgrass + red clover + ladino clover Crownvetch + tall fescue	25 to 35 lbs.	1 lb.	5.5 to 7.5	Track steep slopes with dozer up and down hill before seeding. Mulch slopes after seeding with 2 to 3 tons of straw or 6 tons of wood chips per acre. Use tackifier on mulch, disk it in, or punch in with sheep-foot roller. Disk or sheep-foot on the contour (across slope, on the level). For extremely steep slopes, use erosion control blankets after seeding. Use 24" spacing for blanket staples.
	10 to 20 lbs.	½ lb.		
	40 to 50 lbs.	1 lb.		
	1 to 2 lbs.	2 oz.		
	20 to 30 lbs.	1 lb.	5.5 to 7.5	
	10 to 20 lbs.	½ lb.		
	1 to 2 lbs.	2 oz.		
	10 to 12 lbs.	¼ lb.		
	20 to 30 lbs.	1 lb.	5.6 to 7.0	

Lawns and other high traffic or high maintenance areas (mowed)				
Bluegrass	105 to 140 lbs.	3 lb.	5.5 to 7.0	Use wildflower mixes to save on mowing and watering costs. Do not establish grassed lawns near streams or wetlands – leave a 15- to 30-foot buffer of natural vegetation.
Perennial ryegrass (turf) + bluegrass	45 to 60 lbs. 70 to 90 lbs.	2 lb. 2½ lb.	5.6 to 7.0	
Tall fescue (turf type) + bluegrass	130 to 170 lbs. 20 to 30 lbs.	4 lb. 1 lb.	5.6 to 7.5	
Ditches and other areas of concentrated water flows				
Perennial ryegrass + white or ladino clover	100 to 150 lbs. 1 to 2 lbs.	3 lb. 2 oz.	5.6 to 7.0	Seed ditches and channels thickly. Do not use fertilizer near ditch or channel bottom. Use erosion control blankets or turf reinforcement mats when channel bottom slopes exceed 3 percent.
Kentucky bluegrass + smooth bromegrass + switchgrass + timothy	20 lbs. 10 lbs. 3 lbs. 4 lbs.	½ lb. ¼ lb. 2 oz. ¼ lb.	5.5 to 7.5	
+ perennial ryegrass + white or ladino clover	10 lbs. 1 to 2 lbs.	¼ lb. 2 oz.	5.5 to 7.5	Silt check dams are needed when channel slopes exceed 5 percent or when channels begin downcutting (gully) on the bottom. Do not use silt fencing or hay bales as silt check dams in channels with slopes greater than 3 percent; use rock, brush, or commercial silt dikes instead.
Tall fescue + ladino or white clover	100 to 150 lbs. 1 to 2 lbs.	3 lb. 2 oz.	5.5 to 7.5	
Tall fescue + perennial ryegrass + Kentucky bluegrass	100 to 150 lbs. 15 to 20 lbs. 15 to 20 lbs.	3 lb. ½ lb. ½ lb.	5.5 to 7.5	

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Fertilize poor soils with 400 – 800 pounds per acre of 10-10-10 fertilizer. Apply lime at 1 to 2 tons per acre if needed. Disk or harrow fertilizer and lime 2 to 4 inches into soil. Follow the contour (level path) with tractors and other equipment on all slopes if possible.

Check seed bag tags to make sure correct seed is used. Mix seed thoroughly prior to loading seeders. Use the tables on the preceding pages to calculate seed application rates, mixture portions, and soil pH requirements, or use seed mixes approved for your site. Apply seed by hand, seeder, drill, or hydroseed. Drilled seed should be 0.5 inch deep. Mulch right away if possible.

Apply more seed to channels, ditches, lawn, and landscaped areas. Apply less seed to areas that are flat or that will not be mowed very often. Water seeded areas during dry conditions to ensure seed germination and early growth. Re-seed areas that do not show growth within 14 days after rain or watering.

Protect bare areas during the cold season by sowing winter rye, winter wheat, or mulching. Sow permanent seed when weather permits.

Do not mow newly seeded bluegrass or red fescue until it is at least 4 inches high. Crownvetch should never be mowed.

Seed mixes for wildflower and native plant plots are also available. They are more expensive, but are very hardy, require little mowing or watering, and add beauty to landscaped and other areas. Most mixes require mowing only once per year, to control tree and brush growth.



Excellent soil preparation prior to seeding. Seeded development sites erode less, are cleaner, and are easier to market than muddy sites.



Erosion and sediment loss is virtually eliminated on seeded areas (left side). Rills and small gullies form quickly on unseeded slopes (right).



Good mix of sod, seed, and mulch at site of new community center. Note that inlet should be protected by installing a rock or sandbag berm to pond water before it flows into the inlet.



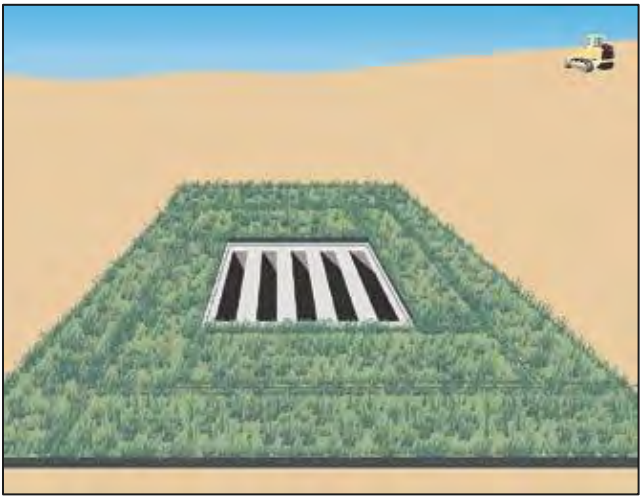
Poor seed establishment on slope. Use erosion control blankets or turf reinforcement mats when slopes are steep (greater than 4:1) and soil quality is poor. Terracing or benching steep slopes also helps.

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Sod reduces the potential for erosion to near zero. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer, and lime if needed .

Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row. Notch into existing grass.

Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.



Sod provides immediate protection around storm drain inlets, on slopes, and other areas.

Mulch types and application

Mulch by itself or applied over seed provides excellent erosion protection (see table). To apply, bring site to final grade and clear rocks, wood, trash, and other debris. Apply seed first. Straw or hay should be hand scattered or blown at a rate of 1 ½ to 2 ½ tons per acre (see table). Wood chips, bark, and sawdust should be applied to 5 to 8 tons per acre. Emulsified asphalt or other tackifier should be used on slopes greater than 3:1. In general, apply mulch so that at least 80-90 percent of the ground is covered.

Mulch product	Application rate	Benefits	Limitations
Straw or hay	1½ to 2½ tons per acre	Readily available and inexpensive; very effective in controlling erosion; can be applied on large sites via blower	May carry unwanted seeds; may need tackifier or anchoring, especially on steep slopes; crimp mulch in with dozer or straight-set disk harrow to prevent blow-off
Wood chips, bark, sawdust	5 to 8 tons per acre	Very low cost in some locations; can use chips produced from removed vegetation; chips effective on slopes up to 35 percent	High nitrogen demand when decomposing; may float away or blow away during rain storms
Rock	200 to 500 tons or more per acre	May be inexpensive and readily available in some localities; may be suitable for smaller sites	Inhibits plant growth; adds no nutrients to the soil; can be costly to apply on slopes and large sites; adds “hardened” look to slopes
Hydraulic mulches and soil binders	1½ to 2 tons per acre	Easily and rapidly applied with sprayer equipment; can include seed, fertilizer, and soil binders; many new products available	May be too expensive for small or very remote sites; must dry for at least 24 hours before rainfall.
Compost	2 to 3 tons per acre	Adds nutrients to the soil; readily available and inexpensive in some locations	Limited erosion control effectiveness; not suitable for steep slopes; may be expensive in some areas

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Installing sod immediately after grading work is complete can reduce erosion and sediment loss to near zero.



Excellent application of hand-scattered straw mulch in new residential subdivision. Work sites must be seeded and mulched as soon as final grade is established. Crimp mulch into soil with dozer tracking or disk harrows set straight to prevent straw from blowing.



Very good treatment of roadside areas with blown straw after seeding. In areas near lakes, streams, and rivers, straw in roadway must be cleaned up after application.



Excellent soil coverage at stream bank stabilization project using hand scattered straw, jute matting, and erosion blanket.



Good slope protection with permanent rock cover. This slope could have been protected with erosion control blankets or mats and seeded for a "softer" look and to promote infiltration.

Erosion control blankets

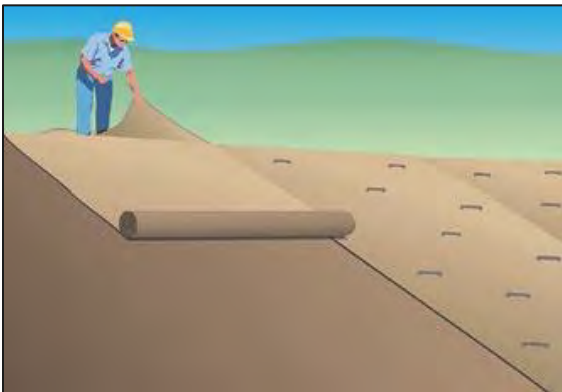
Erosion control blankets are used to protect steep slopes (up to 3:1; check product information sheets), drainage ditches with less than 20:1 slopes, and other areas where erosion potential is high. Most are designed to provide temporary stabilization until vegetation is established. Blankets degrade within 6 to 24 months, depending on their makeup. They usually consist of a layer of straw, coconut fiber, wood fiber, or jute sandwiched between layers of plastic or fiber mesh.

22 Protecting Soils

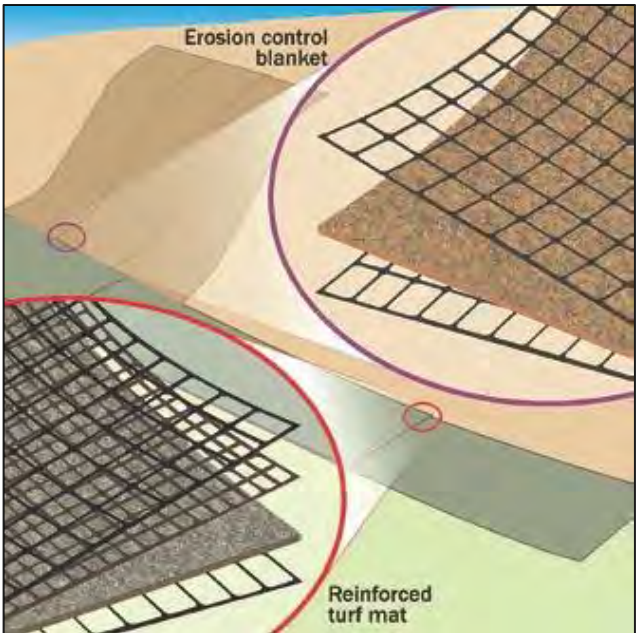
Site conditions	Blanket installation notes
Ditches and channels (from high flow line to ditch bottom—see Section 8)	<ul style="list-style-type: none">• Grade, disk, and prepare seedbed.• Seed, lime, and fertilize the area first.• Install horizontally (across slope).• Start at ditch bottom.• Staple down blanket center line first.• Staple & bury top in 8" deep trench.• Top staples should be 12" apart.• Uphill layers overlap bottom layers.• Side overlap should be 6"–8".• Side & middle staples = 24" apart.• Staple below the flow level every 12".• Staple thru both blankets at overlaps.
Long slopes, including areas above ditch flow levels	<ul style="list-style-type: none">• Grade, disk, and prepare seedbed.• Seed, lime, and fertilize first.• Install vertically (up & down hill).• Unroll from top of hill if possible.• Staple down center line of blanket first.• Staple & bury top in 8" deep trench.• Top staples should be 12" apart.• Side & middle staples = 24" apart.• Uphill layers overlap downhill layers.• Overlaps should be 6"–8".• Staple thru both blankets at overlap.

For short slopes (8 feet or less) above channels, install blankets across the slope (horizontal). Install up and down the hill (vertical) for long slopes.

Walk blankets down to ensure good contact with soil. Use plenty of staples to keep blankets flat. Overlap blankets at 6 to 8 inches on sides, tops, and bottoms. Do not stretch blankets, and do not exceed manufacturer's directions on maximum slope angle for the product.



Install blankets and mats vertically on long slopes. Unroll from top of hill, staple as you unroll it. Do not stretch blankets.



Erosion control blankets are thinner and usually degrade quicker than turf reinforcement mats. Check manufacturer's product information for degradation rate (life span), slope limitations, and installation.

Turf reinforcement mats

Turf reinforcement mats are similar to erosion control blankets, but are thicker and sturdier because they have more layers and sturdier fill material. Mats provide greater protection than blankets because of their heavier construction, and last longer in the field.

Mats are used for steep slopes (3:1 or steeper) and ditches or channels with 15:1 to 10:1 slopes. Mats are installed just like blankets (see previous table). Additional staking or stapling is needed for applications in channels that carry flowing water, and on steep slopes.

Other engineered products are available that are similar to blankets and mats. For example, bonded fiber matrices and other hydraulically applied products contain a mix of soil binders, mulch fibers, and even seed and fertilizer that can provide a stable crust that cements soil particles and prevents erosion. Apply seed prior to hydraulic mats or mulches, if seed is not included in the mix. Consult the manufacturer's installation instructions for product applicability and installation instructions.

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Very good installation of erosion control blanket in seeded ditch below well-mulched slope on highway project.



Blankets installed along stream banks or other short slopes can be laid horizontally. Install blankets vertically on longer wells. Ensure 6 inch minimum overlap.



Excellent slope and bank protection for stream stabilization project. Note that stream bottom is not lined, to preserve rock and gravel habitat.

Good application of erosion control blanket to stabilize shoulder and protect storm drain, but too few staples used along the top edge. Trench in top edge of blanket on steep slopes.



SECTION 5

Sediment Barriers and Sheet Flow Protection

The use of silt fences and other sediment barriers involves simple observation and common sense. The following summary provides details on how to install sediment barriers.

Sediment barrier placement

Sediment barriers such as silt fences or rock filters are required below (downhill from) areas of bare soil. Hay or straw bales must not be used as sediment filters due to their inherent weakness and tendency to fall apart. There are several factors to consider in placing silt fences, rock sediment filters, or other commercial sediment barriers:

- Place filters on downhill edge of bare soil areas.
- Make sure the filter catches all the muddy runoff.
- The goal is to pond runoff, to filter and settle it out.
- Spacing on long slopes is every 60 to 110 feet.
- Put filters across slopes, on the contour (level).

Silt fence installation

Each 100-foot section of silt fence can filter runoff from about ¼-acre (about 110 feet uphill) depending on slope. Keep in mind that placing multiple silt fences along a slope in parallel series does not extend the size of the drainage area. Instead swales, dikes, or berms should be used to keep runoff away from disturbed areas and steep slopes. These diversion practices may receive stormwater runoff from areas up to 10 acres.

Maximum drainage area (in acres) to 100 linear feet of silt fence	Range of slope for a particular drainage area (in percent)
0.5	< 2%
0.25	> 2% but < 20%
0.125	> 20% but < 50%

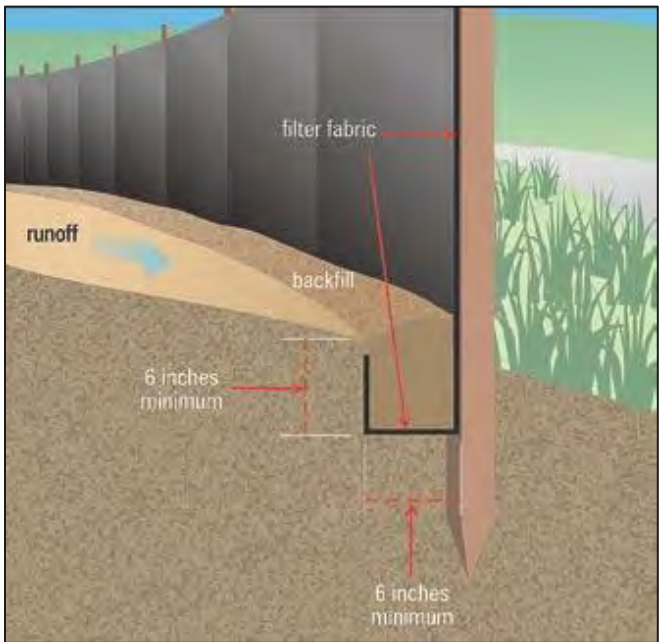
26 Sediment Barriers

To install a silt fence correctly, follow these steps:

- Note the location & extent of the bare soil area.
- Mark silt fence location just below bare soil area.
- Make sure fence will catch all flows from area.
- Dig trench 6 inches deep across slope.
- Unroll silt fence along trench.
- Join fencing by rolling the end stakes together.
- Make sure stakes are on downhill side of fence
- Drive stakes in against downhill side of trench.
- Drive stakes until 8 to 10 inches of fabric is in trench.
- Push fabric into trench; spread along bottom.
- Fill trench with soil and tamp down.

Silt fencing should not be installed:

- Up and down hills.
- Above (uphill from) areas of bare soil.
- In ditches, channels, or streams.



Remember: stakes go on the downhill side. Dig trench first, install fence in downhill side of trench, tuck fabric into trench, then backfill on the uphill side (the side toward the bare soil area).



For silt fences treating high flows from steep slopes, reinforce the silt fence with woven wire and metal fence posts. Install wire fencing between the posts and the silt fence filter fabric, so pressure on the fabric from uphill flows is distributed across the wire fencing, then to the posts.

If muddy runoff flows along the uphill side of a silt fence, install “J-hooks” every 40 to 80 feet. These are curved sections of silt fence that act as small dams to stop, pond up, and filter or settle out flows. When installing, turn ends of silt fence toward the uphill side to prevent bypassing.

Silt fence slicing devices

New tractor-mounted equipment that “slices” silt fence into the ground can provide a better installation than the open trench method. The equipment uses a chisel-point or vibratory plow to create a narrow slit in the ground. Rolled silt fencing is pushed into the slit, creating a very tight seal that prevents water from blowing out the bottom of the fence. Posts are driven and attached to the fence after the fencing is installed.

Besides better performance, the slicing method is also faster. For slicing and all other applications, posts are spaced 6 feet apart or less.

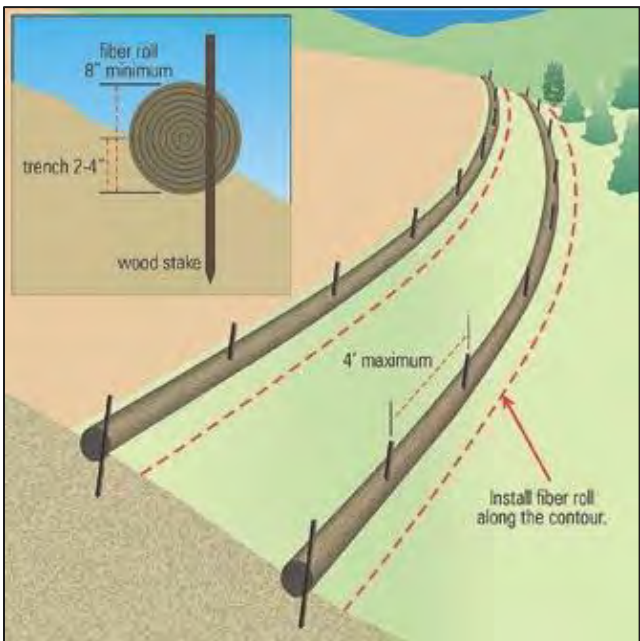
Other sediment barriers

Brush cleared from the site can make an excellent sediment filter if it is properly placed and built up well. Brush barriers are installed on the contour and are 2 to 5 feet high and 4 to 10 feet wide at the base. Trench in and walk them down slightly with a loader or dozer to compress the material in the brush barrier. Stuff

28 Sediment Barriers

additional brush on the uphill side where bypasses or undercutting are evident.

Fiber rolls and other commercial products made from coconut fiber, plastic, wood shavings, or other material can also be used as sediment barriers on slopes. Install on the contour and trench in slightly. Press rolls firmly into trench and stake down securely. Consult manufacturer's instructions for expected lifespan of product, slope limits, etc. As always, seed and mulch long slopes as soon as possible. Inspect to make sure runoff does not bypass brush barrier, coconut rolls, or other barriers underneath or around the ends.



Maintenance of sediment barriers

Sediment collecting behind silt fences must be removed when it is one-half the height of the fence. Move collected sediment to a vegetated area or other place where it will not wash into ditches, channels, or streams. Re-trench and tamp down fencing that is undercut by gullies.

Stop uphill gully formation by grading, seeding, and mulching, or filling with rock, soil, brush, or other material. Use erosion control blankets or turf reinforcement mats to control large areas of uphill erosion. Replace broken or bent-over stakes. Inspect places where fences are joined to make sure joint is solid. Install J-hooks where water flows along silt fence if necessary. Remove all silt fences and grade and seed the area when grass is established, before the project is completed.



Very good use of continuous "super" (reinforced) silt fence and shot rock sediment barrier (far side) to filter muddy runoff from commercial development site. Note that wire fencing is installed between the filter fabric and the posts.



Proper staking of a compost roll in use as a sediment barrier on a construction site

30 Sediment Barriers



Poor installation where silt fences are joined. Roll end stakes together before driving in to create an unbroken sediment barrier or lap curved sections to prevent bypasses. Leaving grass strip between silt fence and bare soil area is a good idea.



Poor installation of silt fencing, fair to good seeding. Silt fence must be trenched in along bottom. Straw bales are not approved as sediment barriers.



Sediment barrier installed backwards. Silt fence fabric should face bar soil area. Stakes go on downhill side. Straw bales can be used to back up fence on downhill side, but not alone.



Excellent example of J-hook installation to intercept muddy runoff flowing along silt fence. Good temporary seeding and mulching (right side). Sediment must be removed before it reaches halfway to top of fence.



Good application of silt fence to protect drop inlet (see Section 7). Make sure fencing is trenched in and soil around fabric is compacted.



Good installation of silt fence at toe of slope. Do not pile soil or other material on silt fences. If space is available, move fence back from toe of slopes to allow room for sediment accumulation and maintenance. Leaving a strip of vegetation between bare soil and fence also improves performance.

SECTION 6

Protecting Slopes to Prevent Gullies

Slopes—especially long ones—must be protected to prevent sheet, rill, and gully erosion. Slopes are stabilized immediately after grading work is completed. Seeding and mulching provide the best and cheapest protection. Erosion control blankets or turf reinforcement mats are needed on most slopes greater than 3:1 (see Section 4).

Approximate slope conversions

Percent	Slope ratio	Degrees
100%	1:1	45°
50%	2:1	27°
33%	3:1	18°
25%	4:1	14°
10%	10:1	6°

Assessing slopes and soils

Steeper slopes (3:1 or steeper) require more protection than flatter slopes. Slopes with highly erodible soils (silty soils) need more protection than those with less erodible soils (sands and gravels). Also, long slopes (greater than 50 feet) are at greater risk for erosion than short slopes.



Tread-track slopes up and down hill to improve stability.

Slope protection basics

Protecting slopes from erosion requires several actions that must be taken together. No single approach will be successful, especially if the slope is long, steep, or has highly erodible soils (see table). Use one or more of the following actions to reduce erosion on slopes:

Divert upland runoff

See Section 3 for information on how to install a berm or channel above the slope to divert upland rain runoff around the bare soil area.

Control slope runoff

If slopes are broken up into benches or steps, runoff can be collected and diverted along berms or in channels to pipe or open channel slope drains with stable outlets.

Till seedbed or condition the soil

Dozer tracks up and down slopes help hold soil in place and lengthen the runoff flow path down the slope. See the table for information on how the condition of the soil surface (compacted, tracked, etc.) can increase or decrease erosion.

Seed and mulch

The best and cheapest protection by far. See Section 4 for details on seed types, application rates, and mulch, blanket, and mat products.

Silt fence or other barrier

These should be installed at the toe of the slope or slightly away from the toe, and every 75 to 125 feet apart on long slopes. Fiber rolls installed on the contour work very well in breaking up flows on long slopes.

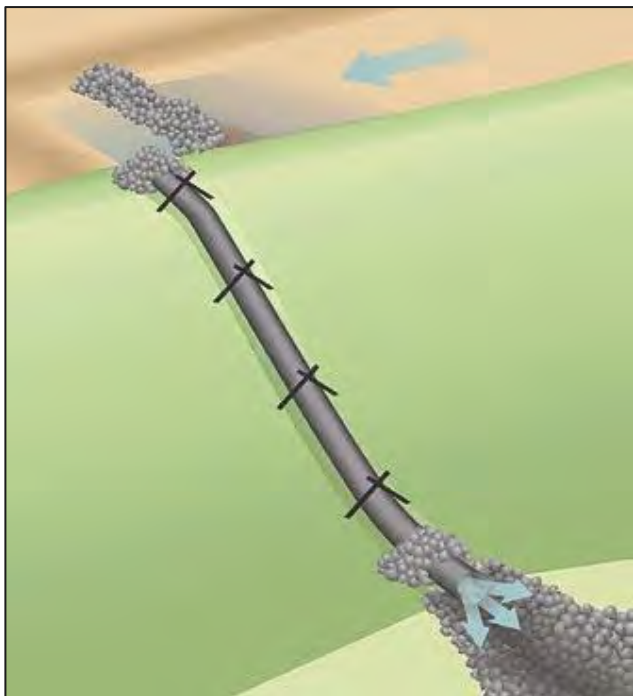
Retaining wall

Extremely steep slopes can be leveled out and shortened into two or more steps or benches by installing retaining walls of rock, brick, block, wood, logs, or other material. If rock layers are present along the slope, use these to establish firm benches in a stair-step pattern.

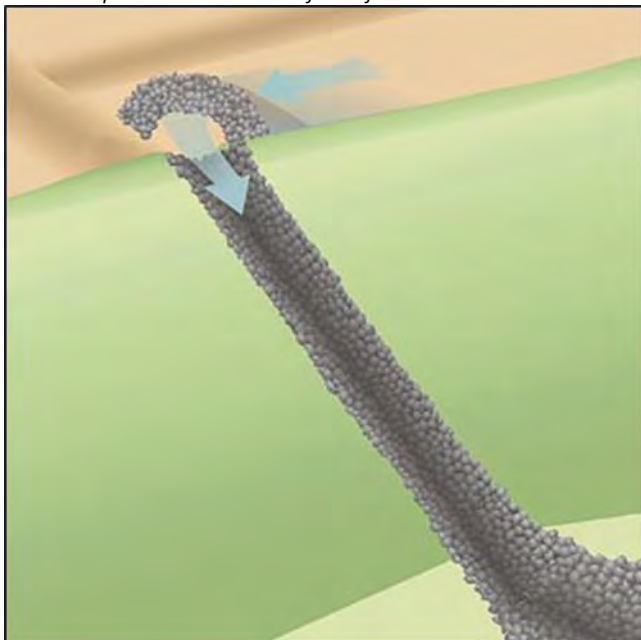
Blankets, mats, or armoring

Slopes exceeding 3:1 with highly erodible soils must be protected with erosion control blankets, turf reinforcement mats, or other products such as hydraulic soil binders or bonded fiber matrices. Rock mulch and lined down drain channels might be needed on steep slopes to control gullyng.

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Temporary downdrain using plastic pipe. Stake down securely, and install where heavy flows need to be transported down highly erodible slopes. Note check dam in front of inlet.



Temporary or permanent downdrain using geotextile underliner and riprap. All slope drains must have flow dissipaters at the outlet to absorb high energy discharges, and check dams at the inlet until grass is established.



Steep, long slopes need blankets or mats. Install blankets and mats up and down long slopes. For channels below slopes, install horizontally. Don't forget to apply seed, lime, and fertilizer (if used) before installing blanket.

Soil conditions vs. erosion

If soil is:	Erosion will be:
Compacted and smooth	30 percent more
Tracks across slopes	20 percent more
Tracks up & down slopes	10 percent less
Rough and irregular	10 percent less
Rough & loose to 12" deep	20 percent less

Chemical soil stabilizers and hydraulic mulch

Anionic polyacrylamide (PAM) and other chemical soil binders and stabilizers have been proven effective in controlling erosion on slopes. Do not use these products within 25 feet of natural waterways. Follow manufacturer recommendations regarding mixing and application. Keep equipment off treated areas.

Note that this protection is only temporary—repeat applications or seeding and mulching or other action is still needed for permanent slope protection. Bonded fiber matrices and other hydraulic mulch products applied after seeding or with seed in the mix can provide permanent protection if mixed and applied properly. Apply 1 to 2 tons per acre; follow manufacturer's directions.

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Excellent soil conditioning (dozer tracking) prior to seeding and straw-blowing. Seed and mulch provide cheap, excellent protection. Use blankets on slopes if they are steep or soils are poor.

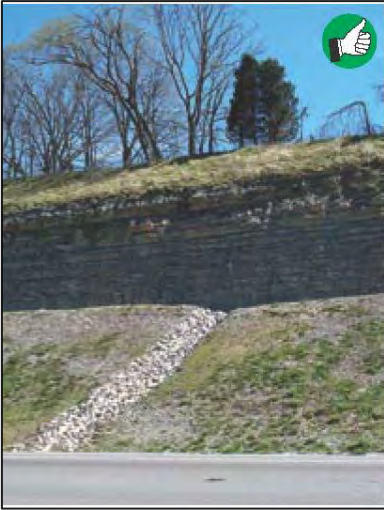


Excellent slope protection with seeding and erosion control blanket. Blankets or mats are required on most projects if slopes are 3:1 or steeper.



Excellent use of temporary plastic covering during bridge construction to reduce slope erosion. Filter sediment from pump discharges or discharge to protected infiltration area away from waterways.

Protecting Slopes 37



Very good application of rock lined down drain channel to carry water down slope face. Use filter fabric under rock. Install multiple drains at appropriate spacing where flows are heavy. Install flow dissipaters at outlet to absorb energy of the discharge.



Very good use of 20-inch plastic slope drain pipes to convey water from roadway to lower channel. Note staking and rock anchoring at bottom of temporary slope drain pipes.



Good use of rock-filled, stacked gabion baskets to protect steep slope. Soil and bark mulch can be used in or over gabions and planted with live willow or hardwood cuttings to reduce "hardened" look

38 Protecting Slopes



Good use of engineered retaining wall to break up slope. Development site and customer preferences will dictate type of materials used.



Poor slope protection. Seed has washed away—blankets or mats should have been used. Channel lining is poor. Check dam has washed out; more checks are needed.



Very poor slope protection. Gully formation is obvious. For best results, prepare soil and apply seed with mulch or blanket immediately after reaching final grade.

SECTION 7

Protecting Culvert and Ditch Inlets and Outlets

Culverts and ditches are designed to carry moderate and large flows of stormwater. They can transport a lot of sediment to streams, rivers, wetlands, and lakes if they are not properly protected. In addition, culvert and ditch outlets can become severely eroded if high velocity flows are not controlled.

Culvert and storm drain ponding methods

Muddy runoff that flows toward a culvert, ditch, or storm drain inlet must be slowed down and pooled or filtered to settle out and remove sediment. This can be accomplished by placing rock, reinforced silt fencing, silt dikes, or other barrier in front of the inlet. The goal is to cause ponding of the inflow so sediment can settle out, and allow ponded water to enter the inlet only after sediment has been removed.

Straw bales alone are not approved for inlet protection. The next section describes several inlet protection devices. If the drainage area above the inlet is greater than three acres, a sediment trap or basin is needed (see Section 9). For all inlet protection approaches, seeding and/or mulching upland areas promptly will greatly reduce incoming runoff volumes and sediment loads.

Inlet protection devices

Inlets can be protected with structures made of rock, reinforced silt fence, stone-filled bags, or commercial “inlet dam” products. Accumulated sediment must be removed after each rain to ensure effectiveness. Place materials to form a small dam around the inlet. Build larger dams farther away from inlets with heavy incoming flows. When using rock, mix rock of various sizes so flows can seep through the dam slowly (see photos on following pages). If spaces between rocks are too large, runoff will move through the dam without adequate settling time.

Silt fence dams can be used in low flow areas. Install a wire-reinforced silt fence dam or box around the

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inlet (see Section 5). Use diagonal bracing on sides and/or top to protect against incoming flow pressures. Make sure fence is trenched in and securely fastened to posts. Repair bypasses and undercuts promptly.

Place removed sediment in areas where it will not wash into inlets, ditches, channels, or streams. Do not wash sediment or any other material down curb, channel, or drain inlets.



Good design and installation of inlet protection ponding dam using concrete blocks and rock. Outlet pipe in background has a rock apron to dissipate flows.



Good application of silt fence frame to protect inlet. Use wire fence backing to reinforce frame, or diagonal bracing across top of stakes. Make sure fence is trenched in to prevent bypasses or undercutting. Inspect and remove sediment as necessary after each rain.



Very good application of mixed rock for culvert inlet ponding dam. Mixing rock promotes better ponding, drainage, and settling of sediment



Poor protection for drop inlet on concrete pad. Straw bales make good mulch but are not suited for inlet protection or silt check dams.



Poor placement of stone bag inlet dam; poor education of construction site drivers. Bags work well if used properly and maintained. Bags must form a dam around the inlet with no large gaps.

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Poor placement and poor maintenance of stone bag inlet ponding dam. Accumulated sediment must be removed and dam should be repaired after each 0.5-inch rain.



Straw bales have rotted and failed, with muddy runoff undercutting bales. Concrete apron and drop inlet grate are nearly covered in sediment. Use straw for mulch only.

Outlet protection methods

Outlets for storm drains, culverts, and paved channels that discharge into natural or constructed channels must be lined with rock or other armoring to prevent downstream bank and channel erosion when flow velocities are high.

The rock-lined “apron” at the outlet must be straight (lined up with the discharging pipe or channel) and laid in flat. Bring the sides up around outlet to prevent erosion, and up the banks to prevent scouring. The apron is shaped like a long triangle, with the narrow end located at the outlet and sized about 3 times the diameter of the outlet pipe. The width of the downstream end of the apron will be wider, tied into

the channel, and vary according to the shape of the channel it empties into.

The table below provides general information for sizing rock and outlet aprons for various sized pipes. Outlets that discharge high flows must follow the maximum suggested sizing criteria.

Sizing for flow dissipaters at culvert outlet

Culvert size	Avg. rock diameter	Apron width*	Apron length**	Apron length***
8"	3"	2–3 ft.	3–5 ft.	5–7 ft.
12"	5"	3–4 ft.	4–6 ft.	8–12 ft.
18"	8"	4–6 ft.	6–8 ft.	12–18 ft.
24"	10"	6–8 ft.	8–12 ft.	18–22 ft.
30"	12"	8–10 ft.	12–14 ft.	22–28 ft.
36"	14"	10–12 ft.	14–16 ft.	28–32 ft.
42"	16"	12–14 ft.	16–18 ft.	32–38 ft.
48"	20"	14–16 ft.	18–25 ft.	38–44 ft.

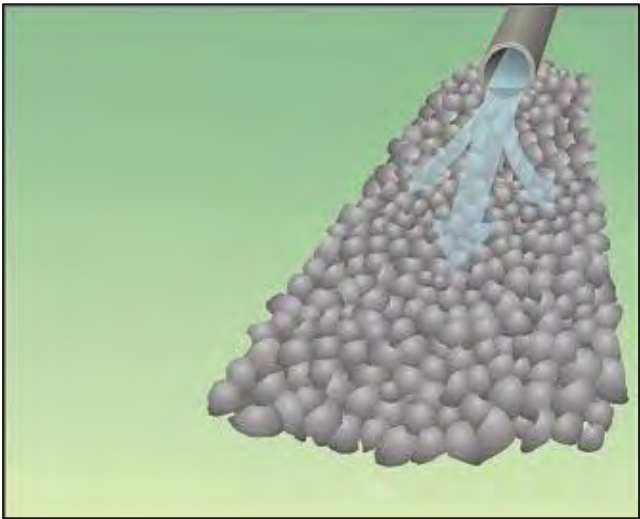
* Apron width at the narrow end (pipe or channel outlet).

** Apron length for slow-flow (no pressure head) culverts.

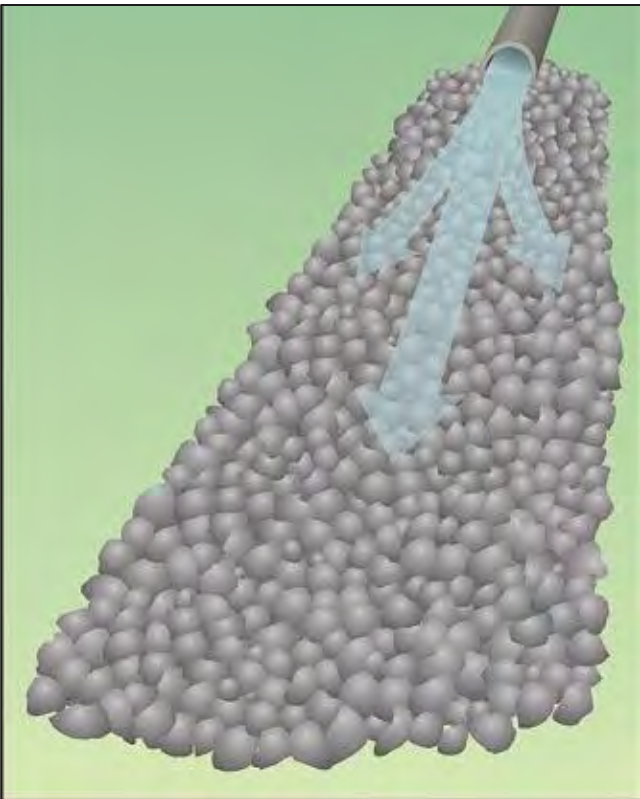
*** Apron length for high flow (pressure head) culverts.

If the culvert outlet and receiving channel do not line up straight, the channel bank receiving the brunt of the outlet flow must be lined or it will erode quickly. If rock will be used, double the average diameter when sizing the rock needed. Gabion baskets—galvanized wire mesh boxes filled with rock—are often used in this situation, and can be stacked to form a wall if necessary. Mulch and soil can be mixed with the rock in the baskets to promote growth of stabilizing vegetation if desired.

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Low-flow energy dissipaters (above) are shorter than those for high-flow outlets (below).





Good placement and construction of rock apron at high-flow culvert outlet. If flow from culvert enters a channel, make sure channel is lined with grass, and blankets or mats, if necessary, to prevent erosion.



Excellent placement and construction of rock apron to dissipate flows from culvert outlet. Area needs seeding and mulching.



Good silt fence installation, fair seeding and mulching on slopes. Poor placement and construction of flow dissipater apron at culvert outlet.

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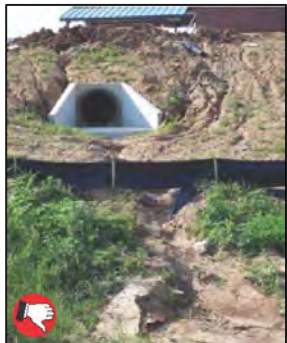
Poor rock apron placement and construction at culvert outlet; poor seeding and slope protection (right side).

Poor slope protection, no rock apron or flow dissipater at culvert outlet. Silt fence must not be used across ditches or channels; do not put sediment traps at culvert outlets.



Poor seed and mulch application, slopes badly eroding. No rock apron or flow dissipater at culvert outlet. Culverts clogged with sediment and rock.

Very poor outlet protection. No slope protection or seeding, no rock apron or flow dissipater at culvert outlet. Misapplication of silt fence across ditch. Flow bypass.



SECTION 8

Stabilizing Drainage Ditches

Man-made drainage ditches with gently sloping bottoms (less than 3%) can be stabilized with thick grass seeding and erosion control blankets (see Section 4). Natural (i.e., not “man-made”) drainage channels and creeks or streams cannot be cleared, re-routed, or otherwise altered without one or more permits from the U.S. Army Corps of Engineers and the Ohio EPA (see Section 10). Moderately sloping ditches (3%–6% slopes) will likely require turf reinforcement mats and perhaps some riprap if soils are silty. Steeply sloping ditches (greater than 10%) need heavier armoring with concrete, riprap, gabion baskets, geogrid, retaining walls, or other approved products.

Drainage ditch slopes and soils

As noted in Section 6, silty soils are the most erodible and clay is the least erodible. Steeper ditches and those with highly erodible soils need more protection. Drainage ditch bank slopes must not exceed 2:1. If tractor mowers or other equipment will cross channels in the future, bank slopes must be 3:1 or flatter. The outlet must be installed, seeded, stabilized, and protected before the ditch receives incoming flows.

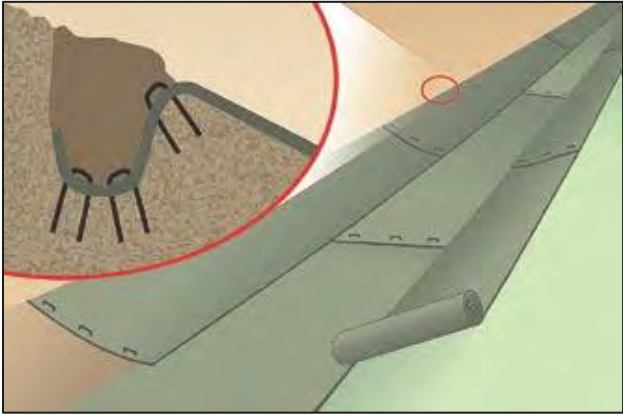
Stabilization approaches for drainage ditches

Ditch Slope	Soil Type in Ditch		
	Sandy	Silty	Clays
Steep >10%	Concrete or riprap	Concrete or riprap	Riprap
Moderate 10%	Riprap with filter fabric	Riprap or turf mats & seeding	Riprap or turf mats & seeding
Slight 5%	Riprap or turf mats & seeding	Seeding & turf mats	Seeding & turf mats
Mostly Flat <3%	Seeding & blankets	Seeding & mulching	Seeding & mulching

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Erosion control blanket and turf mat linings

All ditches steeper than 10% require rock, concrete, or other armored liners and/or grade control structures. Ditches of 10% or less can be stabilized with turf reinforcement mats or erosion control blankets if they are seeded quickly. See Section 4 for installation and other information on turf reinforcement mats, erosion control blankets, and seeding/mulching applications.

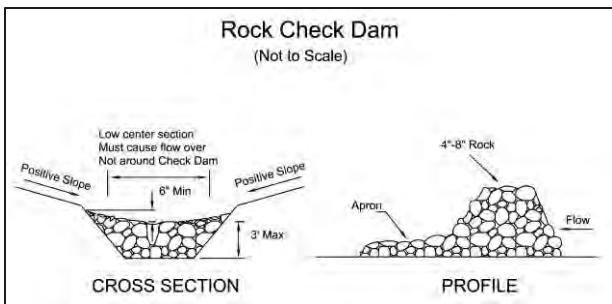


Lay in ditch blankets similar to roof shingles; start at the lowest part of the ditch, then work your way up. Uphill pieces lap over downhill sections. Staple through both layers around edges. Trench, tuck, and tamp down ends at the top of the slope. Do

Check dams of rock, brush, or other products

Drainage ditches need temporary check dams to capture sediment and reduce ditch bottom downcutting. Silt dikes or dams can be made of rock, stone-filled bags, fiber rolls, or brush. They are only effective when the drainage area is 10 acres or less.

Silt fencing and straw bales are not approved for use as check dams, and must not be used in drainage ditches that carry flowing water. Also, do not place check dams in creeks or streams. Sediment must be intercepted before it reaches streams, lakes, rivers, or wetlands.



Stabilizing Drainage Ditches 49

Seed ditches and install check dams before excavating, filling, or grading uphill areas. Inspect, repair, and clean out sediment from upstream side of check dams after each rainfall exceeding 0.5 inch. Remove temporary check dams after the site is stabilized and vegetation is established, placing filter fabric under the ditch check during installation.

Check dams are spaced according to the slope of the ditch bottom (see table). Extend the ends of the check dam to the top of the bank to prevent bypassing and sidecutting. Keep the middle part lower and relatively flat so overflows aren't too concentrated and bypasses are prevented.

Spacing for check dams

Ditch slope	Check dam spacing	Additional information
30%	10 ft.	Calculated for 3' high check dams.
20%	15 ft.	
15%	20 ft.	Center of dam should be 6" lower than sides.
10%	35 ft.	
5%	55 ft.	Use 5"–10" rock, stone bags, or commercial products.
3%	100 ft.	
2%	150 ft.	
1%	300 ft.	
0.5%	600 ft.	



Silt check dams of rock, stone-filled bags, or commercial products must be installed before uphill excavation or fill activities begin. See table for correct silt check spacing for various channel slopes.

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Lining steep ditches

Riprap is used to line sides and bottoms of steep ditches. Rock used in liners is mixed so the spaces between large rocks are filled with smaller rock. See table for rock sizing.

Rock sizing for ditch liners

Flow velocity	Average rock diameter
6 ft. per second	5 inches
8 ft. per second	10 inches
10 ft. per second	14 inches
12 ft. per second	20 inches

As ditch depth and steepness increase, rock size must also increase. Line the bare ditch bottom and sides with non-woven filter fabric to prevent undercutting and washouts. If flows are 10 feet per second or more, use #2 rock as a bottom liner, below the larger rock. Rock must be placed along ditch bottom first, then up the sides. Rock layer thickness should be 1½ times the average diameter of the largest fourth of the rocks.

Install a protected outlet first by excavating a 1½- to 2-foot trench at the toe of the slope and filling with riprap. See Section 7 for details on outlet apron construction. Replace dislodged rock after storms as needed.



Good construction of rip-rap lined ditches on road project. Good use of erosion blankets on slopes but seed coverage on slopes is fair to poor.



Good installation of temporary rock check dams. Remember to tie sides of check dam to upper banks. Middle section should be lower. Clean out sediment as it accumulates. Remove check dams after site and channel are stabilized with vegetation.



Good placement and spacing of fiber-roll check dams. Coconut fiber rolls and other commercial products can be used where ditch slopes do not exceed three percent.

52 Stabilizing Drainage Ditches



Poor application of commercial check dam product. Check dam needs to be longer (tied into banks). More are needed, at correct spacing for channel slope. Area needs to be re-seeded; ditch may need blanket liner.



Poor check dam installation. Straw bales are not approved as check dams for ditch or channel applications due to rotting, installation difficulties, and high failure potential.

SECTION 9

Installing Sediment Traps and Basins

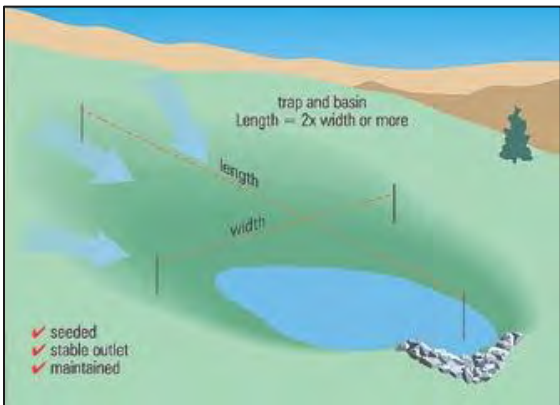
The purpose of a trap or basin is to provide an area where muddy runoff is allowed to pool, so sediment will settle out. Sediment traps and basins are installed in natural drainage areas before excavation or fill work begins. Do not depend on sediment traps and basins alone to control sediment loss from your construction site. Other uphill controls on bare areas, slopes, and in ditches and channels are needed to prevent overloading traps and basins.

Containment for the pooling area can be an excavated hole or a dike made of earth or stone. Straw bales and silt fencing are not approved for use as containment structures for concentrated runoff flows.

Locations for traps and basins

Low-lying sites on the downhill side of bare soil areas where flows converge are ideal places to install temporary sediment traps and basins. In general, sediment traps are designed to treat runoff from about 1 to 5 acres. Sediment basins are larger, and serve areas of about 5 to 10 acres. Basins draining areas larger than 10 acres require an engineered design, and often function as permanent stormwater treatment ponds after construction is complete.

Do not put sediment traps or basins in or next to flowing streams or other waterways. Make sure pooled water does not flood buildings, roadways, or other structures.



54 Installing Sediment Traps and Basins

Sediment traps

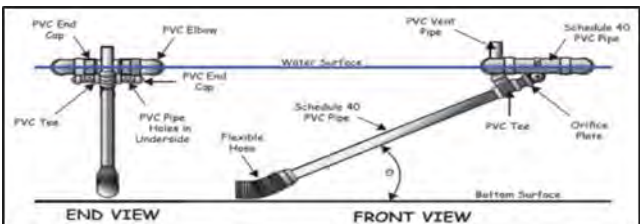
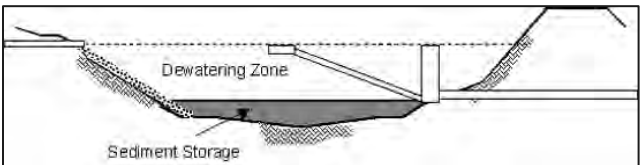
Any depression, swale, or low-lying place that receives muddy flows from exposed soil areas can serve as a sediment trap. Installing several small traps at strategic locations is often better than building one large basin. The simplest approach is to dig a hole or build a dike (berm) of earth or stone where concentrated flows are present. This will help to detain runoff so sediment can settle out. The outlet can be a rock-lined depression in the containment berm.

Sediment basins

Sediment basins are somewhat larger than traps, but the construction approach is the same (see below). Sediment basins usually have more spillway protection due to their larger flows. Most have risers and outlet pipes rather than rock spillways to handle the larger flows.

Sediment basins are often designed to serve later as stormwater treatment ponds. If this is the case, agreements are required for long-term sediment removal and general maintenance. Construction of a permanent, stable outlet is key to long-term performance.

Ohio EPA requires that you dewater sediment basins at the pond surface using a skimmer or similar device. The sediment settling pond consists of both a dewatering zone and a sediment storage zone. Ohio EPA requires that you dewater sediment basins at the pond surface using a skimmer or similar device. Several commercial skimmers are available or an alternative is to build a skimmer using PVC pipe. Illustrations of the dewatering zone and a skimmer are shown below.





Skimmers are dewatering devices that draw water from the water surface to remove the least turbid water from the sediment basin. The accumulated sediment must be removed from the sediment storage zone once it's full.

Sizing and design considerations

Basins and traps must be built with a total volume that allows for 1000 cubic feet of sediment storage volume per disturbed acre and 1800 cubic feet of dewatering volume per acre of drainage area going to the trap/basin. Traps and basins are designed so that flow paths through the trap or basin are as long as possible, to promote greater settling of soil particles. Sediment basin length must be twice the width or more if possible—the longer the flow path through the basin, the better.

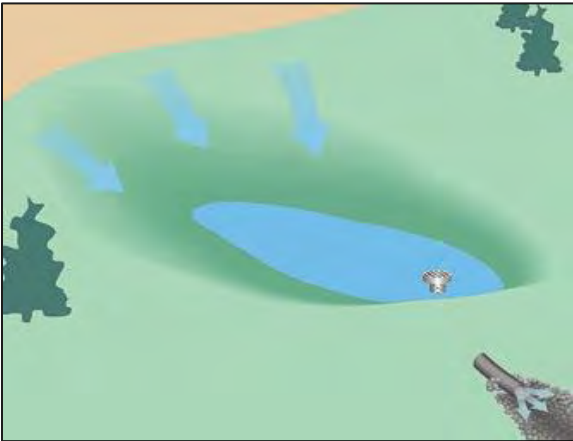
For basins and traps, the length to width ratio between the nearest inlet and the outlet must be 2:1 or greater. Berms should be made of well-compacted clayey soil, with a height of 5 feet or less. Place soil fill for the berm or dam in 6" layers and compact. The entire trap or basin, including the ponding area, berms, outlet, and discharge area, must be seeded and mulched immediately after construction (see Section 5).

An overflow outlet can be made by making a notch in the earthen berm and using a stone outlet per the Rainwater and Land Development Manual. The downhill outlet should be stabilized with rock or other flow dissipaters similar to a culvert outlet. Overflow should be at an elevation so dam will not overtop. Allow at least one foot of freeboard. Outlets must be designed to promote sheet flow of discharges onto vegetated areas if possible. If the discharge will enter a ditch or channel,

56 Installing Sediment Traps and Basins

make sure it is stabilized with vegetation or lined (see Section 8).

If used, outlet risers and discharge pipes must be 15 inches diameter or larger. Corrugated metal pipe works best for risers. Plastic or other pipe can also be used for temporary applications. Risers should be topped with trash racks and anti-vortex baffles, and have 0.5-inch holes every 3 to 6 inches apart. Large holes or slots, if used, should not appear in the lower two-thirds of the riser. Risers should be anchored to a concrete base, and should be bedded in a pile of 1-to 5-inch rock to a height of at least 2 to 3 feet to promote sediment filtration during draindown. Riser tops must be at least 2 feet below the top of the containment berm or dike. If risers or outlet pipes that do not comply with these design criteria are used for temporary applications, inflows must pass through a filter made of mixed rock piled around the pipe. Rock should be removed after upland area is well vegetated.



Ponds often have riser pipes that must be retrofitted to function as a sediment basin. Typical methods for accomplishing this may include: skimmers, floating pumps, siphons or other acceptable methods that provide dewatering between 48 hours and 7 days.

Inspection and maintenance

Inspect inlets, berms, spillway, and outlet area for erosion after each rain exceeding 0.5 inch. Repair gullied areas and any upslope areas contributing large volumes of sediment. Clean trash and plugged areas from the riser pipe. Repair and reseed bare areas. Ensure that downstream receiving area is stable. Remove sediment before it fills half the trap or basin volume.



Fair installation of two traps above small pond. Dikes are a little too small; placement is too close to pond. Area needs seed and mulch.



Fair sediment trap construction. Rock dike is undersized and lacks a defined overflow notch. Poor maintenance attention. Silt fence beyond rock dike is not needed—silt fence should not be used across flow channels.



Good sediment trap installation, but poor maintenance has caused trap to fill and bypass to occur. Remove sediment before trap is half full. Make sure containment dike has an overflow notch to control the discharge location.

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Fair to poor trap installation. Dike overflow notch is too deep; basin is too small. No seed or mulch covering bare soil areas.



Good trap location; needs cleaning out. Trap might be too small for area drained. Very good channel protection, seeding, and mulching.



Good trap location; needs cleaning out. Trap might be too small for area drained. Very good channel protection, seeding, and mulching.

SECTION 10

Protecting Stream Channels, Wetlands, and Lakes

Streams must not have sediment control devices or stabilization structures placed into them without one or more permits. The U.S. Army Corps of Engineers defines any waterway with a defined bed and bank to be a stream and regulated by the U.S. Clean Water Act, even if it only has water flowing in it during or immediately following rain.

Setback requirements

No clearing or other activities are allowed within 25-50 ft. of perennial or intermittent streams, rivers, sinkholes, wetlands, or other waters. Flag off vegetated buffer areas to keep equipment away. Check with the local planning and zoning office before working near waterways.

Recommended setbacks from waterways

Bank Slope	Soil Type Along Banks		
	Sandy	Silty	Clays
Very Steep (2:1 or more)	100 ft.	80 ft.	60 ft.
Steep (4:1 or more)	80 ft.	60 ft.	40 ft.
Moderate (6:1 or more)	60 ft.	40 ft.	30 ft.
Mostly Flat (less than 10:1)	40 ft.	30 ft.	20 ft.

Vegetated buffers

Preserve existing vegetation near waterways wherever possible. This vegetation is the last chance barrier to capture sediment runoff before it enters the lake, river, stream, or wetland. Where vegetation has been removed or where it is absent, plant native species of trees, shrubs, and grasses. Use live stakes or cuttings to save on planting costs.

60 Protecting Stream Channels, Wetlands, and Lakes



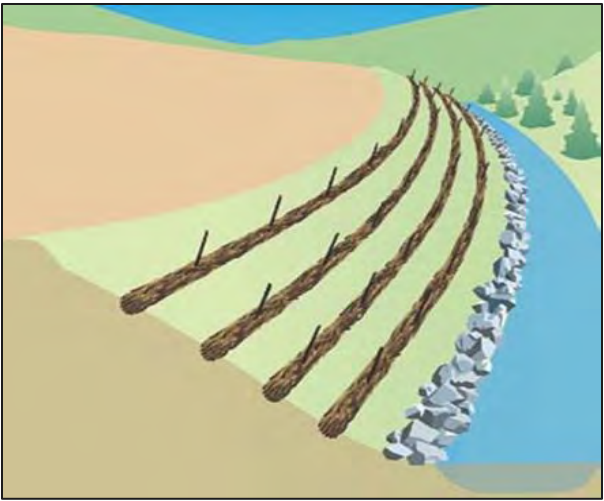
Trees shrubs and grasses should be replanted along disturbed stream banks.



Eroded banks can be stabilized by replanting native vegetation. Note that erosion control practices must be used and proper permits must be obtained



Live willow stakes, cut during dormant season and kept cool and moist until planting, can be used to stabilize bare stream banks.



Drive Live willow or hardwood stakes through live wattles or rolls, trenched into slope to provide excellent stream bank protection. Protect toe of slope with rock or additional rolls or wattles.

Ohio EPA regulations require that all disturbed areas within 50 feet of surface waters of the state be stabilized within 48 hours.

Stream bank stabilization

Stream banks are likely to erode if:

- Vegetation has been removed
- Bank slopes are steeper than 3:1
- Outside curves are not protected
- Runoff increases in the drainage area

Removal of vegetation should be avoided if at all possible. Bank slopes can be cut back and replanted if severe erosion is occurring. Outside channel curves might need protection with large rock, imbedded root wads, logs, gabions or other material if banks are collapsing. Note that work in and around a stream will likely require one or more permits. Environmental impacts are regulated by the U.S. Clean Water Act Sections 401 and 404. Increased runoff in the drainage area, caused by new roads, parking lots, roofs, etc. can be addressed by promoting infiltration at every available opportunity. Direct roof gutters, parking lot discharges, and other runoff onto grassy swales and

62 Protecting Stream Channels, Wetlands, and Lakes

vegetated or landscaped areas, rather than into ditches or creeks.

Unstable or bare stream banks can be stabilized with willow or hardwood cuttings harvested from vegetated areas near the site. Live stakes are 1- to 3-foot long cuttings from live hardwood trees or shrubs. Stakes are harvested during the dormant season (November–February) and driven into the stream bank, right-side up. They will develop roots and grow if sufficient moisture is available and they are not heavily damaged during installation. Willow, maple, poplar, cottonwood, dogwood, sycamore, oak and other hardwoods can be used. Plant half of the stake or cutting below the ground surface. Push into the ground where soils are soft; make a pilot hole with wooden or metal stake if soil is very hard. Make sure the bottom end—nearest to the roots—is put into the ground! Stakes or cuttings can be harvested and rooted in cool damp sand mixed with moist compost prior to planting if desired. Cover roots with at least 1 to 2 inches of soil when planting. Keep soil moist during dry season, until plants are well established.

Wattles are also effective in stabilizing stream banks. Wattles are bundles of live cuttings approximately 4 to 6 inches in diameter and 6 feet long. They are placed across the slope at 3- to 5-foot intervals, in long rows. Wattles are laid in shallow trenches, staked down, and covered with 2 to 3 inches of soil. Shoots and roots will sprout along the entire length of the wattle, creating a continuous erosion barrier and stabilizing the bank.

Stream crossings

Note that work in and around a stream will likely require one or more permits. Environmental impacts are regulated by the U.S. Clean Water Act Sections 401 and 404. Keep equipment away from and out of streams. If a temporary crossing is needed, put it where the least stream or bank damage will occur. Look for:

- Hard stream bottom areas
- Low or gently sloping banks
- Heavy, stable vegetation on both sides

Use one or more culverts (18 inches minimum) as needed, sized to carry the two-year 24-hour rain storm.

Protecting Stream Channels, Wetlands, and Lakes 63

Cover culverts with at least 12 inches of soil and at least 6 inches of mixed #2 and #57 rock. A 25' long, 6" thick pad of rock should extend down the haul road on each side of the crossing, similar to a construction entrance (see Section 2). Remove culverts and cover material when crossing is no longer needed. Grade, seed, or otherwise re-plant vegetation removed.



Good use of silt fence, straw, rock, and other practices for temporary stream crossing. Any work in stream channels—such as installation of culverts—requires a Section 404 permit from the U.S. Army Corps of Engineers and a Section 401 Water Quality Certification



Excellent soil coverage at stream bank stabilization project using hand scattered straw, jute matting, and erosion blanket.

SECTION 11

Construction Site Housekeeping

Housekeeping practices, including the management, storage, and disposal of materials, wastes, and wastewater are described in the site SWPPP.

Wash Water

Most wash waters are considered wastewater. And must be collected and properly disposed of or their discharge authorized by an NPDES permit. A few types of washwaters (e.g. wheel wash water and pavement washing where there are no spills and detergents are not used) may be authorized with special conditions under Ohio EPA's NPDES Construction General Permit (OHC00004). To minimize the discharge of pollutants, you must treat these wash waters in a sediment basin or implement alternative measures that provide equivalent or better treatment prior to discharge. This can be accomplished through several options:

- Locate washing where drainage is directed to sediment basin or collect wash water in a sediment trap
- Install a proprietary wash system
- Broom off instead of washing

Remember: Keeping vehicles on stone or pavement will decrease the need for washing. When washing vehicles, do not use surfactants.

Material storage and handling

To keep materials from leaching contaminants into the storm sewer system, you must minimize the exposure of all materials to rainwater and stormwater



Materials are stacked on pallets and fuel is stored with secondary containment. If fueling takes place on site, it must be in accordance with the approved SWPPP and a spill prevention plan must be in place.

runoff/runon. Building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site must be covered and stored using secondary containment.

Compounds such as fertilizers, lime, asphalt, and concrete may only be mixed in the areas designated in your site SWPPP and away from watercourses, drainages ditches, field drains, and stormwater drainage areas.

Concrete waste management

Concrete waste and truck/chute wash water must be contained within constructed, plastic-lined berms, bale structures, formed-up areas designated for future pours, or other contained areas



Concrete washout is properly contained



Concrete washout is not contained and debris litters the site.

Fueling and Maintenance

Vehicle fueling and maintenance may only take place off-site or in areas delineated on your approved site map. If fueling takes place on site, you must have spill prevention and countermeasures plan in place.

Non-hazardous Material Disposal

Non-hazardous materials must be disposed of in covered dumpsters. Make sure to take debris to the dumpsters regularly to avoid transport by wind and stormwater.



Improper storage of waste materials. Debris and contaminants can run off or blow off the site.

Spill and leak prevention and response

Make staff aware your site's spill response plan found in the SWPPP. Staff must know how to respond and who to call in case of a small release (less than 25 gallons) and in case of a large release (more than 25 gallons). All large releases must immediately be called in to Ohio EPA (1-800-282-9378), the local fire department (911), and the local emergency planning committee.

Wastewater Disposal

The following liquids may not be released on site and must be collected and disposed of properly:

- Wastewater from washout of concrete, unless managed by an appropriate control
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials
- Sanitary waste facilities
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance
- Soaps or solvents used in vehicle and equipment washing

SECTION 12

Maintaining and Closing Out Your Project

Erosion and sediment controls need to be inspected and maintained. Temporary controls must be removed and permanently stabilized when the project is completed. Failing to fill, grade, and seed temporary sediment traps or basins or failing to remove silt fences, check dams, and other controls can result in legal liabilities and Ohio EPA NPDES stormwater permit violations. See details of the stormwater Ohio EPA Construction General permit for more information on post-construction closeout requirements.

Inspecting stormwater flow structures

Erosion and sediment controls must be inspected weekly and after each rain exceeding 0.5 inch. Keep records of inspection observations and actions taken, and file inspection records with other erosion and sediment control plan paperwork.

Keep erosion and sediment controls in good working order until the project is completed. Brush and other debris should be removed from culvert and channel inlets. Rock or sediment accumulating behind silt fences or other sediment filters should be removed regularly. All structures that have become dislodged or damaged (such as silt fences, rock aprons, etc.) should be repaired as soon as possible. Keep rock entry/exit pads clean by raking/grubbing or adding new rock as needed when sediment begins to fill spaces between the rock. During inspection also make sure that all good housekeeping practices are in place as described in Section 11.

Vegetated cover considerations for close-out

No site is closed out properly until 70% vegetation is established on all bare soil areas and ditches are stable. Check seeded areas, and reseed areas where vegetation is thin or absent. This is especially important for slopes, ditches, and channels.

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Removing temporary sediment controls

When project is completed:

- Remove all silt fencing and stakes. Grade out and seed the area, remove accumulated sediment, broadcast over grassed areas, or dispose of off-site.
- Culvert inlets should be stabilized, vegetated, and show no visible gullies. Rock or soil that has been washed away by runoff or upstream flows should be replaced. Brush or other debris that could clog inlets should be removed.
- Check ditches and channels to make sure banks and ditch bottoms are well vegetated. Reseed bare areas and replace rock that has become dislodged.
- Check areas where erosion control blankets or mats were installed. Cut away and remove all loose, exposed material, especially in areas where walking or mowing will occur. Reseed all bare soil areas to achieve 70% cover.
- Replace rock washouts near culvert and channel outlets. Fill, grade, and seed or riprap eroded areas around inlets and outlets. Make sure downstream ditches and channels are fully vegetated. Fill and seed any gullies along the banks or other slopes.
- Fill in, grade, and seed all temporary sediment traps and basins that have been removed. Double the seeding rate where runoff flows might converge or high velocity flows are expected.
- Remove temporary stream crossings and grade, seed, or re-plant vegetation removed during crossing installation.

Final site stabilization

Make sure all subcontractors have repaired their work areas prior to final closeout. Conduct a final inspection of all work areas, vegetation, stormwater flow structures, and downstream receiving waters to make sure no visible gullies or sediment movement is evident. Notify site owner or manager after all temporary erosion and sediment controls have been removed and final stabilization has been completed. If

Maintaining and Closing Out Your Project 69

the site is one acre or larger and covered under the Ohio EPA NPDES permit, submit a Notice of Termination to Ohio EPA. For instruction visit - <http://www.epa.ohio.gov/dsw/storm/index.aspx>.



Excellent installation of rock flow dissipater at culvert outlet. Make sure inlets, outlets, and slopes are well stabilized before leaving the site and filing your "Notice of Termination" for ending permit coverage.



Poor job of seeding and protecting curb inlet with stone bags. Project should not be closed out until all bare soil areas are vegetated and all temporary controls (inlet dams, silt checks, silt fencing) have been removed

APPENDIX A

Erosion Prevention and Sediment Control (EPSC) Site Inspection Check List

Erosion Prevention and Sediment Control • Construction Site Inspection Checklist

EPSC practices	Field Indicators for Compliance
	Grading and clearing conducted in phases and according to plan to minimize exposed soil areas
	No vegetation removal or other operations in stream or sinkhole buffer zone (25-50 ft. min.)
Project Operations	Rock construction entrance/exit in place where vehicles enter paved roads
	No sediment, mud, or rock on paved public roads in project area
	Dust control if needed when working in residential areas during dry conditions
	Inspection of all controls weekly and after each rain exceeding ½ inch during construction
	Upland runoff diverted around or through bare soil areas below with lined ditches or grassed berms
Drainage Management	Drainage channels exiting the site are seeded & stable, with no muddy flow after rains
	Discharges from dewatering operations cleaned in silt fence enclosure or filtered
	No unmanaged muddy runoff leaving site after rains up to 1½ inches
	Exposed soil areas seeded after 7 days if they will lay dormant for 14 days
Erosion Protection for Bare Soil Areas	Soils on flat ground or moderate slopes seeded at approved rate
	Soils on steep slopes stabilized with seed and mulch and/or other erosion control products
Sediment Filters	Silt fence, rock filter, or other sediment control below all bare soil areas
	Sediment filter installed across slope on the contour, trenched in, posts on downhill side

Erosion Prevention and Sediment Control • Construction Site Inspection Checklist (continued)

	Silt fence posts are 6 feet apart or closer; ends of fence turned uphill
Sediment Filters (continued)	Multiple sediment filters 110 feet or less apart on unseeded slopes steeper than 4:1
	J-hook interceptors along silt fence where muddy runoff flows along fencing
	No visible undercutting or bypassing of sediment filter, failures found and repaired promptly
Slope Protection	Slopes tracked, disked, or conditioned after final grade is established
	Slopes seeded, mulched, or covered with blankets within 14 days, no unmanaged gullying
	Heavy downslope flows controlled by lined down drain channels or slope drain pipes
	No gullies, no muddy runoff from slopes entering streams, rivers, lakes, or wetlands
	Ponding structure located at storm drain, culvert, and channel inlets receiving muddy flows
Inlet Ponding Dams	No visible undercutting, overtopping, or bypassing of inlet ponding structure
	Accumulated sediment is less than halfway to the top of the ponding structure
Outlet Protection	High flow discharges have rock or other flow dissipaters of adequate sizing at outlet
	Channel and culvert outlet areas show no visible signs of erosion, bank failure, or collapse
	Outlet discharging to lined, stable ditch or vegetated area

Erosion Prevention and Sediment Control • Construction Site Inspection Checklist (continued)

	No unmanaged ditch bank erosion or bottom scouring visible within or below site
	Ditches with slopes greater than 3% have silt checks, spaced closer as slope increases
	Ditches with slopes up to 3% are thickly seeded with grass
Ditch Stabilization	Ditches 3% to 10% are lined with thick grass and erosion control blankets
	Ditches 10% to 20% are lined with thick grass and turf mats or other approved product
	Ditches exceeding 20% are lined with rock, concrete, or other approved erosion control products
	Sized to account for both the sediment storage volume and the dewatering volume (Section 9)
Sediment Traps and Basins	Outlet structure is stable and consists of rock lined overflow or outlet riser pipe
	Rock overflow has 6" depression to control discharges; discharge area is stable
	Outlet riser pipe has concrete & rock base, ½- inch holes every 3" to 6", and trash rack
	Sediment behind silt fence and other filters does not reach halfway to top
	Sediment traps and basins are less than half full of sediment
Maintenance of EPSC Management Practices	Gullies noted and repaired, silt fences and other controls inspected and repaired/replaced
	Written documentation of controls installed, inspection results, and repairs performed
	All controls removed and control areas graded, seeded, and stabilized before leaving site
	Regulatory requirements for stormwater permitting, etc. addressed as needed

APPENDIX B

Construction Site Inspection Report

Construction Site Stormwater Permit Compliance Inspection Report

General Site Information

COMPANY:	COUNTY:
SITE:	DATE:

Permit Compliance

Yes No

	Yes	No
Copy of permit kept on site		
Copy of Stormwater Pollution Prevention Plan (SWPPP) kept on site		
Site specific description of project timing/ phasing and implementation		
Adequate site map showing:		
• Drainage patterns indicated on plan		
• Receiving waters (stream, river, lake, wetland, etc.) named		
• Approximate slopes after major grading		
• Area of soil disturbance		
• Undisturbed areas and vegetative buffer zones		
• Location of structural and non-structural controls (BMPs)		
• Areas where stabilization practices are to be employed		
• Stormwater discharge locations		

Specific Site Information

Name of receiving stream	
Total area of site:	
Area disturbed	

Inspection Results

Satisfactory, marginal, unsatisfactory	S	M	U
Condition of receiving stream			
Is BMP Plan adequately implemented?			
Timely seeding and mulching			
• Revegetation on cut/fill/cleared areas			
• Condition of slope areas			

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Inspection Results (continued)

Satisfactory, marginal, unsatisfactory	S	M	U
Structural Controls			
• Drainage ditch protection/liners installed			
• Inlet protection for curb drains, etc.			
• Outlet protection—no erosion or scour			
• Silt fences below bare soil areas			
• Rock check dams in ditches			
• Sediment traps/ponds maintained			
Other controls			
• Secondary containment for fuel; maintenance area designated			
• Proper disposal of concrete wastes; wash in designated area			
• Other (non-stormwater discharge, etc.)			
• Off-site tracking of sediment prevented			
• Compliance with state and local regulations			
• Waste, fertilizer, paint, pesticide/herbicide storage and disposal			
• Proper sewage management			
Operation and Maintenance of BMPs			
• Maintenance plan incorporated into written BMP plan			
• Maintenance plan followed			
• Maintenance documented			
• Inspections done as required and documented			
• Inspection reports completed and maintained on site, in file			
Contractor Certification on File			
Plan Certification on File			

Comments:

Inspector's Signature

STORMWATER COALITION



The Stormwater Coalition is a forum for local governments to address drainage, erosion, stormwater pollution, and stormwater management regulations on a cooperative, watershed basis and to design and implement solutions to regional stormwater management problems. Below is a list of dues paying members:

- | | | |
|-----------------------|-------------------------|---------------------------|
| Lucas County | City of Toledo | Middleton Township |
| Wood County | City of Waterville | Monclova Township |
| City of Bowling Green | Village of Haskins | Perrysburg Township |
| City of Maumee | Village of Holland | Spencer Township |
| City of Northwood | Village of Millbury | Springfield Township |
| City of Oregon | Village of Ottawa Hills | Sylvania Township |
| City of Perrysburg | Village of Walbridge | Washington Township |
| City of Rossford | Jerusalem Township | Waterville Township |
| City of Sylvania | Lake Township | Home Builders Association |

For specific erosion and sediment control questions call the SWPPP review and inspection staff in your jurisdiction:

Lucas County Townships	SWPPP and inspection	419-213-2860
Wood County Townships	SWPPP and inspection	419-354-9060
City of Bowling Green	SWPPP and inspection	419-354-6227
City of Maumee	General questions	419-897-7150
City of Northwood	SWPPP and inspection	419-693-9329
City of Oregon	SWPPP and inspection	419-698-7047
City of Perrysburg	SWPPP and inspection	419-872-7880
City of Rossford	General questions	419-666-0210
City of Sylvania	SWPPP and inspection	419-885-8967
City of Toledo	SWPPP review	419-245-1315
	Site inspection	419-936-3015
City of Waterville	City of Sylvania	419-878-8100
Village of Haskins	General questions	419-823-1911
Village of Holland	SWPPP review	419-352-7537
	Site inspection	419-865-7104
Village of Millbury	General questions	419-836-9671
Village of Ottawa Hills	General questions	419-536-1111
Village of Walbridge	General questions	419-666-1830



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August 2016