



**Targeted Constituents**

● Significant Benefit		◐ Partial Benefit		○ Low or Unknown Benefit	
● Sediment	○ Heavy Metals	◐ Floatable Materials	○ Oxygen Demanding Substances		
● Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes	

**Description**

Stabilize eroding slopes and streambanks in order to protect ditches, swales, storm drains, creeks, lakes and natural waterways. Slope stabilization improves the appearance of private property and will substantially reduce sedimentation and flood damage. Streambank stabilization may require a permit from the Tennessee Department of Environment and Conservation (TDEC) prior to grading; see the TDEC website for more information. <http://www.state.tn.us/environment/permits/>

**Approach**

Homeowners and private property owners can make a big difference in controlling erosion and sediment. The benefits of controlling erosion substantially outweigh the costs involved. Contrary to popular opinion, vegetation does not just grow by itself on disturbed areas and steep slopes. There is a large potential for eroding slopes wherever land is developed or landscaped in Knoxville, due to hilly topography and native clay soils.

“Green” methods (with permanent vegetation) are the preferable means to fix steep slopes and erosion problems. Green methods help to capture rainfall, thus reducing the amount of runoff and flooding. Green methods are more attractive (and usually more durable) than structure stabilization methods such as gabion walls and riprap.

**Overview of Slope Stabilization**

First, determine the reason that a slope is unstable. If the slope tends to slide, collapse or slough .....then the soil itself is unstable and typically needs a permanent solution.

Possible remedies may include:

- Planting hardier and more durable types of vegetation (native trees & vines).
- Regrading the slope so that it is less steep.
- Constructing a retaining wall, crib wall or other structural feature.
- Divert surface water (and possibly groundwater) that tends to saturate soils and makes them heavier.

If a slope tends to erode or washout in certain spots .....then the problem may be a combination of inadequate ground cover, poor drainage, no topsoil, wrong plants, etc.

- Divert surface water around the slope, if possible.
- Improve ground surface by adding topsoil, lime, fertilizer, mulch or other soil amendments.
- Plant long grass, trees, shrubs, vines or another type of ground cover. Select

plants that meet sunlight, drainage and maintenance requirements.

Green methods involving permanent vegetation are preferable to non-green solutions. A common misconception is that gabions and riprap require less maintenance than green methods; this is not true. Gabions and riprap need to be inspected frequently for loose and misplaced stones, vegetation trimming and removal, settlement, etc. Green methods are more likely to be stable and self-maintaining. Specific aspects of slope stabilization are addressed in the following related BMPs:

- |             |       |  |
|-------------|-------|--|
| Slope:      | ES-04 | Terraces, benched slopes                   |
|             | ES-05 | Surface roughening                         |
|             | ES-20 | Bank stabilization and soil bioengineering |
|             | ES-23 | Riprap (non-green solution)                |
|             | ES-28 | Gabions (non-green solution)               |
| Vegetation: | ES-06 | Topsoil                                    |
|             | ES-07 | Mulch                                      |
|             | ES-08 | Seeding                                    |
|             | ES-09 | Sodding                                    |
|             | ES-10 | Trees, shrubs, vines                       |

Retaining walls, crib walls and prefabricated structural walls must be designed by a professional engineer or other qualified expert for specific site conditions. Walls which have a maximum height of at least 4 feet must be reviewed as part of a site development permit issued by either the Knoxville Inspections Bureau (5<sup>th</sup> floor) or the Stormwater Engineering Division (4<sup>th</sup> floor) in the City County Building.

**Overview of Streambank Stabilization**

TDEC will require a property owner to obtain an Aquatic Resource Alteration Permit (ARAP) for any grading in or near Waters of the State. Here are two quick definitions used to specify Waters of the State:

- Knoxville Engineering Department usually defines this as a blue-line stream on a USGS quadrangle map, or any point downstream from where a blue-line stream begins.
- TDEC typically defines a channel as carrying water for longer than one week after a heavy rainfall. The local TDEC office can send a field inspector to make difficult judgments when requested.

TDEC allows a property owner to clear downed trees and brush from a stream. The property owner should also unblock any culverts or pipes to prevent flooding. Live trees, shrubs, brush and other vegetation (when adjacent to a channel) are usually necessary to anchor and protect the streambanks. An ARAP is needed for any grading work near a stream that places or removes soil. See the TDEC streambank website for further information on permits, channelization, streambank protection, and allowable activities.

It is important not to alter the hydraulic stream cross sections. An ARAP is needed to relocate a channel, change the slope, or to provide channel linings such as concrete or riprap. Changing the channel hydraulics at one location (flow width, flow depth, velocity, channel roughness) will affect the channel hydraulics elsewhere. Specific aspects of streambank stabilization are addressed in these related BMPs:

- |             |       |  |
|-------------|-------|--|
| Streambank: | ES-20 | (bank stabilization and soil bioengineering) |
|             | ES-22 | (channel linings)                            |

**References**    **141, 155, 162, 167, 179, 180, TDEC website** (see BMP Manual Chapter 10 for list)