Stream Bank Stabilization Is Important

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Under normal circumstances, streams exist in equilibrium with their watersheds and immediate surroundings, called riparian zones. Streams are part of the slow erosion of the landscape. Over time, streams move both laterally and vertically, transporting tons of rocks and soils and organic matter downstream, deepening and widening valleys along the way. In an undisturbed landscape, however, streams change gradually, moving but maintaining their basic structure and equilibrium with both the landscape and the ecosystems of which they are a part. Natural streams in undisturbed watersheds are, therefore, more predictable, in most cases, than disturbed streams, and tend to be self-maintaining. Streams whose equilibrium has been disrupted by changes in land use, however, lose that predictability and often become expensive liabilities to both human and natural communities. The following is basic information for the understanding of how streams work and what can be expected when they or their supporting watersheds are disrupted.

Streams and rivers are nature's mechanism for transporting both inorganic and organic materials downhill and eventually to the sea. A stream's overall energy (its speed times its volume) is in balance with the amount of material that is capable of moving downstream (its bedload). Greater energy creates more erosion and more bedload, and vice-versa.

Let's look at the factors that affect the speed or velocity of water in a stream. Velocity increases with slope, of course, but natural streams are twisting and winding and arranged in a fairly regular pattern of "S" shaped bends. These "S" shaped bends assures that even though it may flow through fairly steep country, its actual slope, and therefore its velocity is lessened. These twisting bends reduces energy by reducing the slope of the stream, reducing the effects of gravity, and reducing the velocity and power of the water.

Vegetated Streambanks

There are factors besides slope that influence the velocity of water in a healthy watershed. The presence of vegetation, both near a stream and throughout its watershed, is critical to a stream's health and stability in a number of ways. When rainfall is heavy enough to cause water to run across the surface of the land, or to cause streams to overfill their banks, vegetation acts to decrease the velocity of flood and runoff waters. Stems, leaves, and roots create friction that slows and breaks up water currents, reducing their power to cause damage. Vegetation also serves as a natural screen, to catch debris, organic materials, and soil particles and cause them to settle out before reaching the stream channel. This benefits the stream by reducing the inputs of silts and mud, but it also benefits the plants by providing new inputs of nutrients into floodplain soils.

A vegetated watershed and stream corridor also reduce stream energy by reducing volume. In an undisturbed watershed soil litter layers and wetlands capture and hold water, some of which subsequently infiltrates into ground water layers, and some of which is evaporated into the atmosphere. A single, healthy, floodplain tree can transpire over 200 gallons of water into the atmosphere per day. Combined with shrubs, marshland, and meadow vegetation, evaporation can remove thousands or even millions of gallons

This is an example of a riparian zone bordering the stream bank. It provides pollutant protection and bank stabilization for the stream.

of water that would have otherwise entered the stream as runoff. A well-vegetated watershed also tends to moderate how quickly rainwater enters an stream and how long it stays. For all of the reasons described above, vegetation and undisturbed, permeable soils in a watershed cause floods to occur gradually over a long period of time, with lower peaks flows and a greater time lag between a rainfall event and the high water event in the stream.

Vegetated watersheds also prevent stream levels from becoming too low. Water that infiltrates into soil or ground water layers tends to be released slowly back into the stream channel by "percolating" through the ground layers. This keeps the stream from drying out during times of relative drought, and because the ground water is cold, it combines with the effects of shade to keep streams much cooler throughout the seasons. Vegetation in a watershed tends to preserve the stability of water in a stream, creating lower highs, higher lows, and gradual changes in water level and quality. This is in contrast to a disturbed stream that tends to alternate between sudden, destructive floods, and prolonged periods of low water.

Vegetation Helps In So Many Ways

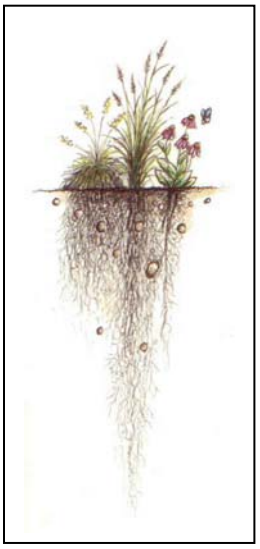
Vegetation has many other important functions. In a healthy stream system, banks are relatively stable because they are held together by vegetation growing very close to or even in the water itself. Roots shield the banks from erosion and overhanging branches shade the stream and keep its waters cool. Leaves and twigs that fall or wash into the stream provide organic matter that forms the base of the aquatic food chain, and insects that fall directly into the stream provide food for larger fishes. Tree trunks and branches in the stream and undercut banks under roots along the edges provide hiding places for fishes and other stream organisms. Finally, plants that grow in the water itself are critical to the survival of larval insects and fingerling fish that hide among stems and leaves.

Use The Right Plants For Bank Stabilization

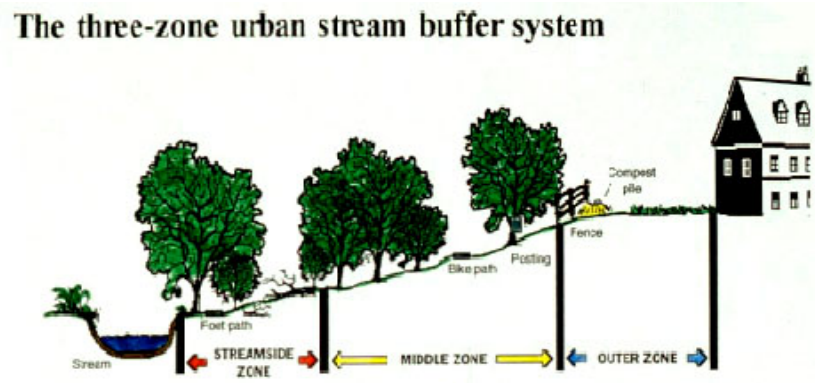
Natural vegetation or native plants have distinct advantages over conventional turf grasses in stabilizing easily erodible soils. Native plants are particularly effective on steeply sloped sites, stream banks and areas where moving water is present. The roots of native plants are very dense, fine and often very deep (in some cases, 5 to 10 feet in mature plants) and hold soil well. Turf grass root systems are only four to six inches deep.

Native Vegetation Improves Water Quality

Native vegetation in naturalized drainage ways enhances the infiltration of contaminated stormwater. The dense, deep root systems augment the permeability of the soil and help the uptake of certain stormwater pollutants. Native vegetation buffers are particularly effective along the edges of streams, lakes, and wetlands. They can intercept runoff and subsurface water pollutants from urban and agricultural land uses and construction sites. Submerged wetland vegetation provides an additional benefit along the edges of lakes and streams by serving as a growing surface for microorganisms. These microorganisms break down certain pollutants thereby reducing their harmful effects.



Plants native to this area have long root systems and have adapted to our weather and soil conditions.



CHARACTERISTICS	STREAMSIDE ZONE	MIDDLE ZONE	OUTER ZONE
FUNCTION	Protect the physical integrity of the stream ecosystem	Provide distance between upland development and streamside zone	Prevent encroachment and filter backyard runoff
WIDTH	Min. 25 feet, plus wetlands and critical habitats	50 to 100 feet, depending on stream order, slope, and 100 year floodplain	25 foot minimum setback to structures
VEGETATIVE TARGET	Undisturbed mature forest. Reforest if grass	Managed forest, some clearing allowable	Forest encouraged, but usually turfgrass
ALLOWABLE USES	***Very Restricted*** e.g., flood control, utility right of ways, footpaths, etc.	***Restricted*** e.g., some recreational uses, some stormwater BMPs, bike paths, tree removal by permit	***Unrestricted*** e.g., residential uses including lawn, garden, compost, yard wastes, most stormwater BMPs

The buffer zone along urban streams is divided into three zones. This picture describes the characteristics of each of those zones.

Choose native plants that will thrive in your soil type and the amount of sunlight they will receive. Some grow well in sunny areas, others in shade or partial shade. Some plants like silty soils; others can survive in clay soils.

To make the best decision, please visit these websites to understand the characteristics of our native plants.

www.mowildflowers.net

www.missouriplants.com

www.grownative.org

www.easywildflowers.com

The Missouri Department of Conservation has a seedling program that allows you to purchase bundles of bushes, shrubs, and trees at very reasonable rates. The order dates are usually between late fall and early spring. The order form and a description of plants can be found at:

www.mdc.mo.gov/forest/nursery/seedling

Information was taken from "Stream and Energy" by William Hudson and
EPA – "Green Landscaping: Greenacres" at www.epa.gov/glnpo/greenacres/toolkit/index.html