



# Understanding Erosion



Controlling erosion sometimes seems like a never-ending battle. Precious soil seems to slip away at an alarming rate—and along with it goes property values.

While some streambank erosion is due to natural stream dynamics, people accelerate the problem when they convert land from forests to farm fields or urban areas without taking special precautions to prevent erosion. A sharp rise in impervious surfaces (paved roads, rooftops, parking lots, etc.) associated with development has brought about an increase in runoff—precipitation that is not absorbed into the soil. The increase in runoff contributes to higher stream flows and flash flooding that scours the streambanks. In effect, streambanks are becoming unstable and eroding as streams become wider or deeper to accommodate the increased flows.

The situation is a little different when it comes to reservoir shorelines, though the end result is similar. When the reservoirs were filled many decades ago, a new waterline was created. The vegetation along the shoreline was exposed to flooding and the trees and shrubs that could not adapt to wetter conditions began to die off. Without the root systems to help hold soils in place, shorelines are more vulnerable to water fluctuations, currents and wave action from wind and passing watercraft. Lawns mowed to the water's edge can speed up the erosion process by increasing runoff and removing the trees and shrubs that would have helped to hold soil in place.



## Major Causes

Streambanks and shorelines are always in a state of fluctuation due to the natural process of erosion in which soil is transported and deposited elsewhere. However, certain conditions increase the speed and severity of erosion including:

- Vegetation removal—the deep roots of native shrubs and trees help to anchor the soil. Removing this woody vegetation leaves the banks unprotected and more susceptible to currents, damage from runoff and wave action. Replacing woody vegetation with lawns also accelerates bank erosion because the roots of common turf grasses are too shallow to prevent bank erosion.
- Increased stream flows—streambank erosion results from the inability of soils and plants to handle increased water flow, which is often related to development as vegetation is removed and replaced with impervious surfaces.
- Wave action from wind—constant waves and swells created by winds can loosen soil particles on shorelines and cause erosion, especially along points and other areas exposed to wind.
- Wave action from watercraft—shorelines are vulnerable to the wakes of passing power boats and other watercraft.
- Overland runoff—if unmanaged, overland runoff may form deep gullies depositing sediment in a nearby stream or reservoir.

## Effects of Erosion

Eroded soil, sand, or gravel carried by water is called sediment, and the process by which it accumulates in streams and reservoirs is called sedimentation. A low level of erosion is a normal part of geological processes, but human activity can increase levels of sediment entering streams, resulting in negative impacts on water quality.

Sediment is transported downstream by streams and rivers. Some sediment eventually reaches a reservoir where it settles and accumulates. Sediment is also deposited directly into reservoirs by runoff and bank erosion. Sedimentation is the largest source of nonpoint source pollution and a serious threat to water quality because it can:

- Fill spaces between rocks and gravel, suffocating aquatic organisms
- Destroy the habitat of aquatic insects and other wildlife in the aquatic food chain
- Release nutrients and toxic chemicals which lower water quality, promote algal growth, and harm aquatic wildlife
- Decrease the clarity of water and limit the growth of beneficial aquatic plants
- Increase the cost of municipal and industrial water treatment
- Reduce the desirability of water for swimming and other types of recreation
- Fill natural stream channels and cause an increase in bank erosion

## Erosion Control

The best approach to controlling bank erosion depends on the severity and cause of the problem. In some cases, woody vegetation and a good riparian buffer may be all that's needed. In other cases, a combination of bioengineering treatments and native vegetation or hard-armorings with rock riprap or gabion baskets (see factsheet on Using Stabilization Techniques) may be required. In many situations, professional guidance and TVA permits will be needed.



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