

Lakeshore and Streambank Erosion Control

What causes lakeshore and streambank erosion?

Lakeshores and streambanks are areas of dynamic energy. The powerful forces of waves, currents, and ice move soil particles toward, away from, and along the shoreline.

Streams are continually downcutting into their valley, carrying sediments downstream particle by particle. The current moves from side to side, undercutting banks and causing the stream channel to meander.

The ice of frozen lakes can expand shoreward with a force of many tons per square foot, moving most obstacles in its path (including shoreline soil). Masses of ice put in motion by winds or currents can scour the banks of lakes and streams.

Even in quite small inland lakes, breaking waves and nearshore currents can dislodge sediments. Headlands (points) usually have relatively high erosion rates because the waves, currents, and ice attack from all sides and eventually transport the sediments to bays, where they are deposited. Bays are usually the most erosion-resistant areas.

Erosion and the transport and deposition of sediments is a natural process along shorelines. Typically, natural erosional processes proceed very slowly, and the plants and animals that live along the shoreline can adjust to these slow changes, maintaining a stable, healthy, productive ecosystem. When some catastrophic natural or human disturbance causes this equilibrium to be upset, accelerated erosion can result. Examples of natural disturbances include large trees uprooted by a windstorm, or a flood resulting from a torrential rainstorm. Human disturbances include vegetation removal, dredging, filling, or construction on or near the shoreline.

What are the impacts of shoreline erosion?

Eroded soils are, by volume, the greatest pollutant of lakes and streams in the United States. Although most sediment comes from overland erosion throughout a watershed, shoreline erosion contributes its share. In aquatic environments, sediment pollution:

- Degrades aquatic and nearshore land habitats, killing aquatic organisms and negatively impacting birds and animals that depend on aquatic habitats.
- Reduces water clarity, light penetration, and plant productivity.
- Causes warming (which is most serious in cold water trout streams).
- Releases nutrients stimulating undesirable plant and algae growth.
- Affects angling success and fish feeding, spawning, and gill function.
- Changes bottom substrate, reduces channel capacities, and increases flooding.

Shoreline erosion can also cause the loss of valuable waterfront property, including nearshore buildings and other structures.

How do you know if there is a serious erosion problem on your shoreline?

Signs of serious problem situations include:

- A large area of bare soil on a steep, high shoreline bank.
- A noticeable recession of the shoreline over a period of time.
- Leaning or downed trees with exposed roots on the shoreline.
- Large patches of muddy water near a lakeshore, or unusually muddy streams during periods of high water or following a rainstorm.
- Excessive deposits of sand or other sediments on the stream bed, or very wide, shallow areas in a stream.

How can shoreline erosion be controlled?

One of the best ways to control shoreline erosion is through preventive measures. Some basic preventive guidelines include:

- Preserve the rocks and vegetation that naturally occur along the shoreline.
- Prevent impervious surface (i.e. roofs, driveways) runoff from flowing to the shoreline, especially bluff areas.
- Avoid construction within 100 feet of the shoreline or the edge of nearshore bluffs.
- Protect nearshore berms pushed up by ice action along lakeshores. They prevent excessive surface runoff and trap sand which "nourishes" the beach.
- Limit the amount of foot traffic and other recreational activities in erosion prone areas. Regardless of preventive measures, the right combination of conditions (such as high water level, violent windstorms, drastic ice movement, and certain shoreline configurations) may result in serious shoreline erosion.

There are three basic types of reactive shoreline erosion control methods:

Vegetative: This method involves planting trees or woody shrubs for the soil binding properties of their large root systems, grass and other herbaceous plants to protect against raindrop impact and scouring from surface runoff, or emergent aquatic plants to stabilize bottom sediments and dampen wave action.

Structural: This includes protective structures. The placement of rock of various sizes (referred to as rip-rap) has traditionally been the preferred and most common method. Other structural methods include bulkheads, gabions (rock filled baskets), sandbags filled with concrete, and railroad ties. However, these other methods are often most visually unappealing, require more heavy equipment and technical expertise, and may be more prone to failure in comparison to simple rip-rap.

Manipulative: Mostly used on streams, this includes removing streamflow obstructions, grading shoreline banks, or, in special circumstances, rerouting the stream channel.

A new technology called soil bioengineering is now being used with good success. Soil bioengineering combines mechanical, biological, and ecological concepts to arrest and prevent shoreline erosion. An example is the planting of willows interspersed with rock rip-rap. The rock provides immediate resistance to erosion. As the willows become established, roots invade and

permeate the rock and underlying soil, binding them together into an erosion resistant mass. The willows also impart a more "natural" looks to the shoreline.

Planning an erosion control project

Before beginning any actions to correct erosion, determine why the erosion is occurring. Without understanding the problem, any actions may be a waste of time and money. Decide if the problem is serious enough to warrant correcting. How is the habitat or water quality of the lake or stream being degraded? What are the threats to private property?

Even though there have been numerous studies and publications on this topic, each problem is unique and there are no manuals with generic plans for bank protection projects which are guaranteed to work. Although it may be possible to install a simple erosion control structure by yourself, most techniques have technical standards for size, height, shape, underlayment, and placement of structures. It is best to consult with a resource professional familiar with geotechnical engineering when planning the installation of erosion control structures.

