Colorado State Parks

COLORADO STATE PARKS
BEST MANAGEMENT PRACTICES

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Parks Affected: Reservoir Parks

Shoreline Stabilization

BMPs

This fact sheet describes Best Management Practices (BMPs) you can adopt to help protect and preserve water quality. In many cases, the best management for shorelands may be retaining the natural characteristics of your property.

Recognizing Erosion Problems

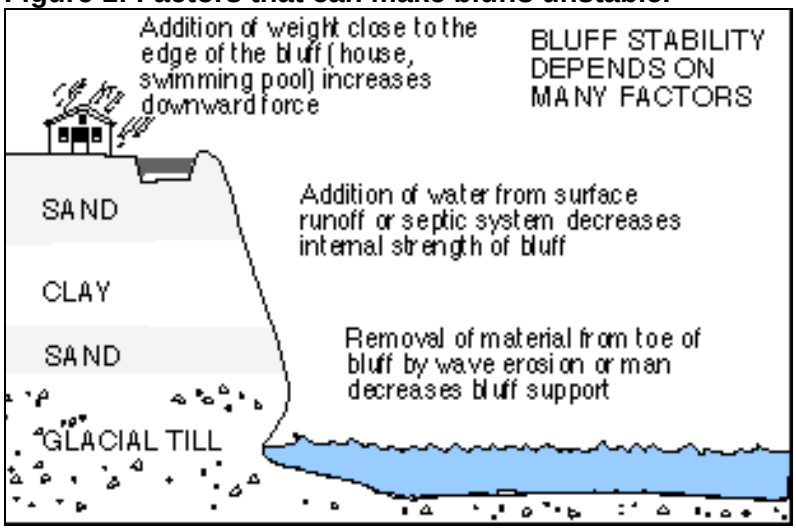
Streambank and shoreline erosion can significantly impact the water quality and wildlife habitat of our rivers and lakes. It is obvious that wave-pounded properties lose soil and ultimately their value. What is not as obvious is that this erosion process can be accelerated or slowed by the practices you adopt, and that sediment going into the lake or river is a pollutant.

Erosion is a natural process and, therefore, some sediment does end up in surface water. Clearing shoreland vegetation and beach rocks, and increasing runoff to the shore will accelerate shoreland erosion.

Bluff Stabilization

Increased runoff is especially detrimental to high bluffs (Figure 1). Slumping of waterfront bluffs results from unstable soil, usually because surface or ground water is reaching the bluff. On lakes, waves can erode supporting soil at the bottom of the bluff and cause slumping. Along river bluffs, river currents may erode the supporting soil.

Figure 1: Factors that can make bluffs unstable.

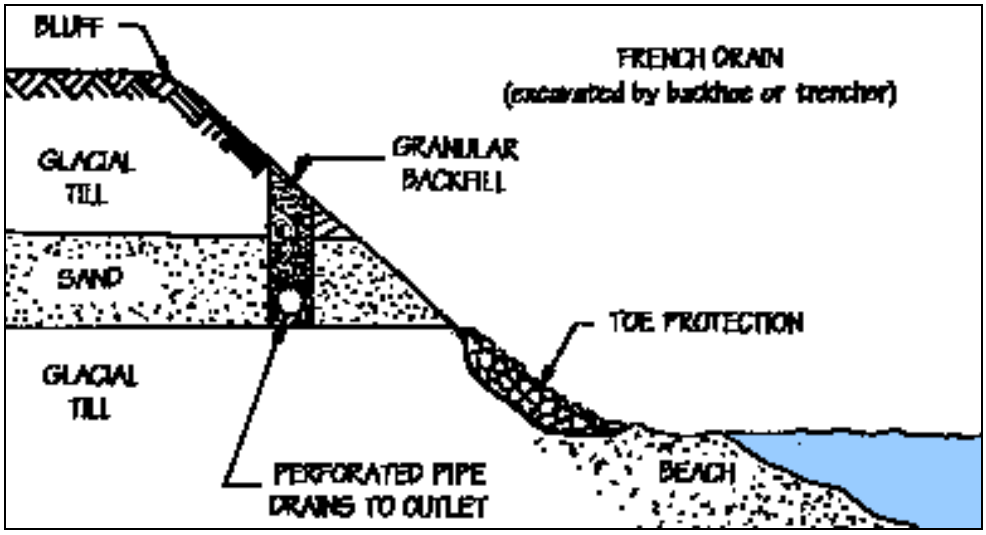


Erosion of higher shoreline bluff areas can be prevented by:

- retaining moisture-absorbing vegetation on the bluff
- outletting rain gutters and diverting surface runoff away from the bluff
- reducing runoff rate toward the bluff
- minimizing paved areas that increase runoff
- limiting ground water flow toward the bluff
- installing septic systems and drainfields away from the bluff
- avoiding additional weight on the bluff edge, such as pools, buildings, or storage sheds

On property with steep slopes or bluffs, reducing the amount of water reaching the bluff will help with stabilization. If diverting water away from the bluff is impractical, it should be routed through a nonperforated plastic drain pipe that outlets at the very bottom of the bluff. Rock should be placed around the outlet to prevent erosion at the bottom of the drain. Surface water and some ground water can be intercepted before it reaches the bluff by installing a "French drain" (Figure 2).

Figure 2: French drains intercept surface water and increase soil stability.



Deeper drains will intercept more ground water, but shallower drains are effective also and may cause less disturbance on the bluff. The maximum depth for French drains is 15 to 20 feet.

A French drain is a narrow trench set back from, but parallel to, the top of the bluff and filled with free-draining sand or gravel. A perforated, corrugated plastic pipe at the bottom collects water and should drain away from the bluff. The entire perforated length of pipe must be wrapped with fabric or a filter sock. Installing deeper drains will intercept more ground water and provide better protection for the bluff.

No additional weight such as a building, garage slab, or vehicle should be placed near the top of the bluff. Septic systems and swimming pools are especially inappropriate near the top of a bluff because they add weight and water.

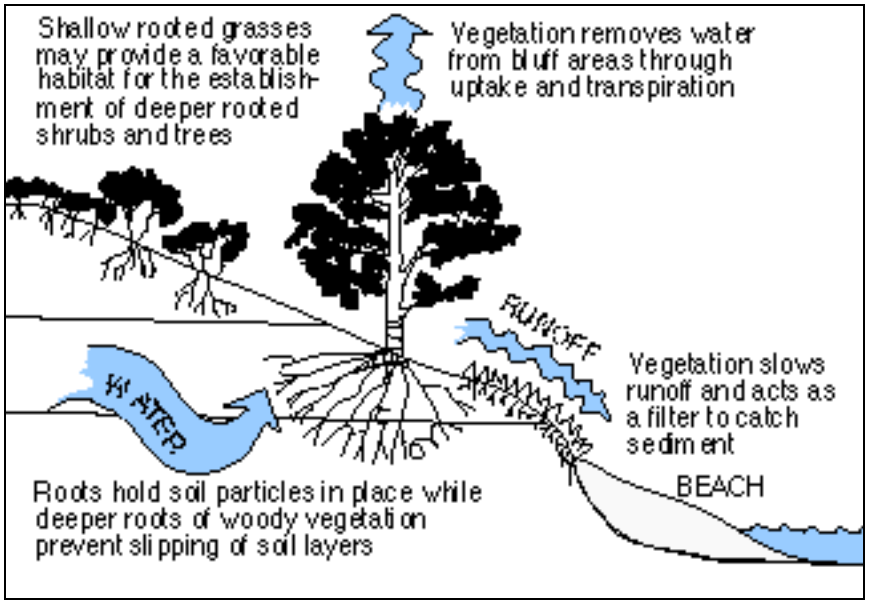
The Importance of Vegetation

Vegetation is one of the most important elements in the natural protection of land. Roots and stems tend to trap fine sand and soil particles, forming an erosion-resistant layer. Vegetation absorbs some of the water's energy, slowing down potentially erosive currents. As well as stabilizing the soil, vegetation

also acts as a shoreline buffer that slows runoff entering the stream or lake and removes nutrients from the runoff.

For most property that slopes toward water, leaving the natural shoreland undisturbed is often the best and least expensive protection against erosion. A filter strip of thriving vegetation on and near the shore binds the soil and minimizes soil loss from surface runoff and waves, and from use by people (Figure 3). Existing vegetation can be enhanced by planting woody or aquatic plants.

Figure 3: Well-established vegetation on the shore stabilizes the soil and helps remove water.



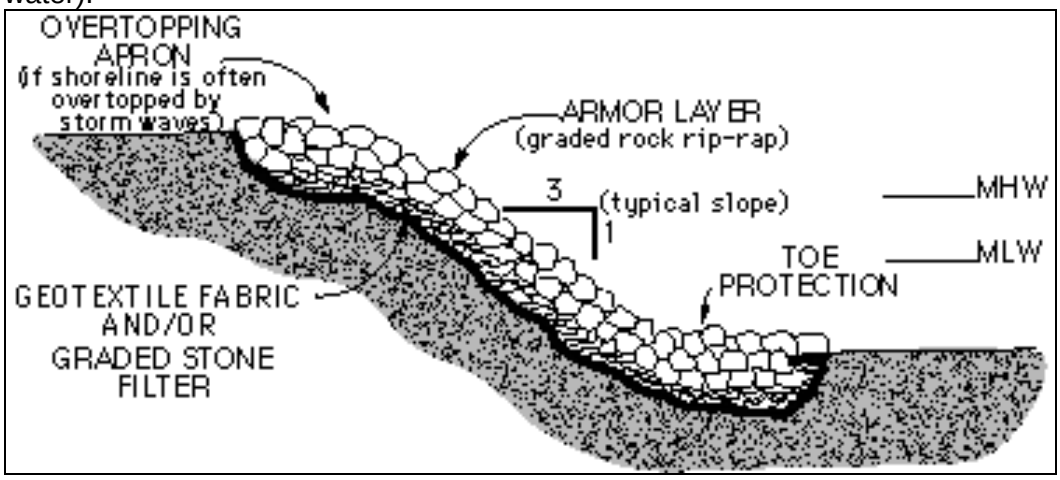
Natural shoreline features provide natural protection. While swimmers may not enjoy walking on cobblestones, and an ice-pushed ridge may block some of the view from your lawn chair, these features help "nourish" your beach by reducing erosion and trapping sand. Even driftwood absorbs a certain amount of wave energy that otherwise erodes soil.

Shore Protection

Regardless of the natural protection on your shore, the right combination of conditions (such as high lake level and wind direction) can result in a severe wave pounding, and shoreland soil may need additional protection.

Placement of large rock, usually referred to as rip-rap, is the preferred and most common form of shore protection (see Figure 4). Technical methods are available to determine rock size, placement geometry, and elevations to ensure the best protection. Your county Soil and Water Conservation District (SWCD) and the federal Natural Resources Conservation Service (NRCS) can provide technical assistance.

Figure 4: Proper rip-rap placement (MHW=mean high water, MLW=mean low water).



The above agencies will also have information on other types or remedies that may be appropriate for your particular situation. Potential shore protection alternatives include:

- bulkheads (retaining walls)
- gabions (rock-filled wire baskets)
- articulating blocks (cable-connected concrete blocks)
- Geoweb matrix (thick, open-cell plastic grid)

A few of the alternatives can be placed by hand. Some other alternatives, such as railroad ties, are often tried but rarely work. If you have your own idea for a solution, you should seek technical advice first.

If rip-rap is used, crushed or blasted rock locks together better than rounded boulders, but can be very expensive unless it is readily available.

Geotextile fabric is usually placed beneath the rock rip-rap to prevent soil loss through the rip-rap openings. It is easy to place and provides an excellent filter barrier (Figure 4). In order to prevent punctures, plenty of slack should be provided over protruding objects that cannot be removed. A layer of sand or fine gravel can be placed on the fabric for extra protection against puncture. Enough fabric should be laid out so that the rip-rap periphery can be "wrapped" by bringing the fabric up and back down into the rip-rap. This will help hold the rip-rap together as one structural unit. Keep in mind that sunlight will degrade exposed fabric. As an alternative to the fabric, a graded filter layer can be used beneath rip-rap to prevent soil loss through the rip-rap openings.

Sufficient rock must be placed at the base of the rip-rap for toe protection. Excavated toe material must be removed from the lakebed and placed in a non-wetland area.

Costs

The price of rip-rap placement depends on local contractors, distance to the nearest rock source, and access to the project site. It also depends on how much other work, such as clearing or earthwork, is required.

You should expect to pay roughly between $40-90 per shoreline foot. A project cost can also be estimated by calling earthwork contractors in your area. A big savings can be realized if you can install these items yourself.

Effective bluff stabilization will require technical assistance. If you want to stabilize a slumping bluff, find out about soil types and ground water level. Consider hiring a geotechnical engineering firm to take soil borings, analyze soil properties, and recommend a remedy.

Regulations

All erosion protection projects that alter the lake- or riverbed require a protected waters permit from the Department of Natural Resources (DNR). Contact the DNR Area Hydrologist for permit guidelines, which other agencies might require a permit, and for assistance in planning your erosion prevention project.

For More Information, contact:

Natural Resources Conservation Service (NRCS): www.nrcs.usda.gov
U.S. Army Corps of Engineers (USACoE): www.usace.army.mil
Your Soil and Water Conservation District (SWCD)
Colorado State University Extension Service: www.ext.colostate.edu

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