



Resloping, Rock Toe and Rip Rap

Bank stabilization

Lake friendly living
means using lakeshore
BEST MANAGEMENT
PRACTICES

BMP

Resloping, Rock Toe and
Rip Rap

STANDARDS

Shorefront

- Stable bank
- Natural Conditions

LAKE BENEFITS

All bank stabilization BMPs reduce the effects of erosion to shorelines and stream banks that empty into lakes and ponds. By reducing erosion, landowners are also reducing the amount of sediment and phosphorus that enters the lake. The most natural form of erosion control is the best option. As a result the BMPs are listed in order of implementation. Riprap should be considered a last resort for erosion control.

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Where erosion has already occurred, consider methods that will allow you to mimic a natural shore, rather than building a retaining wall. Walls are expensive to build, offer no lake habitat or ecological benefits, are a barrier to wildlife, and will require replacement over time.

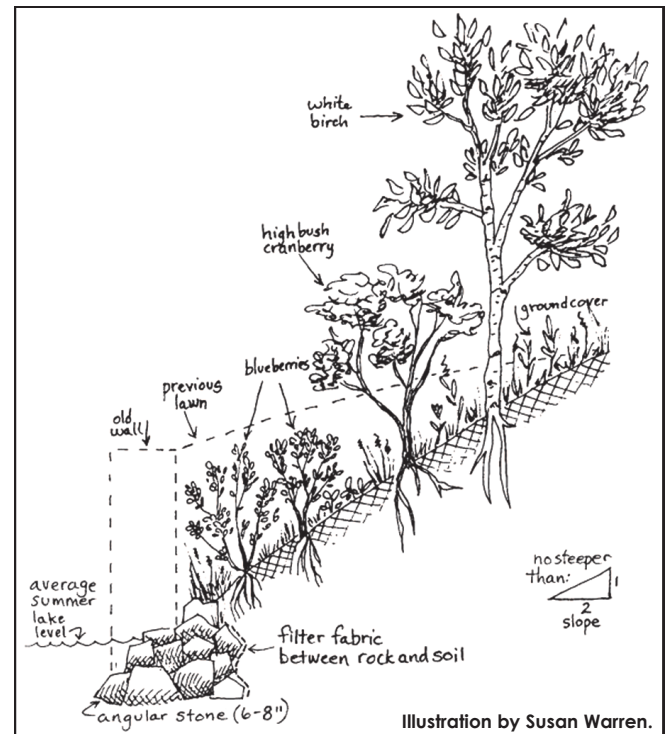
RESLOPING

Description: Resloping is a term that describes the regrading of an eroded bank to a moderate and more natural slope.

Purpose: To reduce the erosion of sediment and phosphorus into a lake by stabilizing a lake bank. Resloping also allows you to replace old retaining walls, as the drawing on the right illustrates.

How To: Reslope, if necessary to smooth erosion gullies, and replant native species above the rock toe. A 2:1 slope (2 feet horizontal to 1 foot vertical) or less can generally be stabilized with just vegetation. Use an erosion control blanket (example of straw), to cover bare soil while herbaceous vegetation becomes established.

Plant water-loving plants just below the eroding area. These will dampen the wave energy and trap eroding soil from above. Unless the erosion is severe, it may eventually self-stabilize. Choose quick growing native species and stay away from invasive species.



A resloped bank stabilized with native vegetation and a shallow rock toe that is only partially visible above water giving it a natural look.



Note: Any work that occurs in the lake, below the average summer water level, requires a [Shoreland Encroachment Permit](#). Read the BMP supplement *Understanding the Shoreland Encroachment Permit* for more details.

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Shrubby vegetation planted above a rock toe prevents erosion better than grass or a lawn especially in circumstances of flooding and intense wave or ice action.

ROCK TOE

Description: Rock toes are low structures of rock placed along the water's edge of a shoreline. They often occur naturally along many Vermont lakeshores and are man made as a structural reinforcement of the bank, when wave action is the primary cause of the loss of bank material.

Purpose: Rock can be layered at the toe of the shoreline as an armor-ing technique to provide additional strength to banks. This will reduce

the scouring of the toe and banks in high velocity wave events. Rock lining the shoreline toe is more effective at protecting the bank when combined with bioengineering practices such as live staking, plantings, and seeding. This combination is how natural lakeshores avoid bank instability and erosion problems.

How To: Most undeveloped natural shores have a line of cobble and rocks right at the water's edge. If rocks are already present at the water' edge, leave them there. Rocks in the 10-16 inch size are typically better than larger ones because large rocks tend to just transfer the wave energy elsewhere, where as the smaller size rock deflects it back and forth between rocks. It is important to have vegetation overhanging the rocks to keep the sun from heating up the rocks and the water, as well as to provide bank support above the rock toe.



If the area is undergoing serious erosion, it may be necessary to excavate in order to establish a rock toe. Install filter fabric against the back side of the rocks to prevent soil from washing out from behind the rocks (see the illustration on the first page). The smaller size rock (10-16 inches) also grips more tightly together, holding in the soil better with less chance of soil being washed out through any large holes among the rock. The rock toe only needs to extend about six to nine inches above the water level. Using this approach allows you to mimic and re-establish a naturally vegetated shore.

RIPRAP

Description: Riprap is heavy, large, irregular-shaped rock fit into place, without mortar, to manage severely eroded lake banks or shorelines.

Purpose: Controlling shoreline erosion often does not require the use of riprap and should be used as a last resort. Instead, shoreline erosion problems can frequently be addressed by limiting foot traffic, diverting upland runoff, and stabilizing banks with native vegetation. These are more affordable and lower-impact solutions that still protect water quality and property values. Riprap should be used only where necessary and never to replace a stable, naturally vegetated shoreline.



Source: Maine DEP

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How to:

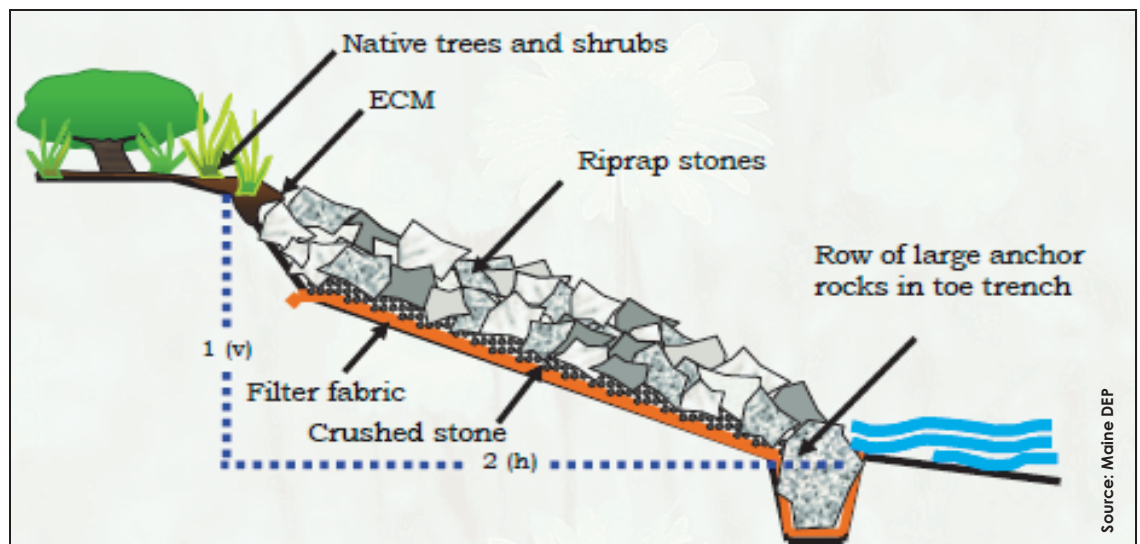
1. If necessary, excavate the bank so that the final riprap slope will be no steeper than 1:1 (horizontal to vertical) and no shallower than 3:1 (horizontal to vertical). Do not remove existing vegetation. Create a trench in the bank toe that is at least as deep as the height of your largest riprap stone (see illustration below).
2. Place a layer of filter fabric over on top of the exposed slope to prevent soil movement under the riprap. If filter fabric is used, it should be followed by a three inch thick layer of clean three fourths (3/4) inch crushed stone. Bury in filter fabric at the top of the riprap edge and at the base, extend it into the toe trench. If filter fabric is not used, a six inch layer of crushed stone ranging from three fourths to three (3/4 - 3") inches must be placed down. (Filter fabric is highly recommended because it protects the soil from being washed out from any gaps between the rocks.)
3. Immediately install the riprap layer. First place an anchoring row of large rocks in the trench at the toe of the bank. Riprap stones should then be hand-placed or very carefully dumped so that smaller stones fill the voids between larger ones. The riprap layer should be at least twice as thick as the average rock diameter.

Ensure that the riprap extends up the slope no more than two feet above the normal high water line.

1. Native trees and/or shrubs should be planted above the riprap. Vegetation provides habitat and can filter nutrients and pollutants from runoff, and helps stabilize the bank and secure the riprap. Planting non-native plants in the disturbed area is not permitted.
2. Disturbed soil above the riprap should be immediately stabilized with seed and hay mulch or permanently mulched.

Materials:

- Riprap: Purchase large angular stones from your local quarry or gravel pit. Do not take them from the shoreline (because they help prevent erosion) or from below the normal high water line (because they provide habitat for aquatic life).
- Filter fabric (also known as a geotextile) and available at most garden stores.
- Crushed stone may be purchased from your local quarry or gravel pit. Ask for washed stone only.
- Buffer plants can be purchased at local nurseries. See Lake Wise BMPs— *Live Staking and Planting and Maintaining Vegetation Areas*.



Riprap installation.