



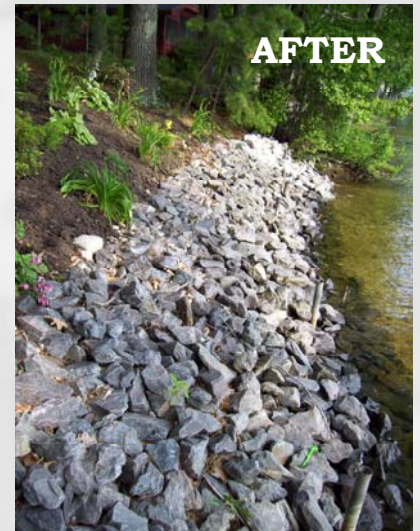
LAKE SHORELINE RIPRAP

~stabilizing severe erosion on lakefronts~



Portland Water District

Purpose: Riprap is heavy, irregular-shaped rock fit into place, without mortar, to manage severely eroded lake banks or shorelines. Yet, *controlling shoreline erosion often does not require the use of riprap.* 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, 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.



Note: A Maine Department of Environmental Protection (DEP) permit is required to install or repair riprap along lakes and other water bodies. If the installation or repair does not qualify for Permit-by-Rule (Natural Resources Protection Act, Chapter 305, Section 8) an individual permit under the NRPA must be obtained from DEP. Local permits may also be required; contact your local Code Enforcement Officer about shoreland zoning requirements.

Installation:

Riprap may only be utilized on lake shorelines where eroded bank slopes exceed 3 horizontal (h) feet to 1 vertical (v) foot—a 33% slope (NRPA Ch. 305, Section 8). To control bank erosion where slopes are shallower than these dimensions, vegetation must be used in place of riprap.

Appropriate Stone Size is Important

Consider the site's exposure to wave action when choosing riprap stones. Stones are available as graded mixes. For conditions around smaller lakes and ponds, a riprap mix with a mean diameter (D50) of 10 to 12" should remain stable in most circumstances. For larger lakes with higher wave action or more ice scour, a larger stone mix may be necessary. Note that a 12"- round stone weighs roughly 100 pounds, so hand-placing large stone mixes may not be possible.

1. If necessary, excavate the bank so that the final riprap slope will be no steeper than 1(h):1(v) and no shallower than 3(h):1(v). 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 (Figure 1).
2. Place a filter layer on top of the exposed slope to prevent soil movement under the riprap. If filter fabric is used, it should be followed by a 3" thick layer of clean ¾" crushed stone. Key in filter fabric at the top of the riprap edge and extend it into the toe trench. If filter fabric is not used, a 6" layer of crushed stone ranging from ¾- to 3" must be placed.
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.

4. Ensure that the riprap extends up the slope no more than 2' above the normal high water line.
5. Native trees and/or shrubs should be planted above the riprap. Vegetation provides habitat

and can filter nutrients and pollutants from runoff. Planting non-native plants in the disturbed area is not permitted.

- Disturbed soil above the riprap should be immediately stabilized with seed and hay mulch or permanently mulched, preferably with Erosion Control Mix (ECM).

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): Contact your local Soil and Water Conservation District for local suppliers.
- Crushed stone may be purchased from your local quarry or gravel pit. Do not use unwashed stone.
- Buffer plants can be purchased at garden centers. See DEP/PWD's Conservation Practices Factsheets on native plants, which list suitable plants for different site conditions.
- Erosion Control Mix (ECM): See DEP/PWD's Conservation Practice Factsheet on ECM for more information about this type of mulch and local suppliers.

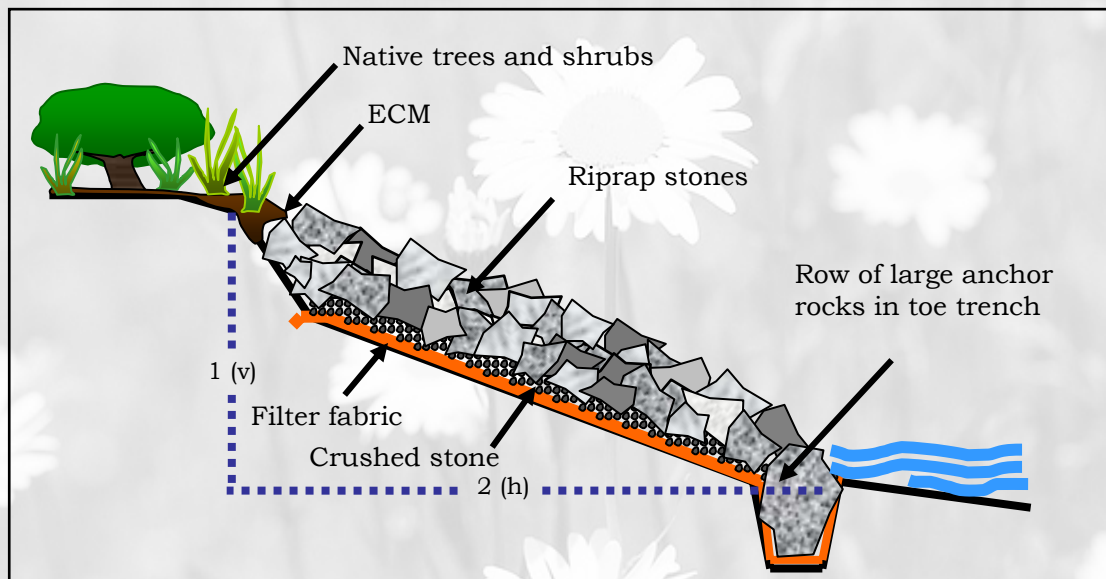


Figure 1. Riprap installation

Maintenance:

Some displacement after frost heaving or severe storms is expected; return stones to their original positions as necessary. Monitor for slumping, and erosion behind the riprap.

References and Resources:

Natural Resources Protection Act: Permit By Rule Standards, Chapter 305. Maine Department of Environmental Protection, Bureau of Land and Water Quality. Rev. 12/5/2006. Available online at <<http://www.maine.gov/dep/blwq/docstand/nrpapage.htm>>

Maine Erosion and Sediment Control BMP: D-2, Riprap slope stabilization. 3/2003. Available online at <<http://www.maine.gov/dep/blwq/docstand/escbmps/>>

Part of the **Conservation Practices for Homeowners** Factsheet Series, available at:
Maine DEP (800.452.1942); <http://www.maine.gov/dep/blwq/docwatershed/materials.htm>
Portland Water District (207.774.5961); <http://www.pwd.org/news/publications.php>