Department of Environmental Quality
Land and Water Management Division

PROTECTING THE WATER'S EDGE

Lakeshores & Streambanks

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

Erosion and the transport and deposition of sediments is a natural process along shorelines. Typically, natural erosional processes proceed very slowly. The plants and animals that live along the shoreline can adjust to these slow changes, maintaining a stable, healthy, productive ecosystem.

Aquatic Vegetation:

Emergent and floating vegetation (cattails & lily pads) along the shoreline will help limit the amount of erosional forces by diminishing wave energy. Vegetation provides habitat for aquatic organisms. Also, maintaining native vegetation will help keep out invasive, non-native species such as phragmites and purple loosestrife.

Natural Vegetation Strip or Green Belt along the Water's Edge

Maintenance of a "natural vegetation strip" or "green belt" of woody vegetation serves several beneficial purposes. Root systems absorb nutrients, stabilize the soil, and help prevent erosion. Natural vegetation provides wildlife and fish habitat and cools water temperatures. Reptiles and amphibians will use the natural shoreline as well as waterfowl, mink and otter. The vegetation strip can also provide an effective, aesthetically pleasing visual screen which gives privacy to property owners and screens development for water users. Lawn maintained to the water's edge perform few of these functions because it is usually cut short and has a shallow root system.

There are three basic types of shoreline erosion control methods:

Vegetative: This method involves planting trees (red & silver maples) or shrubs (dogwoods & willows) for the soil binding properties of their large root systems, planting grass and other herbaceous plants (native grasses & wildflowers) to protect against raindrop impact and scouring from surface runoff, or planting emergent aquatic plants to stabilize bottom sediments and dampen wave action. This method also provides the best wildlife habitat.

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/seawalls. However, these other methods are most often visually unappealing, require more heavy equipment and technical expertise, and may be more prone to failure in comparison to simple rip-rap.

NOTE: Shoreline hardening that occurs with the construction of vertical walls (seawalls) has significant adverse effects on the fishery, wildlife and the overall water quality of a lake. Where vertical walls are built, the natural transition is destroyed. Wave reflection off vertical walls causes bottom scour to occur, stirs bottom sediments, increases water turbidity, and impacts spawning areas and aquatic vegetation. Vertical walls block access to and from the water for turtles, frogs, and other animals that need access to the uplands to feed, rest, and nest. Seawalls damage or destroy these important habitat areas and weaken the ecosystem.

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

NEW TECHNOLOGY: 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 create a more "natural" look to the shoreline.

Sources:

Lakeshore and Streambank Erosion Control, Tip of the Mitt Watershed Council

Michigan's Natural Rivers Program, Guide for Property Owners and Local Officials, MDNR

Shoreline Protection for Inland Lakes, MDEQ

DEQ PERMIT REQUIREMENTS:

Applications available at www.michigan.gov/jointpermit

When planning a shoreline protection project on an inland lake or stream, be aware that the following parts of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, regulate construction activities including, but not limited to, shore protection: Part 31, Water Resources Protection, Part 301, Inland Lakes & Streams and/or Part 303, Wetland Protection.

RIPRAP SHORELINE PROTECTION

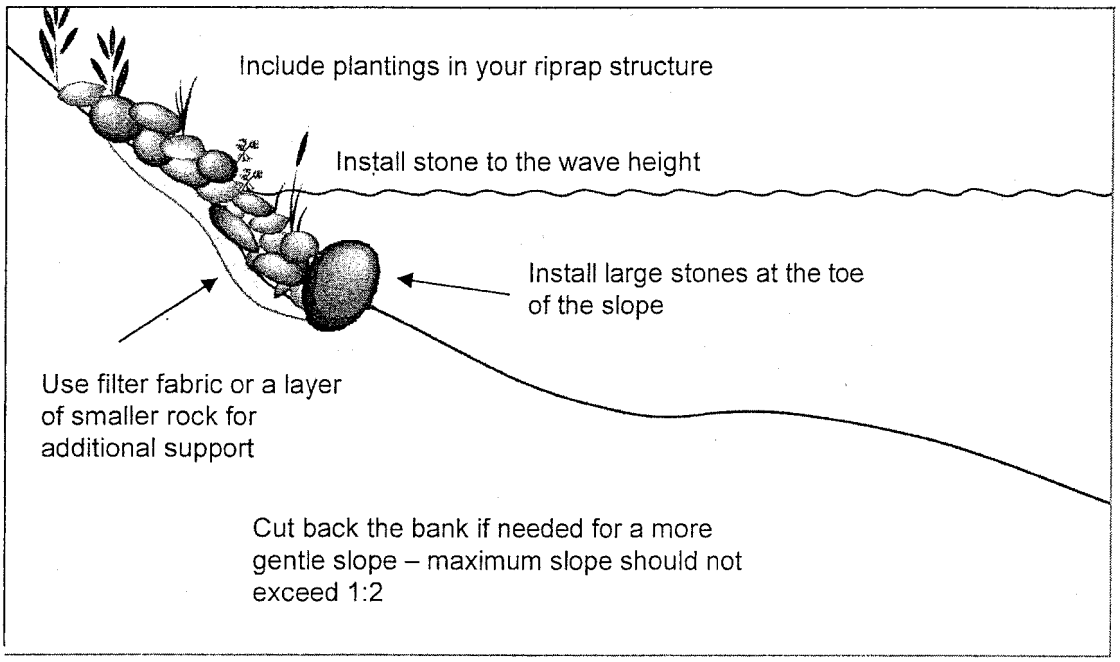
Using stone/rock to protect your shoreline

WHAT IS RIPRAP?

Riprap is the use of stones and/or rocks along a shoreline or riverbank for protection against erosion (such as waves and flowing water).

PREFERRED SHORELINE: Allowing native plants to grow naturally along the shoreline will provide protection against erosion and increase habitat along the land and water interface.

Any woody debris (trees, logs, stumps…) along the water's edge should be protected during shoreline projects.



USING RIPRAP TOGETHER WITH PLANTS:

Plants are an important component along the water's edge. If shoreline protection is needed, consider planting within the riprap to add color, interest and diversity. Live cuttings and plant plugs can be planted within riprap to provide additional slope stability and provide a more natural environment. Examples of native vegetation are silky dogwood, red-osier dogwood, sandbar willow, black willow, weeping willow, meadowsweet, cattails, sedges and rushes.

HOW TO CREATE A SUCCESSFUL RIPRAP PROJECT

Rock installation should be carefully planned out.

Regular maintenance may be required on riprap structures.

CAUTION: Broken concrete or asphalt are not suitable materials.

APPROXIMATE ROCK SIZE FOR:

RIVERS

Velocity of Stream During High Flows	Size Range - Largest Diameter of Rock
2 – 6 feet/second	4" – 12"; average 6"
6 – 8 feet/second	6" – 18"; average 12"
8 – 10 feet/second	12" – 24"; average 18"
10 – 12 feet/second	18" – 30"; average 24"

LAKES

Wave Height (Feet)	Rock Avg. Size (Inches)	Rock Weights (Pounds)
0.5	4	4
1.0	7	13
1.5	8	26
2.0	11	61
2.5	13	105
3.0	16	205
3.5	20	355
4.0	22	490
4.5	26	845
5.0	27	975
5.5	30	1203
6.0	33	1648
6.5	36	2145
7.0	38	2616

CREATING A STABLE SLOPE:

It may be necessary to reshape the bank to a slope of at least one foot of vertical rise for two feet of horizontal (1V:2H).

ROCK PLACEMENT AT TOE OF SLOPE:

Sufficient rock must be placed at the base of the riprap for toe protection. The largest and thickest riprap should be placed over the toe and end to anchor the installation.

FILTER FABRIC/SMALL STONE:

Filter layers of either special filter cloth (also called geotextile) or 6 inches of well-graded stone should be provided to prevent loss of slope material through voids in the riprap structure.

Sources:

Construction & Material Specifications, Ohio Department of Transportation, 1997

Riprap for Shoreline Protection, Maine Department of Environmental Protection

Shoreline Alteration: Riprap, Minnesota Department of Natural Resources

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