

Shoreline Stabilization Ecological Importance of Natural Shorelines and Proper Shoreline Stabilization

This information was developed to increase awareness of the ecological importance of natural shorelines, and to promote more enlightened approaches to shoreline stabilization. By protecting the natural shoreline, you can help protect the key functions and values provided by this essential ecological transition zone. Additional information on shoreline protection may be found using the links in the right column.

Natural Shorelines

Natural shorelines are the undeveloped fringe areas along the edge of a waterbody, which connect the shallow aquatic portion of the waterbody with adjacent upland. These riparian areas provide important environmental functions, such as regulating water quality (including temperature, clarity, nutrients, and contaminants) and sustaining critical habitat for a variety of aquatic and terrestrial organisms (including invertebrates, fish, amphibians, reptiles, shorebirds and waterfowl, and mammals).



Changes or disruptions to riparian areas can threaten the survival of species that rely on this kind of habitat during their various life stages. They depend on these areas for breeding, spawning, nesting, feeding, growing and escaping from predators. Protecting such critical habitat is important - especially on lake shores that are experiencing development pressure and on over-developed lake shores that have limited natural shorelines remaining.

Shoreline Erosion

Shoreline erosion is a natural process caused by wind, frost action and gravity, as well as precipitation and wave and ice action. This natural wearing away of soil and rock can result in benefits such as creation and replenishment of natural beaches. However, it can also cause negative effects such as structural damage, degraded water quality and loss of property and habitat.

Human activities, such as those listed below, often contribute to or accelerate the natural shoreline erosion process, exacerbating the negative effects. However, with thought and planning, such activities can be modified to avoid or reduce those effects.

Clearing Natural Vegetation

Often done by landowners to expand views or increase recreational areas, it destroys the roots of plants that provide significant shoreline stabilization.

Construction or Development

When done uphill of a shoreline, it can result in increased stormwater runoff, resulting in increased sediment loads to the water body.

Impervious Surfaces and Structures

Pavement, buildings, roofs, drainage ditches, etc. increase the amount, velocity and energy of stormwater, resulting in more runoff being routed to streams and lakes (and less into the ground), and increasing shoreline erosion.

Agricultural Practices

These can modify the rate of erosion and increase levels of nutrients in streams and lakes. The effects are greatest in the spring when snow is melting, the soil is saturated and water runoff is highest.

Shoreline Projects

Erecting walls, and other such projects, reduces habitat and commonly affects property elsewhere due to redirection of waves away from the area in which the wall was installed. Such projects also can change the natural "drift" of loose material.

Shoreline Stabilization

For decades, "traditional" shoreline stabilization methods have centered on "hard" construction approaches such as vertical concrete, metal, or wood break-walls, gabions (stone-filled wire baskets) and rip rap (loose rocks or stones). Biologists and engineers now realize that in addition to creating a physical barrier, these hardened vertical or near-vertical structures reflect wave energy rather than absorb it, thereby worsening turbulence and increasing erosion in front of, under and adjacent to the "fix".

The effects of turbulence and erosion are not as severe when rip rap is used because it absorbs some of the energy from moving water. However, depending on its size and placement, rip rap still can create a barrier to many wildlife species, and, as with solid structures, reduces vegetated habitat.

The adverse effects of traditional shoreline stabilization methods can be significant, as hard erosion-control solutions do not provide the water quality or habitat benefits of a natural or restored vegetated shoreline.

Adverse changes to natural resources include the following:

- Reduced or degraded habitat for breeding, spawning, nesting, feeding, growing, escaping from predators, and thermoregulation and/or “loafing” for a variety of fish and wildlife species;
- Impaired movement of organisms between aquatic and terrestrial habitat;
- Altered physical structure of the water’s edge, with resultant changes to hydrology;
- Increased infestation of invasive plants (e.g., Eurasian watermilfoil) due to wave action against the hard structure, causing increased fragmentation and dispersal of plants and “re-seeding” of the water body;
- Local changes in water quality, including changes to temperature and increases in turbidity, nutrients and contaminants;
- Increased erosion of the adjacent natural shorelines and scouring in front of the structure.



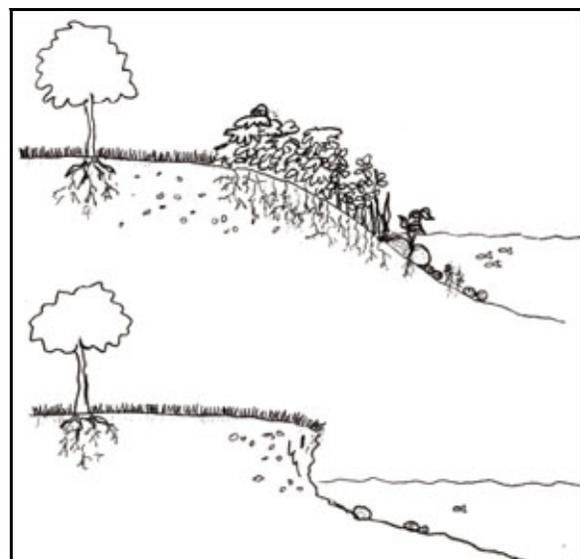
Preferred Methods

Soft or natural approaches to shoreline stabilization are recognized now as being more environmentally effective. When shoreline repair or stabilization becomes necessary, these methods should be considered first.

Natural approaches seek to restore hydrological and ecological balance by using methods that are structurally sound as well as economically feasible and ecologically sustainable. While there are many ways to protect an existing shoreline or restore an eroded one, choosing appropriate materials and design is important. Soft methods may include planting native, deep-rooting vegetation, as well as bioengineering. In all cases, the proposed stabilization method should follow the natural contour of the shoreline.

Preserving the Natural Shoreline

Shoreline stabilization can be as simple as not mowing the grass or not cutting the trees and shrubs along the shoreline. This allows natural vegetation to grow or become re-established. A naturally vegetated shoreline has many benefits. It prevents contaminants or excess nutrients from entering the water; it prevents erosion caused by rain, wind, wave and ice action, and it provides food, shade and cover for fish and wildlife. If some vegetation must be removed, limit the amount. Try to prune trees and shrubs back instead of removing them altogether.

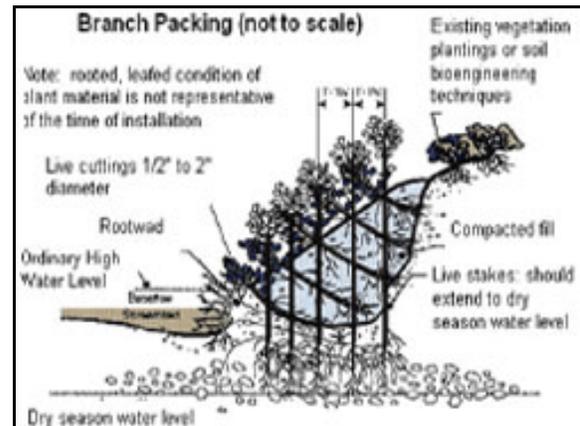


Planting Along the Shoreline

Planting native, deep-rooting species (check with your local soil and water conservation service for suggestions) will help accelerate shoreline stabilization. Many low-growing species are available that will not block waterfront views. Some species of common shrubs have roots that extend deep into the soil, helping to keep the soil and shoreline together. When damage does occur to a natural shoreline, native plants can easily re-establish.

Bioengineering (Soft Structures)

Where planting is not sufficient to stop erosion, a bioengineering approach may be more appropriate. Bioengineering incorporates plants in combination with natural materials such as logs, live stakes (e.g., cuttings from species like willow), and brush bundles (i.e., branches from live woody plants), creating a natural appearance and habitat for fish and wildlife. Bioengineering designs can lead to long-term stabilization of a shoreline, reducing the need for future work.



Less Preferred Methods

Hard approaches should be considered only where erosive forces are severe, and softer approaches would not be effective structurally.

When a site requires the use of "harder" structures, steps should be taken to reduce potential adverse effects by limiting the project area to the smallest possible footprint necessary; by protecting the toe or base of vertical structures with rip rap or stone; and, if appropriate, by incorporating passage areas to facilitate movement of wildlife to and from the water. The "fix" should follow the natural contour of the shoreline to the greatest extent possible.

Rip Rap

Rip rap stabilization designs should include appropriate bank slope and rock size to protect from wave and current action and to prolong the life of the embankment. A final slope ratio of at least 1:2 (vertical to horizontal) is recommended, and a more stable 1:3 slope should be used where possible.

A layer of gravel, small stone, or filter cloth placed under and/or behind the rock helps prevent failure. It also prevents the release of sediment – which can be harmful to fish, their eggs, and their food supply - into the water body.

In many cases, only the toe of the slope may need rock reinforcement; the remainder can be planted with native vegetation. The rock must be clean, free of silts and organic debris and must not come from the water body, as this will affect aquatic habitat.

Vegetation, especially deep rooting species, planted above and immediately behind the rock will greatly increase the stability of the slope and provide additional habitat, food supply and hiding spaces for a greater variety of species.

Gabion Baskets

Gabion baskets provide marginal habitat, and, when exposed to the elements, their durability is questionable. Consequently, their use is not encouraged.

Retaining Walls

Retaining walls are not encouraged and generally are not approved.

These structures (typically sheet steel, concrete, wood or large armor stone) produce a sterile, vertical, flat-faced object which is of little use to aquatic organisms and other wildlife. They also tend to reflect wave energy rather than dissipate it, usually resulting in erosion problems in front of the "fix" and elsewhere.

However, when erosive forces are severe, existing building foundations or structures are threatened, and softer stabilization approaches would not be effective, a new or replacement retaining wall may be warranted. In these cases, rock should be placed at the toe to reduce the adverse impacts of reflected wave energy.



Whenever possible, replacement structures should be installed above the mean high water elevation or behind or on the same footprint as the existing structure; not by encroaching into the water. The existing structure, and all fill in the intervening areas, should be removed and the exposed bed restored.

Other Tips for a Healthy Shoreline and Water Body

Avoid using fertilizers, herbicides and pesticides on your property. Rain will transport these harmful chemicals into the water, impairing water quality and adversely affecting aquatic organisms. In addition, fertilizers increase the nutrient input, which increases algae and aquatic plant growth. When the plants die, the decay process uses up dissolved oxygen in the water, reducing the amount available to fish.

Use soaps and detergents that are phosphorus/phosphate free. Excessive phosphorus levels cause increased growth of aquatic plants and algae. "1 lb. of phosphorus = 300 to 500 lbs. of algae"

Make sure your septic system is maintained and the tank is pumped out on a regular basis. Maintain shrubs or trees in the area between the septic system and the water. Plants help capture some of the nutrients that pass through the septic system.



SUMMARY: Shoreline work should be proposed only when a problem exists and needs fixing (i.e., to stabilize identified erosion areas) - not to decorate, landscape, or reclaim land. When work is necessary, natural approaches should be considered first.

DEC Permits Required

Protection of Waters (ECL Article 15, Title 5)

Applies to disturbance to bed or banks of streams classified as C(T) or higher, and excavation or placement of fill below the mean high water level of navigable waters of the state (including wetlands that are adjacent to and contiguous at any point to any navigable water of the state).

Freshwater Wetlands (ECL Article 24)

Applies to NYSDEC regulated Freshwater Wetlands (i.e., outside the Adirondack Park)

Basis for Permit Issuance:

1. The proposal must be reasonable and NECESSARY (i.e., it will resolve a problem).
2. It must not endanger the health, safety or welfare of the people of the State of New York.
3. It must not cause unreasonable, uncontrolled or unnecessary damage to the natural resources of the state, including soil, forests, water, fish, shellfish, crustaceans and the aquatic and land-related environment.

Other Potential Permits

Permits may also be required from other government agencies, such as but not limited to:

Adirondack Park Agency (518-891-4050) – If your proposal involves shoreline work in the Adirondack Park, please contact the Adirondack Park Agency before finalizing plans. This will help to eliminate unnecessary delays and assure that your project design satisfies both agencies.

U.S. Army Corps of Engineers (NY District: 518-266-6350; Buffalo District: 716-879-4330) – The Corps of Engineers regulates activities involving dredging, excavation, placement of fill, or construction of certain structures in waterways and wetlands of the United States.

Further Information and Jurisdictional Inquiries

Please contact the appropriate DEC regional Environmental Permits office, based on the county where the project is located.