Shoreline Stabilization Techniques

Soft vs. Hard Armoring

The shoreline is a valuable and important area to land owners, recreation users and wildlife. It provides a rich habitat for fish and other animals, filters water runoff before it enters the water body and provides us with a nice place to fish, walk and enjoy nature. Naturally occurring vegetation found on the shoreline dampens wave energy and can protect against erosion from water, ice, and wind. When riparian vegetation, rocks or logs are removed below the high water mark, the risk of erosion increases because these elements provide a very strong natural line of defence. Once they are removed, the land is exposed and becomes more vulnerable to becoming an erosion zone. Changing the natural process of erosion affects our natural resources, water quality, ecosystems' health and can result in major property loss.

"Soft" Armoring

"Hard" Armoring

"Soft" Armoring

Erosion experts are learning that the most successful and least costly approaches to dealing with erosion problems involves **mimicking nature's own design** and using native vegetation as much as possible. Soft shore techniques help to maintain wildlife habitat, reduce sediment erosion, filter runoff, and protect water quality. Re-vegetation in the case of bare lawns and shorelines is an effective method to prevent against low to moderate erosion. The planting of trees and shrubs helps to remove water from slopes through the uptake and transpiration of water. Shallow roots hold soil in place to allow the establishment of deeper rooted shrubs and trees. These deeper roots prevent soil slippage by taking up water that is deep in the soil. Grasses are useful to slow, filter, and take up excess runoff water. They also protect the soil from the erosive forces of rain. Aquatic plants provide fish with spawning habitat and dissipate the energy of waves against the shoreline. By planting native species along your shoreline, you are creating a "living barrier" of protection that blends into the surroundings and creates a natural look. In steeper locations, consider using live palisades, living fences of thick stakes planted deep into the ground in combination with rocks and logs for practical and aesthetic purposes. Many of the materials needed for soft shore techniques can be obtained locally and installed with light weight equipment, saving you money and the potential damage caused by heavy machinery. Soft shore armoring is a successful long-term method of addressing the erosion concerns that led to shoreline armoring while at the same time restoring degraded habitat.

Choose a Native Species

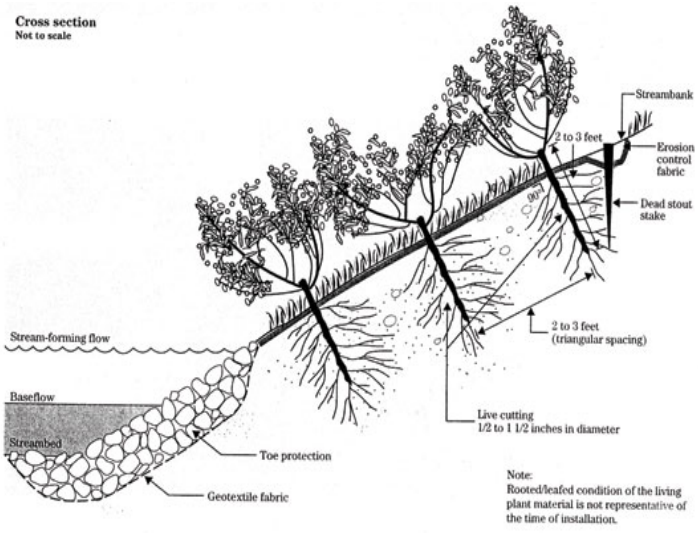
Trees, shrubs and perennials that are adapted for the climate and growing conditions in the area are essential for making soft shore protection work. Native plants root easier, grow well, require little maintence and won't outcompete the other vegetation in the area like an invasive species might. You can obtain plants by rescuing them from sites under development, starting them from seed or buying them at a local native plant nursery. Choose healthy plants that are at least two years old, native to your area and elevation and of species appropriate for your site or purpose. The best time to plant is during the spring because the plant material is still dormant. Consult your local nursery or conservation group to find out other recommendations.

Using Logs and Rocks

Rocks and logs are an integral part of soft armoring that is really about following Mother Nature's example. When trees fall onto a bank or into the water, it acts as a nursery for many plants and wildlife species as it decays. It also helps to stabilize the shoreline and bank by obstructing the movement of runoff and the action of waves on the shore. By placing logs in strategic locations we too can protect the shoreline and make it look natural. Specifically placing rocks in certain locations can help to save banks at drainage outfalls or gullies, break the force of waves and provide shelter for fish and other wildlife. Rocks and logs help anchor plantings and speed up the naturalization of your shoreline.

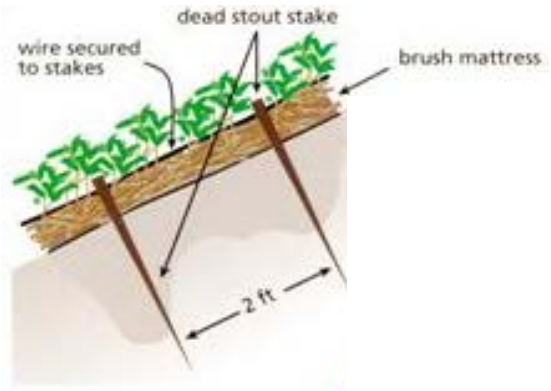
Live Staking

Slopes with light erosion can be used in conjunction with other methods for areas with heavier erosion. Normally live staking can be installed to anchor wattles (bundled live fascine) to provide deep root vegetation with the potential of favorable moisture retention. Wattles are also useful for the capture of sediment, organic matter and seed that is carried by the runoff. This method can be done by taking woody plants that are native to the area and driving them into the dirt or subsrate of the eroded area so they can sprout roots and grow. Live staking is relatively low cost and can be easily done by the landowner.



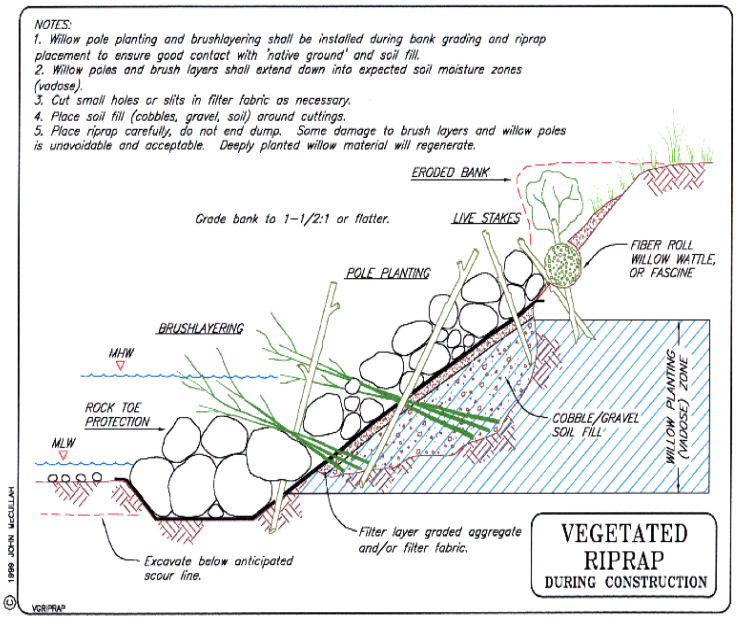
Brush Mattress

A brush mattress consists of a thick (15 to 30cm) blanket of living cuttings and soil fill that is placed on a stream bank or lake shore to simultaneously re-vegetate and armour the bank. This method works well on badly eroded slopes because the dense layer of brush increases roughness, reduces velocities at the bank face and protects the bank from scour. As the live branches root and grow, they provide cover and reinforcement for the soil underneath. If these mats are used on stream banks, they trap sediments during high water and eventual plant growth will enhance aquatic habitat. This method is relatively cost effective but can be quite labour intensive depending on the area.



Vegetated Rip-Rap

Vegetated Rip-Rap combines the rock revetment techniques with vegetative techniques. It consists of a layer of stone or boulder armouring that is vegetated using pole planting, brushlayering and live staking. This technique works best for waterways or inland lakes where continuous and resistive bank protection measures are needed. Plants incorporated into the riprap will create a more natural look to the shoreline as well as create habitat for aquatic and terrestrial wildlife. Although an expensive and sometimes difficult method to implement depending on the land, this option offers an opportunity for the land owner to attain the immediate and long-term protection afforded by riprap with the habitat benefits inherent with the establishment of a healthy riparian buffer.



Hard" Armoring

In certain situations, soft armoring techniques may not be enough. These "harder" solutions are **only approved in situations where erosion risk is very high.**The use of human-made structures alone, such as solid concrete or rocks in cages, or gabions, **use to be** the control method of choice. Experience has shown that these methods are **difficult to implement successfully** and if improperly designed or installed may be worse off than just leaving the problem alone. This technique is often more expensive than soft shore techniques and requires the use of heavy equipment which is more likely to cause damage to the surrounding area. It is also more difficult to obtain approvals for these types of solutions. Consult with the Association of Professional Engineers, Geologists and Geophysicists of Alberta for suitable advice and techniques available. New techniques such as "green gabions" are available to mix a hard approach with live plants and may be useful for updating already existing retaining walls or other forms of hardened shoreline modifications.

BEFORE

AFTER: The 'greener" approach

Revetments

Shorelines can be protected against erosive wave action by placing rocks or other inert material against the bank. This type of protection is called a revetment. Flexible revetment structures include riprap and Gabions. Rip-rap consists of large washed stones or gravel placed on a slope or artificially graded shore and usually placed to protect underlying soil from erosion due to flowing water. Although this method is relatively easy to install for smaller areas, it can be expensive, may require the use of heavy equipment and doesn't have the same ability as plant roots to keep soil firmly in place. Gabions are rectangular wire mesh baskets filled with large washed rocks. Gabions are best for areas without much foot traffic and when an area to be protected is usually already severely eroded or you want to direct the force of a flow of water around a vulnerable structure.

Bulkheads and retaining walls

A naturally occurring slope is usually gradual and will absorb the energy of the waves but when bulkheads and retaining walls are installed, they cause waves around it to crash into shore. A lot of the energy from these waves

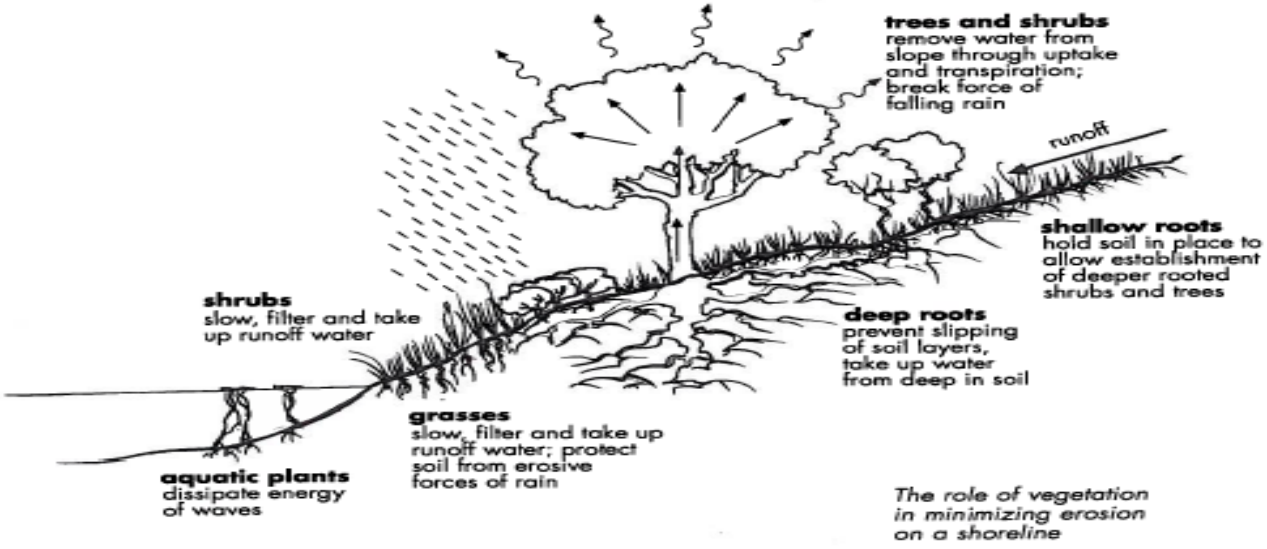
is sent downwards into the base of the wall causing the substrate to slowly be dug out from under the wall's foundation eventually leading to it tumbling into the water. Furthermore, water draining from upland will build up behind the wall and push on it from behind which can be a problem especially during freeze-thaw cycles. The construction of bulkheads or retaining walls can also pose problems to neighbours' properties as it increases erosion rates on either side of it. From an environmental standpoint, retaining walls are by far **the most destructive method** of stabilization because natural vegetation that provides feeding grounds and shelter for Wildlife is cleared and built over. Retaining walls are also the most expensive and troublesome because they require constant maintenance and only provide a quick fix for a short period of time. **Rigid structures, such as retaining walls are not recommended by Alberta Environment and Parks except in public uses areas such as marinas.**You must obtain a permit for your erosion control project and it should include advice for designing and installing revetments where needed.

Recommended Shoreline Protection Methods

For the best chance of protecting your shoreline now and in the future we recommend the use of **"softer"** approaches over "harder" ones. These methods are not only more cost efficient for both install and maintenance but also more durable, aesthetically pleasing and environmentally friendly. These methods will help create a healthy riparian zone on your land and allow the shoreline to blend in with its natural surroundings. Plants and trees provide the best natural protection for the long run and by planting them early or leaving already existing ones alone you avoid potential costly and unfixable property loss. The most favorable soft approaches, such as the ones listed above, as well as others including: erosion control fabrics, hydroseeding, mulching and topsoiling are only just some of the ways you can help keep your shoreline as natural as possible and protect it from erosion.

Controlling shoreline erosion and doing work in and around a water body will generally requires at least two provincial approvals (Public Lands Act, Water Act), and possibly approval from Fisheries and Oceans Canada (federal Fisheries Act or Navigable Waters Protection Act). **Check to make sure you have all the required approvals and plans before you start doing any work on your shoreline!** For more information please check out our website:

http://aep.alberta.ca/land/shorelands/approvals-regulatory-requirements.aspx



The role of vegetation in minimizing erosion on a shoreline