



If your streambank or shore-line is severely eroded, you'll need to stabilize the soil to promote plant growth. There are three general approaches you might consider; live planting, bioengineering, and hard armoring. The best technique will depend on your situation – the size and location of your stream or shoreline, and the cause and severity of the erosion. Often, the best approach is to use a combination of techniques. Before attempting any shoreline stabilization activity, please obtain the applicable permits.

You may be able to stabilize shorelines or prevent erosion problems by planting appropriate types of vegetation, then allowing nature to heal itself. Costs of this approach are relatively low, and homeowners can implement this approach on their own. A small investment of time and money can prevent a serious erosion problem that, in the future, could be very expensive to correct.

## Live Plantings

## Bioengineering

Bioengineering relies on a combination of structural components and plant material to produce a dense strand of vegetation that serves as a “living system” to protect streambanks and shorelines. This technique works to stabilize many, but not all, erosion problems. One challenge in bioengineering is protecting the bank from erosion until the vegetation becomes established. This could take one to two years. There are a number of structural components available to provide temporary protection while the plant growth becomes established. One example is the use of coconut fiber rolls (flexible ‘logs’ made from coconut hull fibers). These can be effective in providing the structural component which protects the ‘toe’ or base of the streambank most vulnerable to erosion. Another example is erosion control blankets, useful for protecting the slope of the bank above the toe. Bioengineering may require bank shaping to reduce the slope of the bank.



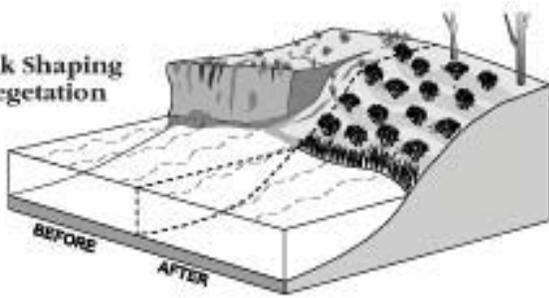
## Hard Armoring

Hard armoring includes a variety of techniques including rock riprap (large stones placed along the slope) and gabions (rock-filled wire baskets placed along a streambank). Hard armoring typically involves grading the bank to a gentler slope. If done properly, these techniques provide very good protection and will work in severe situations where bioengineering will not. However, hard armoring techniques can be relatively expensive and many require professional assistance. These techniques are often used in situations where less expensive, more environmentally friendly and aesthetically pleasing alternatives would have been successful.

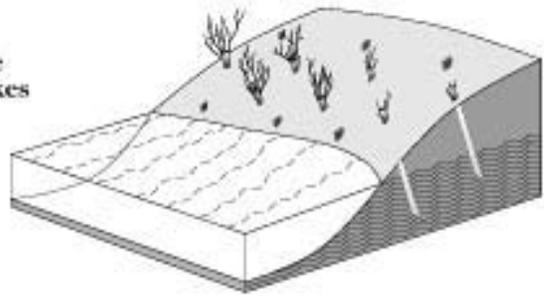
## Stabilization Techniques

Treatment	Description	Cost	Equipment Required	Stabilization Purposes			Comments
				Toe protection	Upper Bank protection	Runoff control	
<b>Preparation</b>							
Bank Shaping	Removal of soil to reduce slope of steep banks to a more stable angle.	Moderate to high	Hand tools or power machinery	Used on conjunction with other techniques			Stabilization techniques can be more successful with a stable slope.
<b>Live Plantings</b>							
Vegetation	Trees, shrubs and other vegetation used to stabilize banks	Low	Hand tools or light power machinery	●	●	●	May require protection from flowing water (stakes, erosion control matting) during root establishment.
Live stakes	Branches of rootable plants inserted into the bank	Low	Hand tools		●		A flexible technique with many applications
Branch packing	Live branch cuttings incorporated into compacted soil	Moderate	Hand tools		●	●	Used to fill depressions in soil.
<b>Bioengineering</b>							
Coconut fiber roll	Flexible 'logs' made from coconut hull fibers, staked at the toe of the bank	Moderate	Hand tools	●			Used on conjunction with native plants to trap sediment and encourage plant growth.
Brush mattress	Live branch cuttings covering entire stream bank and secured in place.	Moderate to high	Hand tools		●	●	Provides immediate complete cover and long-term stabilization
<b>Hand armoring</b>							
Rock riprap	Large stones along the slope of a bank to stabilize the soil	Moderate to high	Light to heavy power machinery	●	●	●	Required good design and construction
Gabions	Wire baskets filled with rocks	High to very high	Light to heavy power machinery	●	●	●	Can reduce or eliminate the need for bank sloping by creating a vertical wall

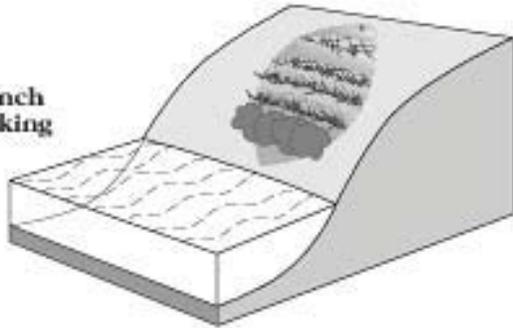
**Bank Shaping & Vegetation**



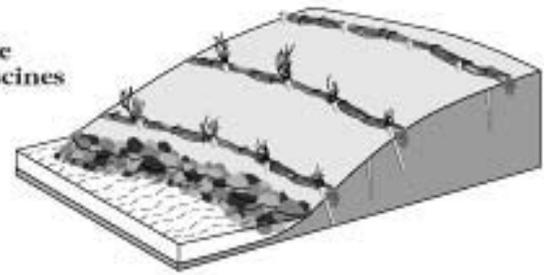
**Live Stakes**



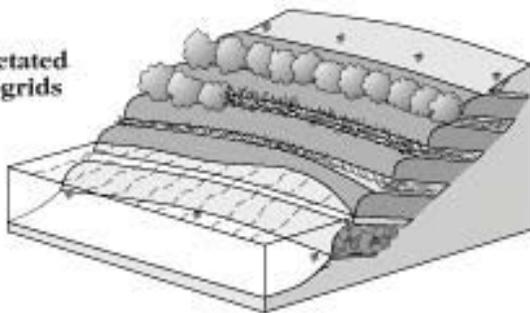
**Branch Packing**



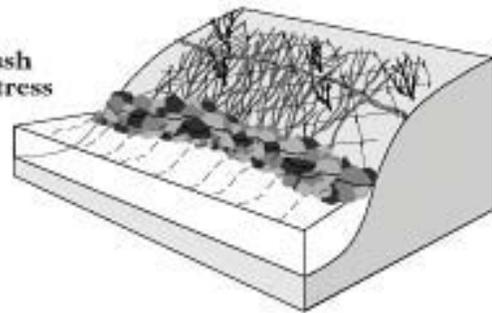
**Live Fascines**



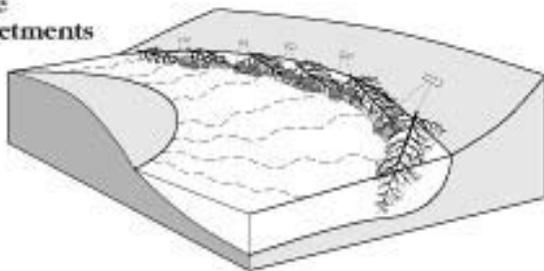
**Vegetated Geogrids**



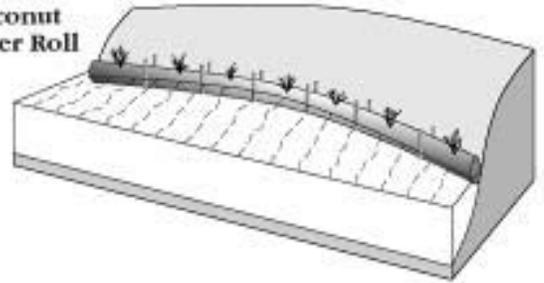
**Brush Matress**



**Tree Revetments**



**Coconut Fiber Roll**



**Rock Riprap**



**Gabions**

