Riparian Restoration

Using Stabilization Techniques

TVA

To Control Erosion and Protect Property

If your streambank or shoreline 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. In many cases, the best approach is to use a combination of techniques. Before attempting any shoreline stabilization activity, be sure to obtain applicable permits.

Live Plantings

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.

Bioengineering

Bioengineering relies on a combination of structural components and plant material to produce a dense stand 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 or shoreline 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 of a streambank or shoreline) and gabions (rock-filled wire baskets placed along a streambank or shoreline). 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 may 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

The following pages present a few examples of the many techniques being used as bank treatments for streams and reservoirs. These illustrations are conceptual only; seek professional advice to determine the best solution for your property.

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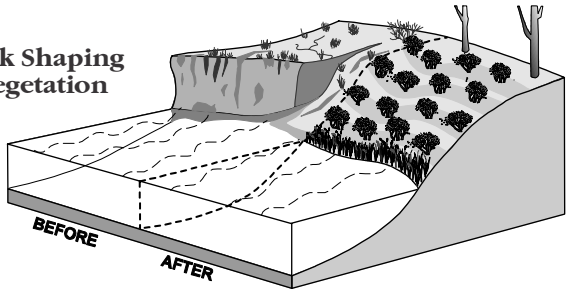
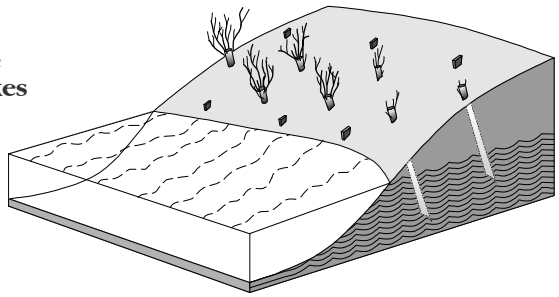
Stabilization Techniques

Treatment	Description	Costs	Equipment Required	Stabilization Purposes			Comments
				Toe protection	Upper bank protection	Runoff control	
Preparation Bank shaping	Removal of soil to reduce the slope of very steep banks to a more stable angle.	Moderate to high	Hand tools or power machinery	Used in conjunction with other techniques			Stabilization techniques can be more successful with a stable slope.
Live Plantings 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.
Live fascines	Bundles of live branch cuttings that are buried into the bank and staked in place.	Moderate	Hand tools		✓	✓	Enhances conditions for colonization with native vegetation; often used with other bioengineering techniques and vegetative plantings.
Bioengineering Vegetated geogrids	Alternating layers of live branch cuttings and compacted soil layers wrapped in geotextile fabric to rebuild and vegetate eroded banks.	High	Hand tools	✓	✓	✓	Can be installed for steeper and higher slopes; useful in restoring outside bends where erosion is a problem.
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.
Tree revetments	Rows of cut trees (usually cedar trees) anchored to the toe of the bank.	Low	Hand tools or light power machinery	✓			Often used as toe protection with other bioengineering techniques.
Coconut fiber roll	Flexible "logs" made from coconut hull fibers, staked at the toe of the bank.	Moderate	Hand tools	✓			Used in conjunction with native plants to trap sediment and encourage plant growth.
Hard armoring Rock riprap	Large stones along the slope of a bank to stabilize the soil.	Moderate to high	Light to heavy power machinery	✓	✓	✓	Requires 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.

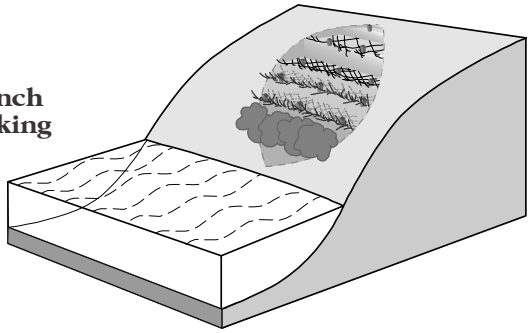
Bank Shaping & Vegetation



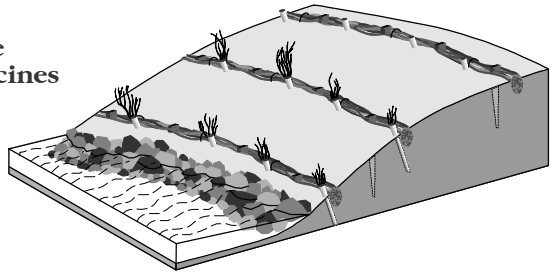
Live Stakes



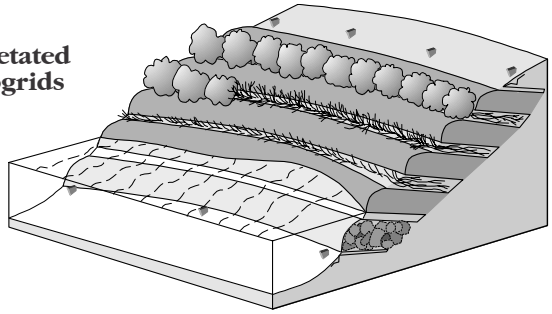
Branch Packing



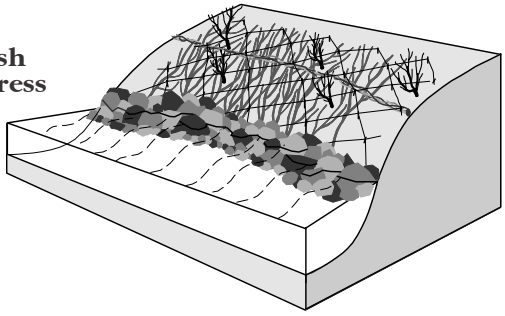
Live Fascines



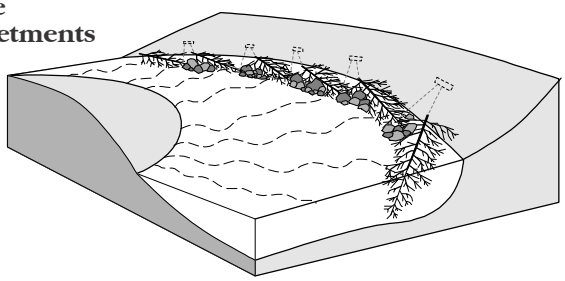
Vegetated Geogrids



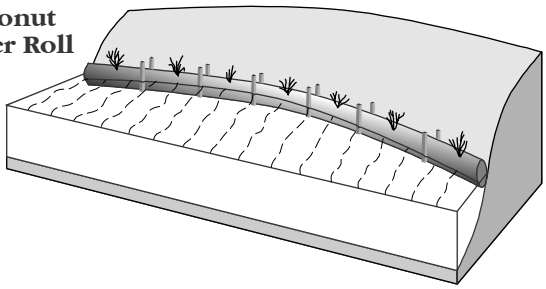
Brush Matress



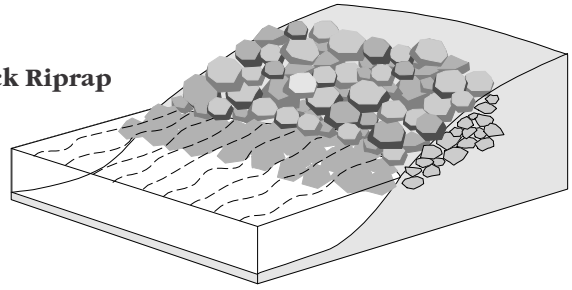
Tree Revetments



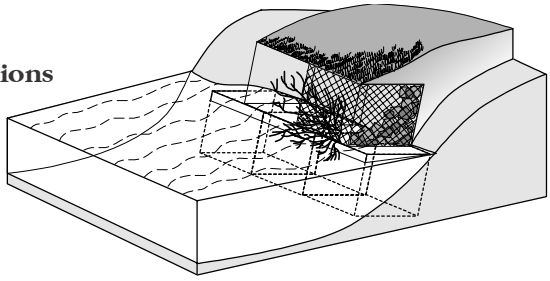
Coconut Fiber Roll



Rock Riprap



Gabions



Illustrations were adapted with permission from "Stream Corridor Restoration: Principles, Processes, and Practices," by the Federal Interagency Stream Restoration Working Group

Stabilization Projects in Progress

Live Stakes and Coconut Fiber Roll

Vegetated Geogrid and Coconut Fiber Roll

Gabions and Filter Fabric

Gabions and Rock Riprap

Tree Revetments

Riprap

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