

USING PLANTS TO STABILIZE STREAM BANKS

This handout is intended to provide you with a general orientation to the three most common and practicable soil-bioengineering techniques. In a number of situations, soil bio-engineering (using live and cut vegetation) can be used to successfully stabilize stream banks. Property owners can use these techniques, including cuttings, fascines, and brushing layering, to:

- Prevent surface erosion on steep slopes
- Increase native riparian vegetation and habitat
- Stabilize small creek banks
- Divert and/or absorb runoff
- Minimize and prevent bank failure

Soil-bioengineering has many benefits over more conventional engineering solutions, such as:

- Reducing maintenance costs
- Promoting diverse and productive riparian habitats
- Providing additional cover for fish
- Improving water quality
- Improving aesthetics and appearance
- Creating local employment opportunities

Some property conditions will require expert consultation from landscape architects, engineers, and/or hydrologist. These conditions could include:

- Significant slope instability and erosion
- Dangerous bank failure
- Heavy flooding

Cuttings

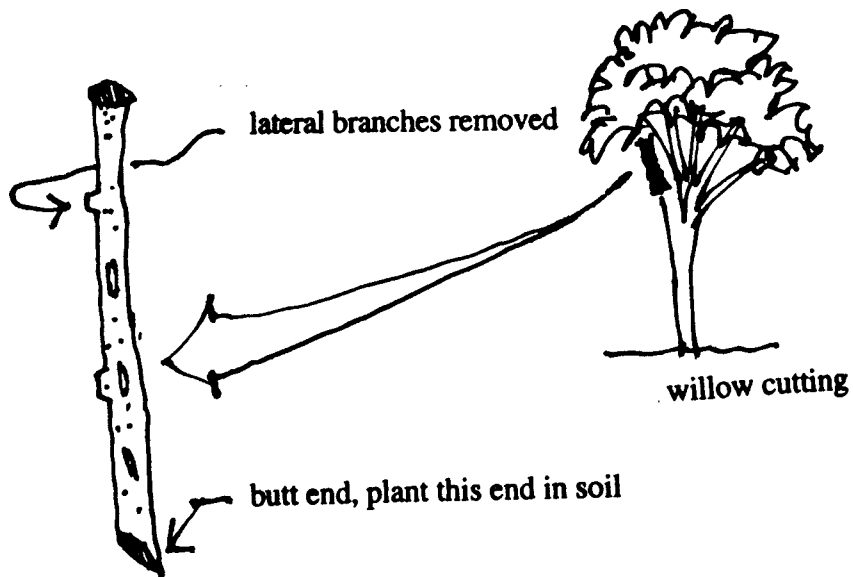
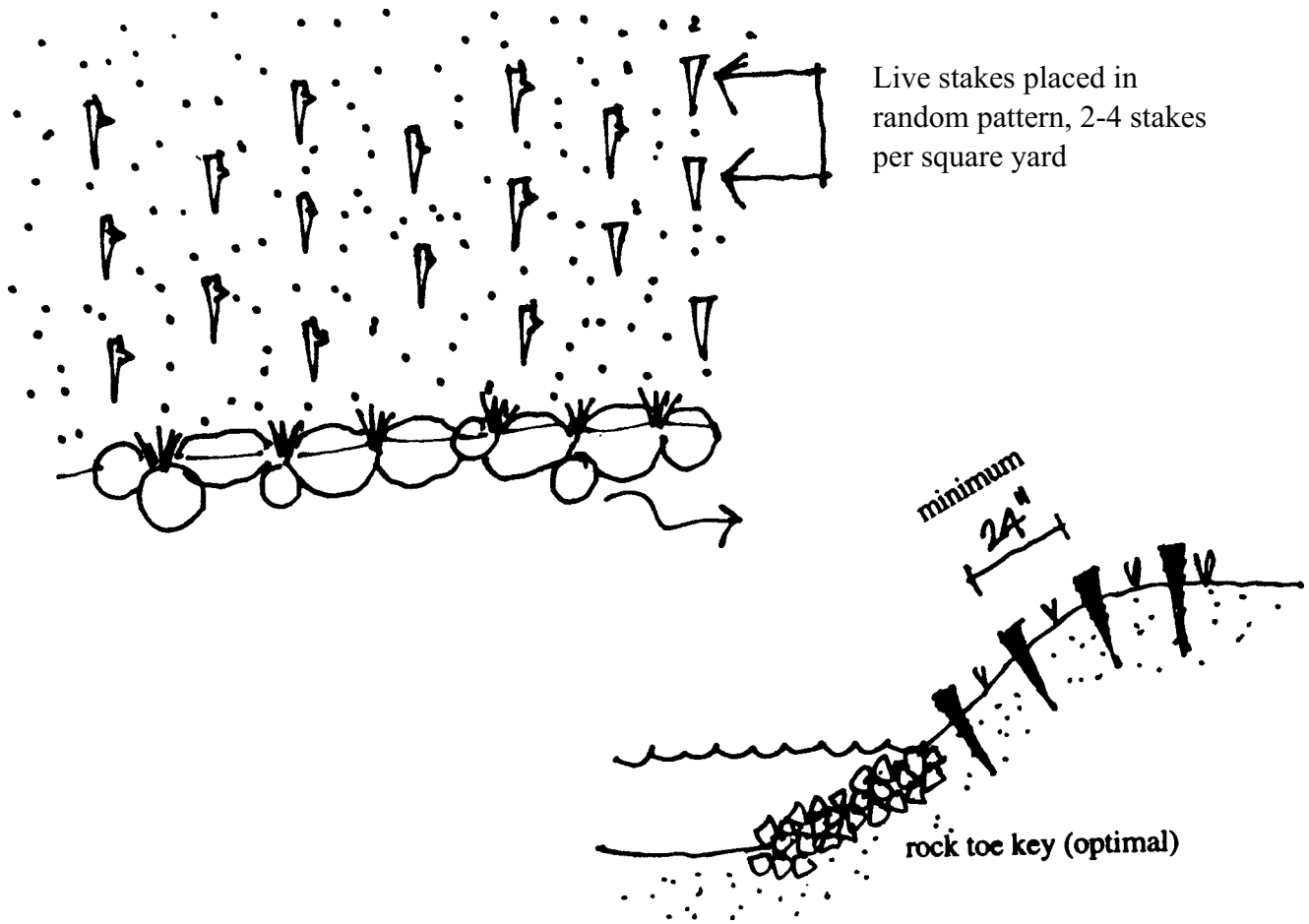
Preparation of cuttings should involve cutting the fatter stems near the base of main branches of shrubs or trees, rather than using the new growth tips, which are thinner and more vulnerable to damages. The cutting should be at least 18" long and 1"-3" thick. Pole sizes are 4-10 feet long and up to 6" thick.

The butt end of the cutting is the end that is planted down in the ground and will root. This butt end should be pointed when you make the cutting. This is helpful for two reasons. The point establishes what the butt end is, so you don't accidentally plant the cutting upside down in the ground, and the point helps make it easier to drive the cutting into the soil. Use sharp tools to make the cuttings so you don't mangle them with loppers or pruners and make them vulnerable to water moisture loss and other problems.

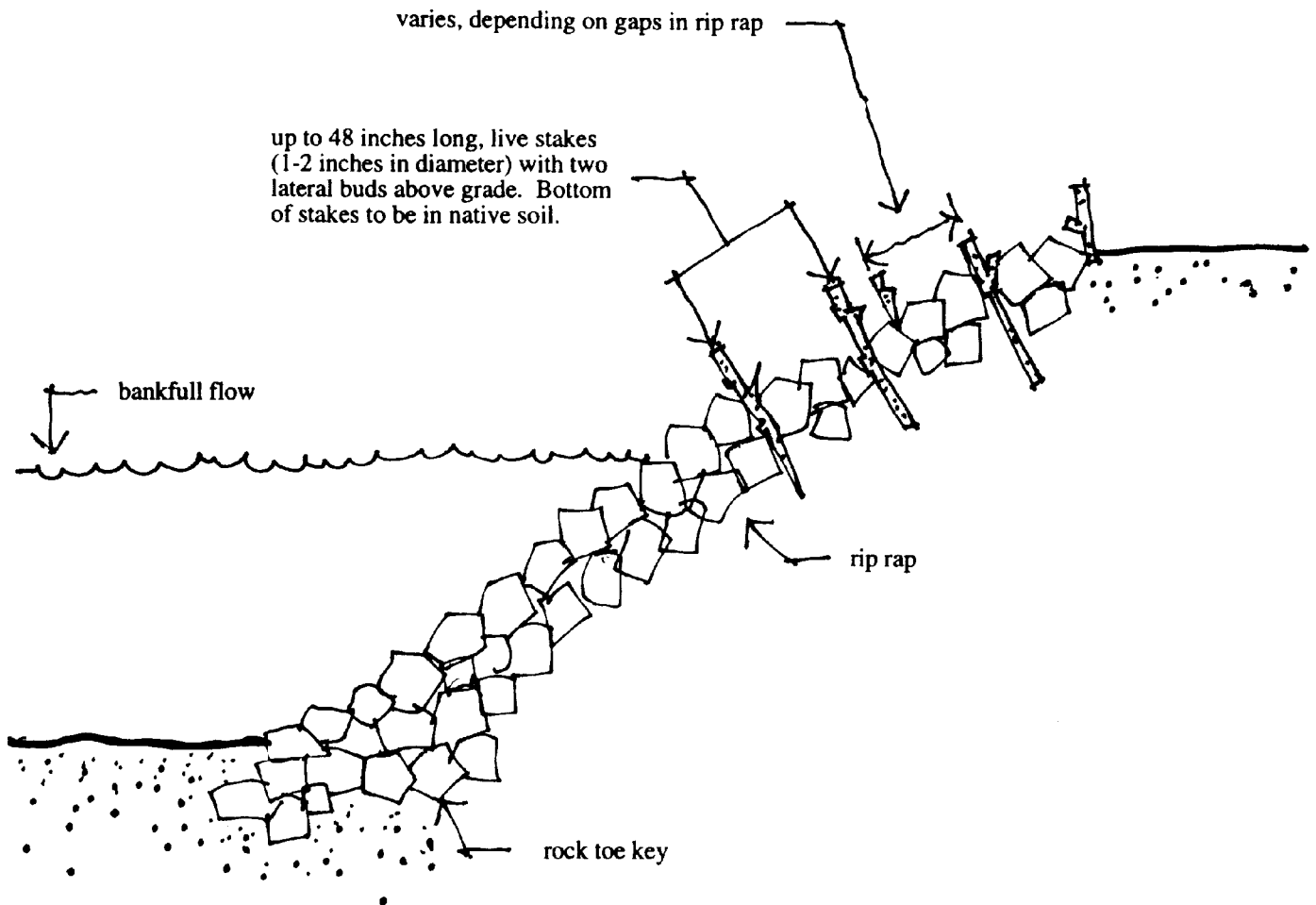
Prepare holes for cuttings in dry soil by driving a piece of rebar into the ground and pulling it out. Gently tamp the cutting into the hole created by the rebar to prevent stripping the bark. Roots start from points in the inner bark so loosening of the bark from the wood destroys the root-sprouting ability of the cutting. Don't damage or split the cutting when hammering in because this significantly hurts its survival capabilities. The deeper the cuttings are set, the better. A good goal is to bury 4/5ths of it below ground. Shallow planting results in too few roots below ground, too many leaf shoots above ground and early death to the cutting because the scanty roots cannot supply water and nutrients rapidly enough for the greater mass of foliage. Wooden, sand or shot filled mauls are better to use in carefully driving or tamping cuttings than metal hammer heads to reduce damage to the plant material.

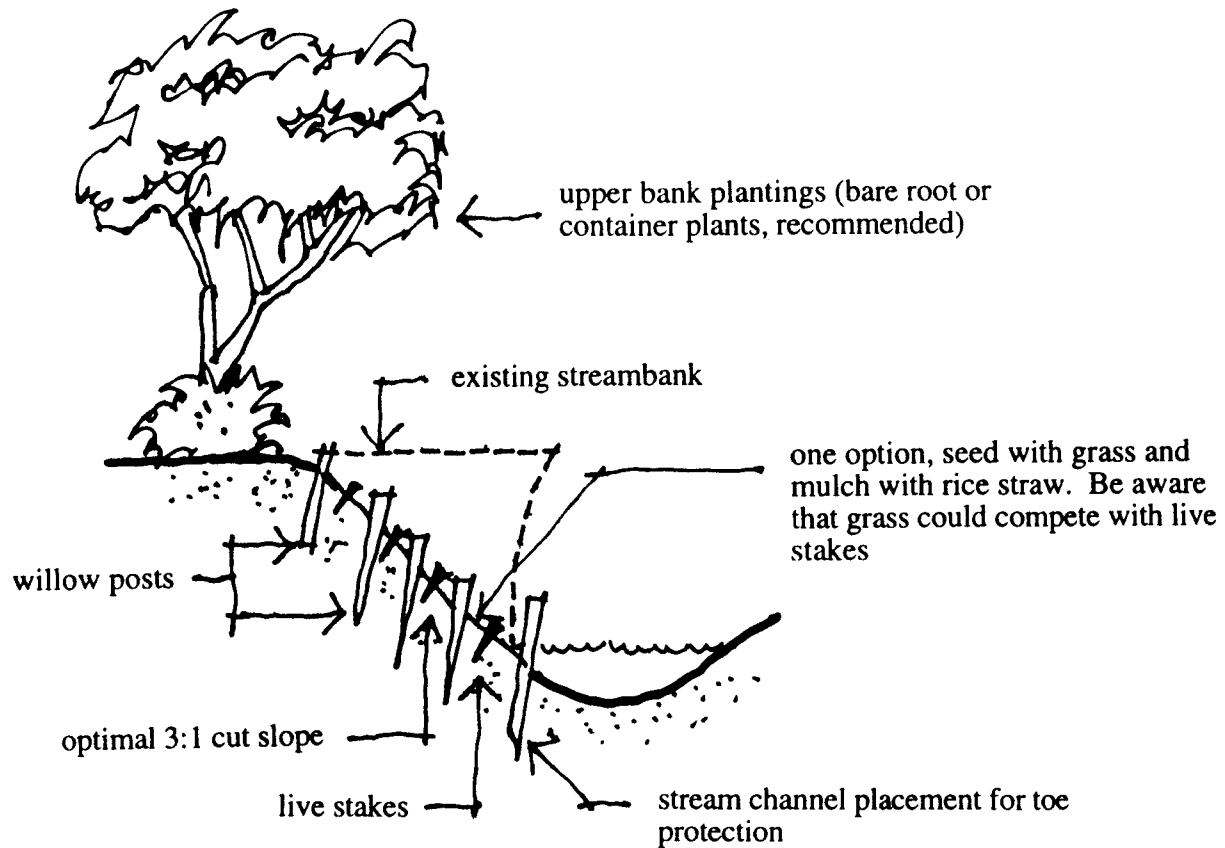
Willows and cotton woods are good species to use to make poles. Cut 3" to 6" diameter trees and branches into average lengths of 6-8 feet with a chain saw and remove all the lateral branches. Sharpen the bottom end to ease planting. Planting poles in softer moist soil is easier than hard, dry soil, but even good site conditions have challenges because of how deep you need to plant poles. At least half of the pole should be driven in the soil. Make a hold first as illustrated on page 5 using a construction stake-a steel rod with a point on the end. This process works best with a team of two working together. One person holds the stake and the other hammers it in. The stake holder needs to wiggle the stake after every few blows of the hammer to make it possible to remove the stake after it has made the hole. After the hole is as deep as you can get it, remove the construction stake and place the live post in it. Put a 2" x 4" board on top of the live post to hammer it in. The board makes it easier to hammer the pole in and protects the pole from splitting. After hammering the pole in as far as you can, saw off the top few inches containing any damaged portion.

Poles should be set deep enough to maintain contact with the water table, but not so deep that they are completely submerged for long periods of time. Long periods of submergence will kill the poles. Some projects are designed using poles installed in the stream channel to help slow and deflect flows away from a stream bank. In these cases, even if the poles die from prolonged submergence, they still serve this useful structural role.

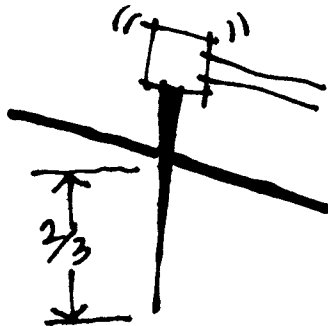


INSTALLATION OF LIVE STAKES
 (shown with an optional rock toe key)
 Riley/O'Connor

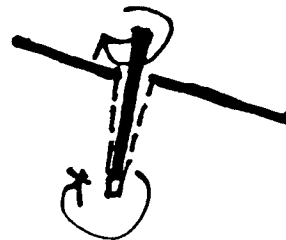




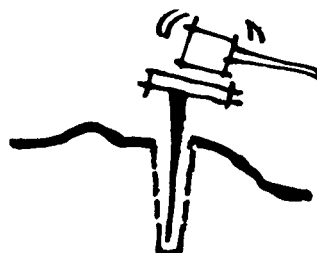
1. Using a substantial sledge hammer and a construction stake (metal pole with a point) make a planting hole.



2. Wiggle stake loose after every few blows of the hammer so you will be able to remove the stake after making as deep a hole as you can.



3. Place live pole in hole started by stake. Place a board on top of the pole and then hammer the live pole in. The board protects the pole from splitting.



INSTALLATION OF POLE CUTTINGS FOR STREAM BANKS

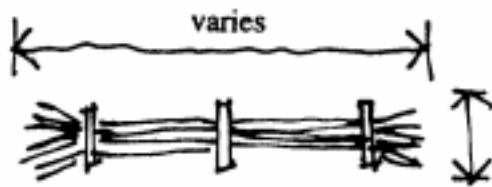
Riley/O'Connor

FASCINES

Fascines are bundles of cuttings three feet or longer and about 8"-10" in width. We have found them particularly good at anchoring the vulnerable toes of stream bank or terrace slopes. fascines should be planted above the elevation of the base flows in the channel so that they do not die from being submerged under water too long. The fascines are laid end to end on the contour of a slope. They should protrude from the slope a few inches and that way provide a terrace which helps break up and protect the slope. The stabilization project should start at the bottom and work up the slope.

Use the following steps to install fascines:

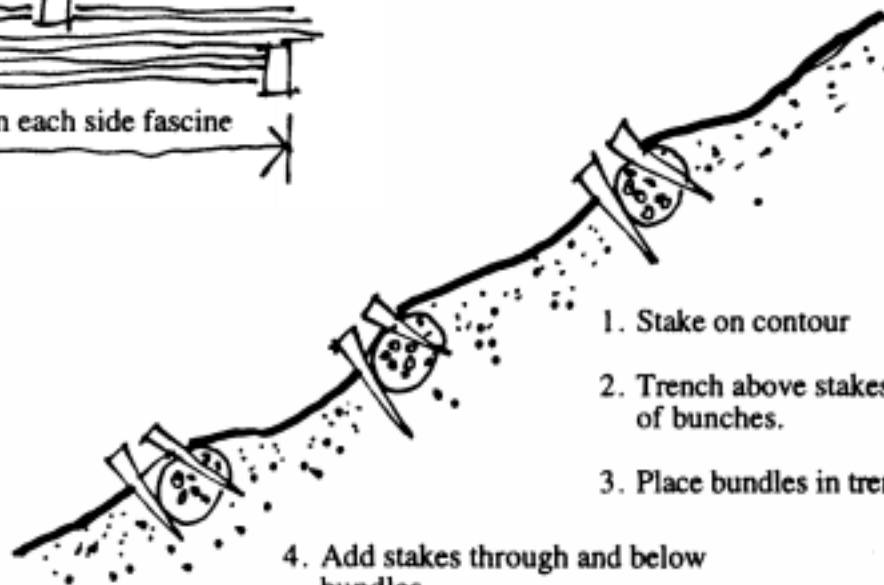
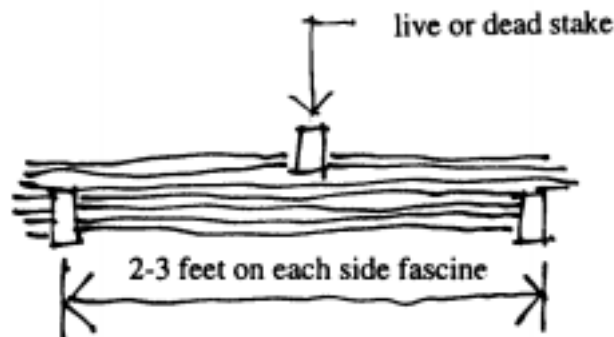
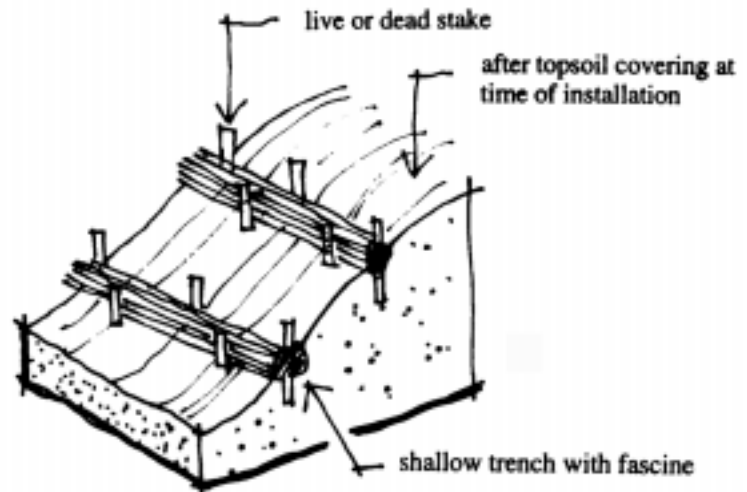
1. Have some of your crew members prepare the cuttings and make the fascines while others are preparing the slope for planting.
2. To make a fascine bundle, mix cuttings from a few riparian species to increase the chances that at least one species will adapt well to the site. Willows and cottonwoods for example won't do well if they are located too high on a dry slope with little moisture. To make the bundle, alternate the butt and growing tips. When the bundle is about 10"-12" thick, tie it together tightly with a string every 15" or so. It should pack down to somewhere between a 8"-10" bundle.
3. To prepare the slope for terracing, use a hand held level to stake a level contour at the base of the hill. This is best accomplished with two people. One person holds the level and instructs the second to place stakes on the contour every 3-4 feet. After the contour is staked dig a 12" wide and 6" deep trench directly above the stakes.
4. Line the trench with fascines by coupling the ends of the fascines together. Stake them where they join to hold them together.
5. This step is the most important to do correctly. Sift and tamp soil down into the fascine with a shovel so that you fill it with as much dirt as possible. You want to maximize dirt-plant material contact. Walk up and down the trench, packing dirt into the fascine as the finishing touch.
6. Add stakes through the bundle at the top of the trench. If you can, cross the stakes over the bundle to help hold it in.
7. Install more terraces in the same manner. On 3:1 slopes, space the terrace no more than 6-8 feet apart.
8. If you are on a dry slope at high elevation or in a dry Western or Southwestern environment, complete the project by watering the fascines with a water tank truck or other available means.
9. Stakes used to hold the fascines are made of 2 foot long 2" x 4" boards cut on a diagonal. Live cuttings can also be driven through the fascines to both aid in holding them in place and to help revegetate the site.



Prepare wattling, cigar-shaped bundles of live brush with butts alternating, 8-10 inch diameter and tied at 12-15 inches on center.

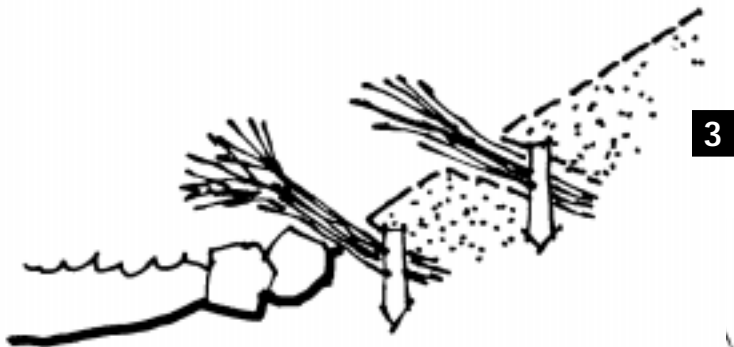
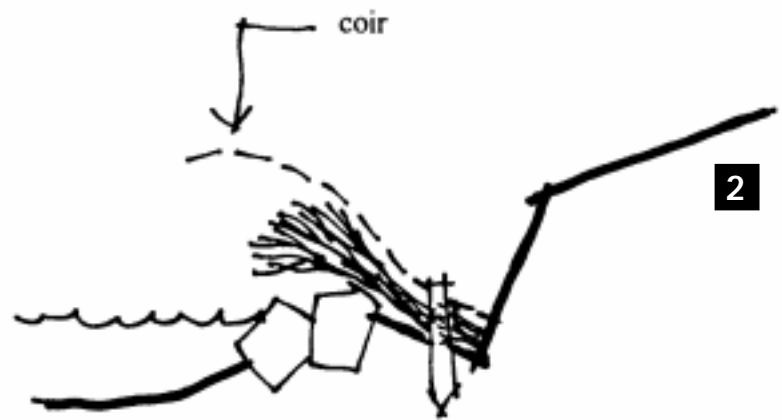
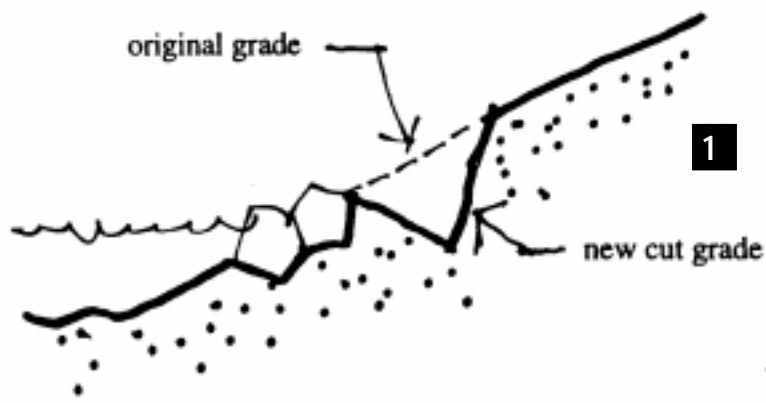
Species which root easily are preferred.

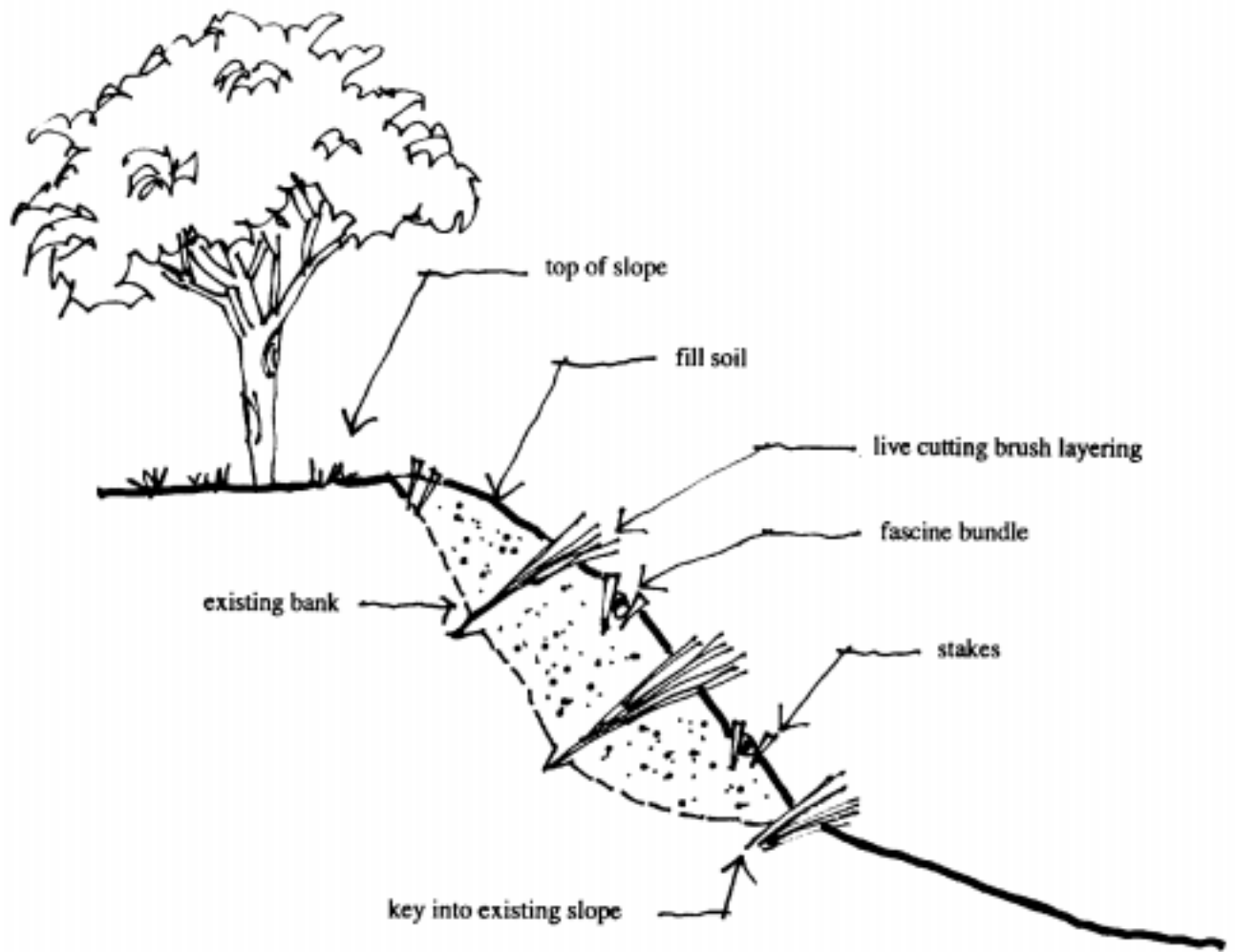
Bundles may be 10-30 feet in length.



1. Stake on contour
2. Trench above stakes at 1/2 to 2/3 of bunches.
3. Place bundles in trench

4. Add stakes through and below bundles.
5. Cover wattling with soil, stamp firmly. Wattling should be 1/3 above and below grade, with 10-20 percent exposed.





INSTALLATION OF BRUSH LAYERING AND FASCINE COMBINATION

(used to restore slope)

Riley/O'Connor