MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND
COLLEGE PARK•EASTERN SHORE

Fact Sheet

Fact Sheet 729

RIPARIAN BUFFER MANAGEMENT

SOIL BIOENGINEERING OR STREAMBANK RESTORATION FOR RIPARIAN FOREST BUFFERS

Streambank erosion is a serious problem along many waterways in the Chesapeake Bay watershed. Using vegetation to stabilize and control or minimize erosion problems near streambanks and their immediate upslope area is less expensive than repairing erosion-caused damage. Techniques to stabilize streambanks work by either reducing the force of the flowing water, by increasing the resistance of the bank to erosional forces, or by a combination of the two.

The following techniques primarily increase the resistance of the streambank through binding the soil with root systems and growing a vegetative cover. These techniques are also known as soil bioengineering. Once established, this living material effectively controls water runoff and wind erosion, minimizes frost heaving effects by binding the soil with roots; filters soil from runoff; intercepts raindrops, reducing soil erosion; improves rainwater percolation into the ground; and moderates ground and water temperatures.

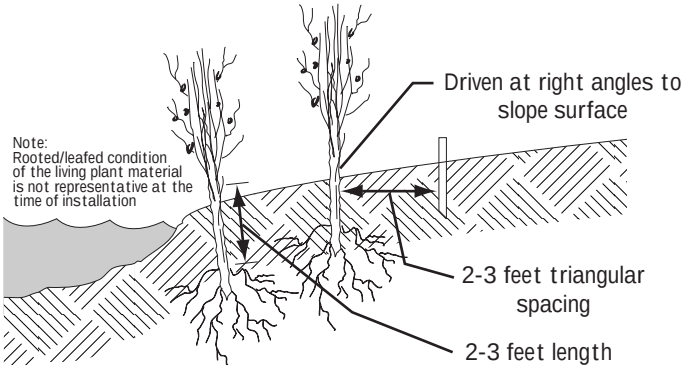
Several soil bioengineering techniques will be addressed in this fact sheet:

1) live staking,
2) conventional plantings,
3) live fascines,
4) branchpacking,
5) brushlayering, and
6) brushmattressing.

Often, methods are combined or intermixed to achieve the desired results. When first installed, these projects offer little immediate stabilization to the streambank, but their value quickly grows.

The live staking (Figure 1) method uses dormant, living woody cuttings of species able to root quickly in a streamside environment. It is also called the willow post method, because willows are a preferred species to use. Shrub-type dogwoods, viburnums, and honeysuckles also work well. This method is appropriate on streambanks of moderate slope (4:1 or less) and in original soil (not fill). It is most effective on small earth slips and slumps that are frequently wet. The cuttings need to be large enough in diameter and long enough to be driven into the ground as stakes (usually 0.5 to 2 inches in diameter and 2 to 3 feet long). They must not be allowed to dry out and should be installed the same day as collected. Side branches should be cleanly trimmed and the bark left intact. The top is cut level and the basal end is cut at an angle to drive easily into the soil. The leaf buds are oriented upward when planting. If cuttings can be obtained from nearby vegetation at little or no cost, the expense for this simple type of bank stabilization is minimal.

Figure 1.
Live Staking.



Conventional plantings (Figure 2) offer a greater selection of plant materials. Transplants of all types are available, such as bare-root, container-grown, or balled and burlapped. Seeding of grasses and/or forbs (broad-leaved herbaceous plants and wildflowers) is also an option. If at all possible, local native species should be used because of their greater wildlife benefit and their adaptation to local climatic conditions. This technique entails greater cost and more installation work than live staking, but a greater variety of plants can be used. Spacing and layout will be determined by the plants selected.

Live fascines (Figure 3), also called wattles, are used to protect banks from washout and seepage, particularly at the edge of a stream and where water levels fluctuate only moderately. A fascine is a long (10 to 20 feet), sausage-like bundle of live, dormant branches. The branches used to make the bundle should be at least 4 feet long. The butt ends face the same direction and the branches are bound in an overlapping pattern to create the full length of the fascine. Bundles are 6 to 8 inches in diameter and tied with natural, undyed baling twine. As with live staking, live fascines are made with species that root easily, such as willows and shrub dogwoods. Working up the slope, live fascine bundles are placed in shallow trenches and held in place by dead stakes. Soil is foot-tamped in place along the sides of the bundle and live stakes are installed on the downslope side. Placement must be secure so water cannot wash soil out from beneath the bundles. The end effect is a series of short slopes, stairstepped and separated by the fascines.

Branchpacking (Figure 4) is a technique suitable for repairing an area of washed-out streambank, such as a hole, gully, or slumped area. The damaged area is prepared and then alternately layered with live branches (0.5 to 2 inches in diameter and 3 to 5 feet long) and soil. The section to be branchpacked is cleaned

Figure 2.
Conventional Plantings.

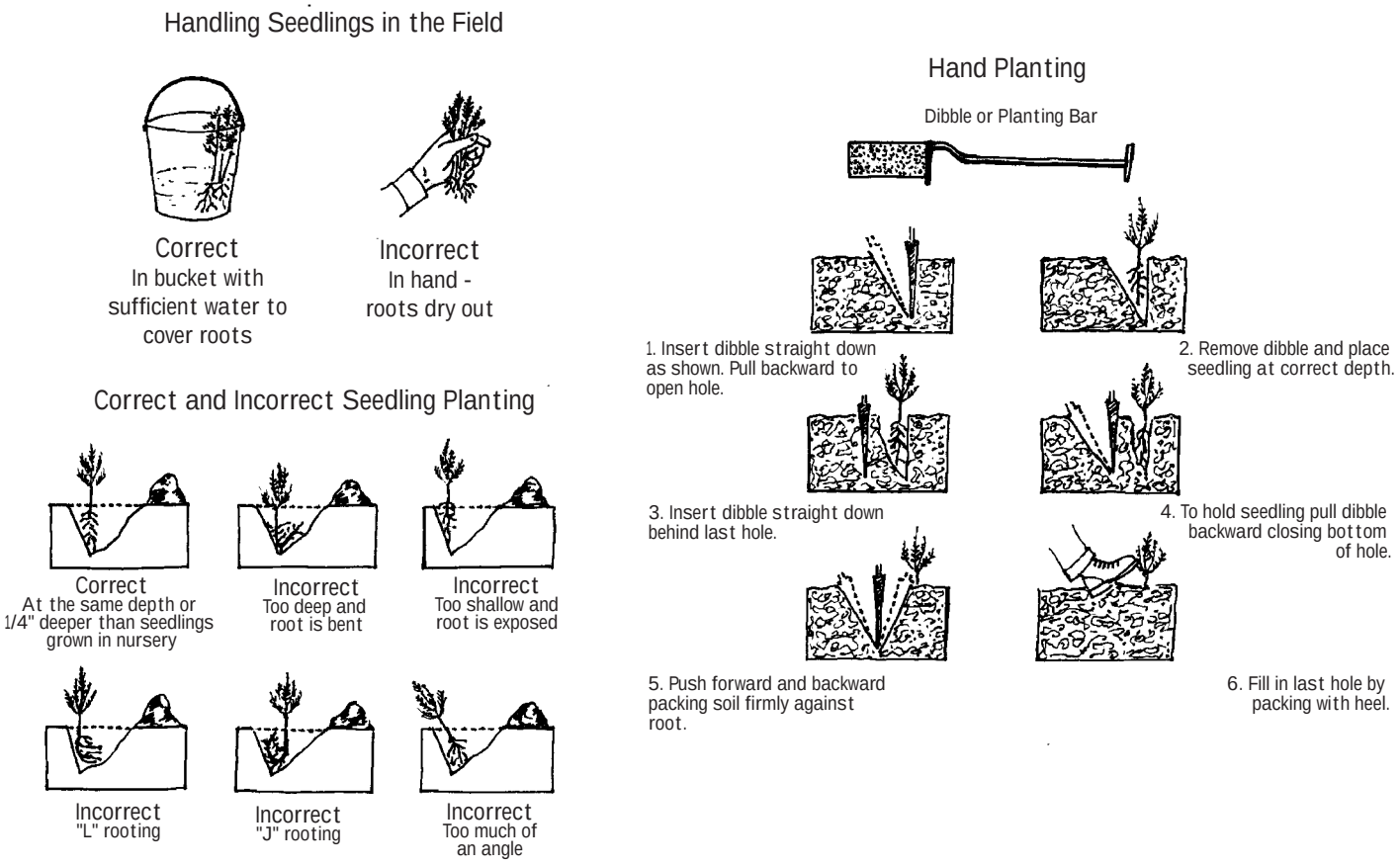
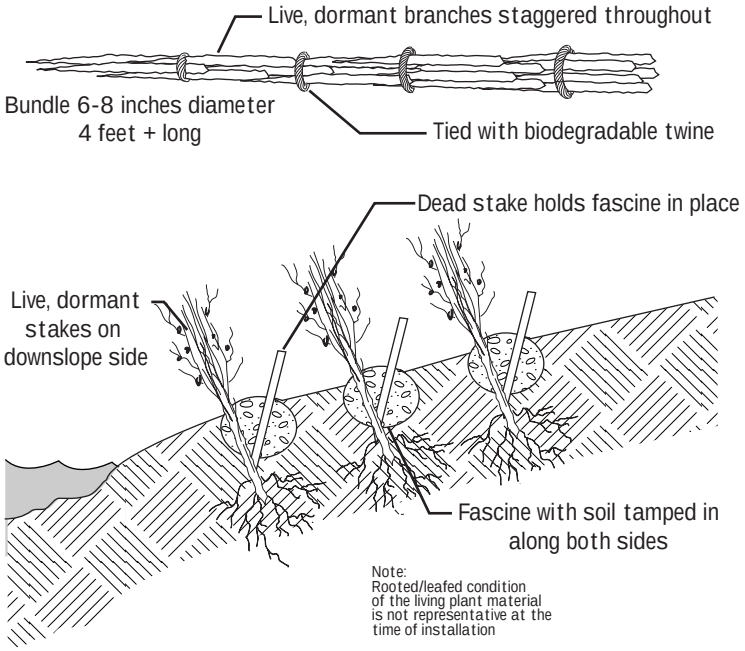


Figure 3.

Live Fascines.

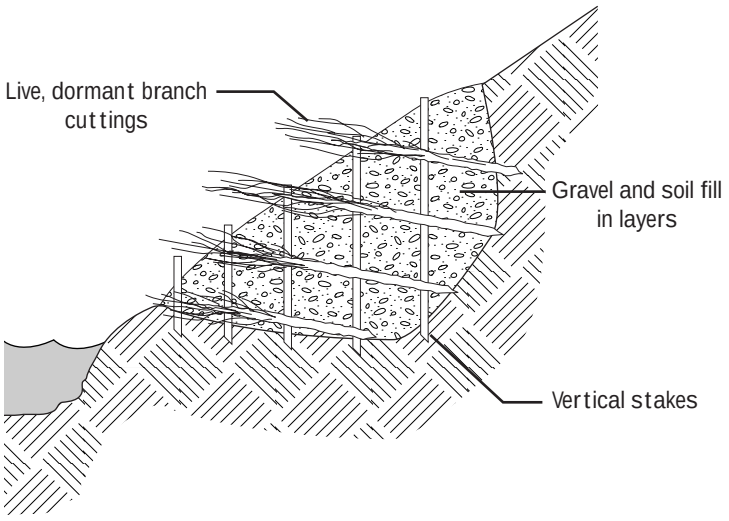


out and sloped toward the bank. Wooden stakes are driven vertically into the bottom of the washout, 4 feet deep and 1 foot apart. Then a thick layer of branches is pressed between the stakes at the bottom of the washout. These are covered with 8 to 12 inches of soil. This alternating procedure is continued until the entire washout is filled in. As layers of branches proceed upward the basal ends are placed lower in the soil than the growing tips. Also, the basal ends must extend into undisturbed soil. This technique is best limited to washouts no more than 5 feet wide and 4 feet deep, because it is a fairly complex design and labor-intensive to construct.

Similar to branchpacking, brushlayering (Figure 5) is used on slopes up to 2:1 in steepness and no more than about 15 feet high. With this method live branch cuttings are oriented more or less perpendicular to the slope contour. The cuttings (with their side branches intact) are placed in small "benches" excavated into the slope. Each bench or step is 2 to 3 feet wide and spaced 3 to 5 feet apart. Starting at the bottom of the slope, each lower bench is backfilled with soil from the next higher bench. Bare earth between the "steps" is mulched and seeded. This technique breaks up the slope length into a series of shorter slopes.

Figure 4.

Branchpacking.



An adaptation of several of the above techniques is brushmattressing (Figure 6). It is fairly involved and labor-intensive to construct, but benefits are both immediate and long term. After any needed grading is done, a live fascine is placed at the toe of the slope. Upslope from the fascine a grid of alternating dormant and dead stakes are driven into the ground. Around these stakes a layer of live, dormant, untrimmed branches are laid to cre-

ate a "mattress." Soil is then spread over the branches until they are partially covered. Wire is strung from dead stake to dead stake, creating a "mesh" to hold the brushmattress in place and tightly to the ground. The mattress provides immediate protection from erosion of the slope while the rooting and subsequently growing bushes from the fascine, the live stakes, and some of the branches in the mattress provide long-term benefits.

These six techniques are just thumbnail sketches of some of the techniques available to help restore streambanks. Contacting a local natural resource professional is highly recommended. That person can fully evaluate a problem area and develop a site-appropriate plan.

REFERENCES

Guidelines for Streambank Restoration. Georgia Soil and Water Conservation Commission. Sept., 1994.

"Soil Bioengineering for Upland Slope Protection and Erosion Reduction." U.S. Department of Agriculture Soil Conservation Service. 1992. *Engineering Field Handbook*, Ch. 18.

Figure 5.
Brushlayering.

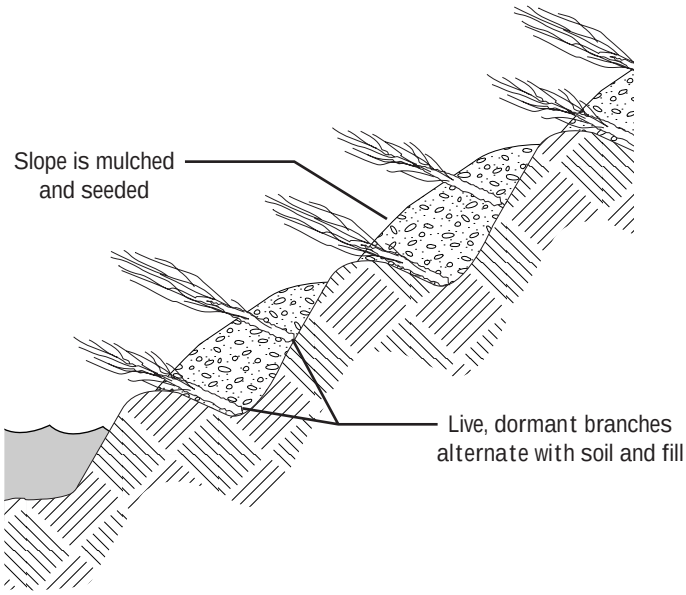
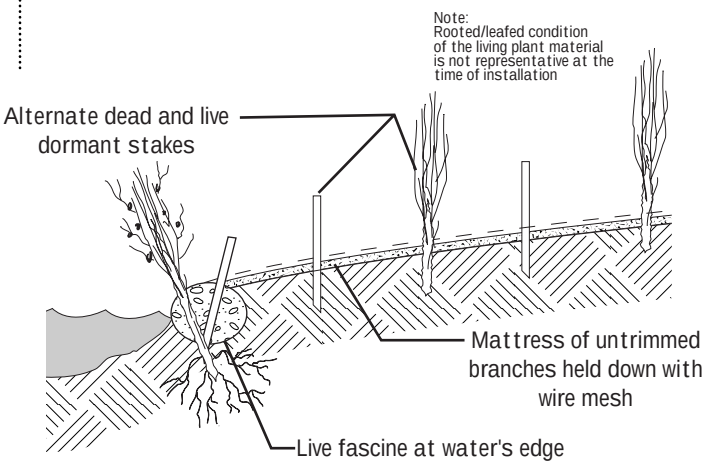


Figure 6.
Brushmattressing.



Riparian Buffer Management: Soil Bioengineering or Streambank Restoration for Riparian Forest Buffers

by

Robert L. Tjaden
Regional Extension Specialist
Natural Resources
Wye Research and Education Center

Glenda M. Weber
Faculty Extension Assistant
Natural Resource Management
Wye Research and Education Center

P97/V98

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, University of Maryland, College Park, and local governments. Thomas A. Fretz, Director of Maryland Cooperative Extension, University of Maryland.

The University of Maryland is equal opportunity. The University's policies, programs, and activities are in conformance with pertinent Federal and State laws and regulations on nondiscrimination regarding race, color, religion, age, national origin, sex, and disability. Inquiries regarding compliance with Title VI of the Civil Rights Act of 1964, as amended; Title IX of the Educational Amendments; Section 504 of the Rehabilitation Act of 1973; and the Americans With Disabilities Act of 1990; or related legal requirements should be directed to the Director of Personnel/Human Relations, Office of the Dean, College of Agriculture and Natural Resources, Symons Hall, College Park, MD 20742.