



OHIO

STREAM MANAGEMENT GUIDE

Live Fascines

Guide No. 14

Live fascines (fa-sheens) are long bundles of live woody vegetation buried in a streambank in shallow trenches placed parallel to the flow of the stream (Figure 1). The plant bundles sprout and develop a root mass that will hold the soil in place and protect the streambank from erosion. For optimum success in Ohio, fascines are constructed of thin live cuttings of willow or red-osier dogwood. These cuttings are bound together in bundles 6-8 inches in diameter and 4-20 feet in length. The name fascine comes from the Latin for 'bundle of sticks.'

The purpose of this Ohio Stream Management Guide is to describe the generally suitable site conditions, design, installation and maintenance steps for live fascines. The guidelines listed herein are a compilation of specifications from a number of sources (see References) and from field experience in Ohio. As with any construction project in a stream, the Ohio Department of Natural Resources recommends you consult with the applicable local, state and federal authorities listed in Guide 06, *Permit Checklist for Stream Modification Projects*, prior to construction. The extent of permit requirements will depend on the location and design of your project.

WHERE TO USE LIVE FASCINES

Fascines are useful in controlling erosion problems associated with over-bank run off, prior to the formation of deep gullies, and are most often used to stabilize fairly

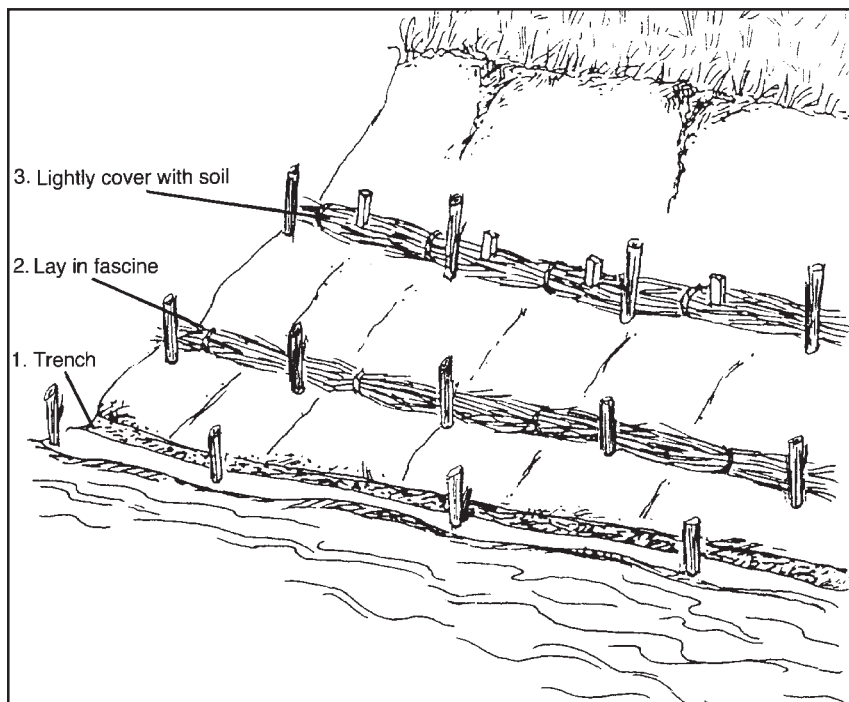


Figure 1. Live fascine construction

long slopes. The plant-filled trenches break up the length of the bank face, shortening each slope segment and reducing the energy available for erosion. The trenches act as a water retention system when placed horizontally or can serve as a drainage system if installed at a slight angle.

Fascines also help protect slopes from shallow slides and can be used to soak up ground water seepage which can de-stabilize a bank. Live fascines are best applied on small, headwater streams, or can be placed above the line of bank-full discharge on larger streams. They are also used to stabilize lake shorelines with shallow slopes. The lines of vegetation placed parallel to the contour of the shore can break up the erosive force of small waves since the

plants grow in lines perpendicular to the source of energy.

Some site conditions and/or project objectives (such as protecting existing structures on the streambank) will require use of more traditional, structurally engineered solutions. This is particularly true where high velocity flows can be expected. In other situations, a combination of structural and biotechnical practices, like live fascines, may provide both strength and habitat. Biotechnical practices are not likely to stabilize an eroded area if streambank erosion is very prevalent in your stream, an indication that the stream is undergoing a systematic change (e.g. deepening or widening). Consulting other Stream Management Guides will help in this planning effort.

No project should be undertaken without an understanding of the functions of stream energy and the source of any problem to be corrected. *Guide No. 03, Natural Stream Processes* will provide an overview of stream dynamics. Technical assistance about stream management can also be obtained at your local Soil & Water Conservation District. Its phone number is listed under County Government in local phone directories.

Site Requirements

For a successful installation of the practice, the bank face should be a maximum of 15 feet long. The streambank should have a slope no steeper than 1:2, that is, a one foot rise per two feet horizontal distance (see Figure 2). A slope of 1:3, that is a one foot rise to three feet horizontal distance, is preferable. Steeper banks should be excavated to this slope. The bank needs to be composed of a material that can easily be trenched and that can hold moisture to support growing vegetation; the presence and predominance of fine soil particles and organic matter will meet this requirement while banks composed of sand or gravel will not. The site will need to receive full sunlight since the live fascine is composed of tree/shrub

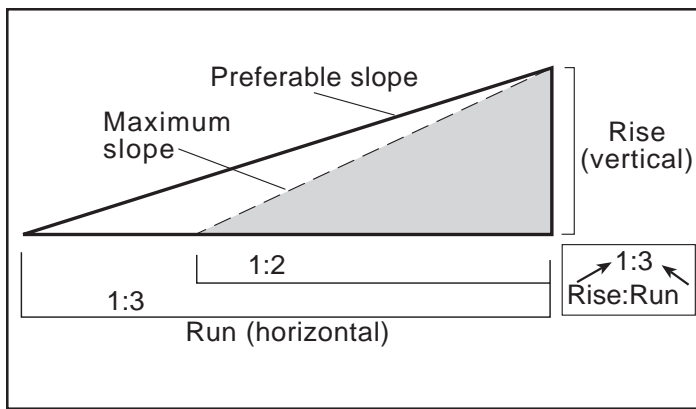


Figure 2. Rise to Run relationship

species that are intolerant of shade.

Check the toe of the slope to see if it is stable and not threatened by scour action that will undermine it. In addition to installing the fascines, the toe of the bank slope may need to be stabilized through the use of another practice such as a revetment made from evergreen or deciduous trees (see *Guide 12 Evergreen Revetments*). Riprap should be used when stream flow velocities are high enough to erode the toe of the slope. *Guide No. 16 Riprap Revetments* describes the use of broken rock, or riprap.

INSTALLATION AND MAINTENANCE

Design

Additional project design considerations include the spacing between rows of live fascines up the face of the bank and location of the project in relation to stable portions

of the streambank. The live fascine bank stabilization project must be anchored to non-eroding portions of the streambank; if it is not, the bank will erode behind the fascine rendering it useless.

The spacing of the live fascine bundles up the bank face depends on the soil type the bank is composed of. If it is a loose erosive soil, the

spacing should be 3-5 feet between rows. If the soil is cohesive and less subject to erosion, the spacing can be 5-7 feet between rows. Place a row at any ground water seepage line or spring.

The bundles themselves, as previously noted, are composed of cuttings of willow or red-osier dogwood. The bundles need to contain at least five cuttings, each being a minimum of 1/2 inch in diameter. These bundles can contain some dead cuttings as long as they are in the center of the bundle leaving the live cuttings on the outside in direct contact with the soil. The cuttings must be in a dormant condition cut between mid-November and mid-March. They must be installed into the streambank within 48 hours of being cut. The cuttings must not be allowed to dry out. They must be kept moist or soaked in water before being formed into bundles and installed in the streambank.

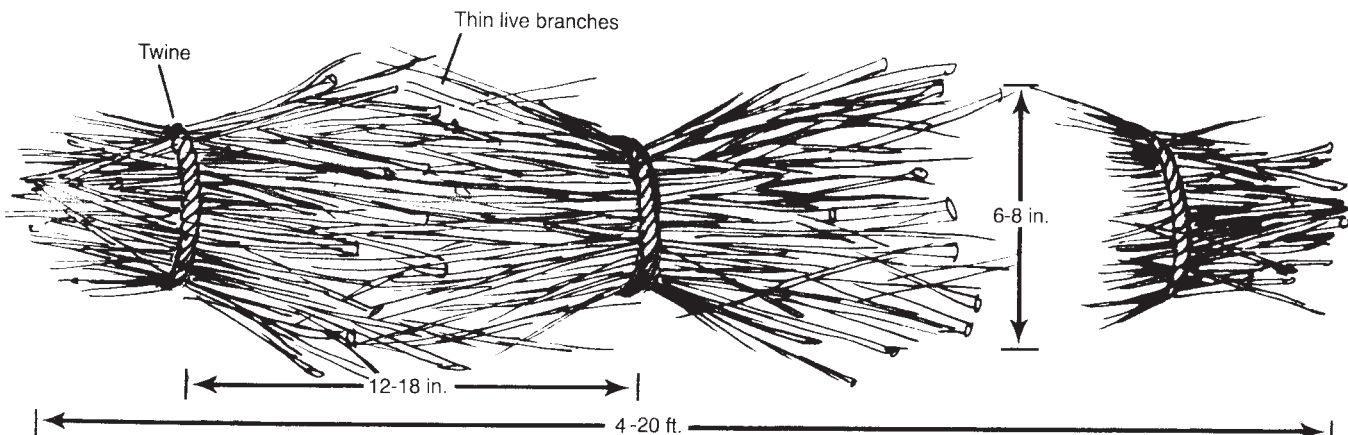


Figure 3. Fascine bundle

All the butt ends of the cuttings should point towards the same end of the bundle with the bundle ends tapered to form a cigar shape. The ends of the cuttings may be staggered along the length of the bundle to facilitate the construction of a long bundle with a maximum length of 15 feet to 20 feet. Ultimately, the bundle should be 6-8 inches in diameter. The cuttings are then bound together every 12-18 inches with untreated/un-dyed bailing twine (see Figure 3). It is helpful to make a saw-horse type frame to support the bundles at waist height as they are being tied together. The frame can be constructed of lumber or cuttings from the site. Each set of legs should extend beyond the crossbar into a "V" shape so that the cuttings can lay inside the V's while being tied together.

Construction

Excavate the bank to the appropriate slope, if needed, according to design specifications (see Table 1). Starting at the toe of the slope, dig or excavate trenches into the exposed slope at the designated spacing, parallel to the stream course. The trenches should be 10-15 inches wide and deep to accommodate the live fascines. Lay the fascines into the trench and backfill soil loosely, leaving the top of the fascine partially exposed (Figure 4). When more than one fascine bundle is used to fill the length of a trench, a slight overlap (6-12 inches) of the ends of the bundles should be used.

Drive stakes 2-3 feet in length through the live fascine to anchor the bundle into the trench. The stakes can be made of live or dead willow or untreated lumber. Live stakes 2-4 inches in diameter and 2-3 feet long, are driven into the soil immediately below the installed live fascine. These live stakes will stabilize the fascine in the bank and will also sprout to enhance the bank stabilization. Cut the ends of live stakes that will go into the earth at a 45° angle and cut the tops flat. They should be cut and installed so that the buds and branches point up.

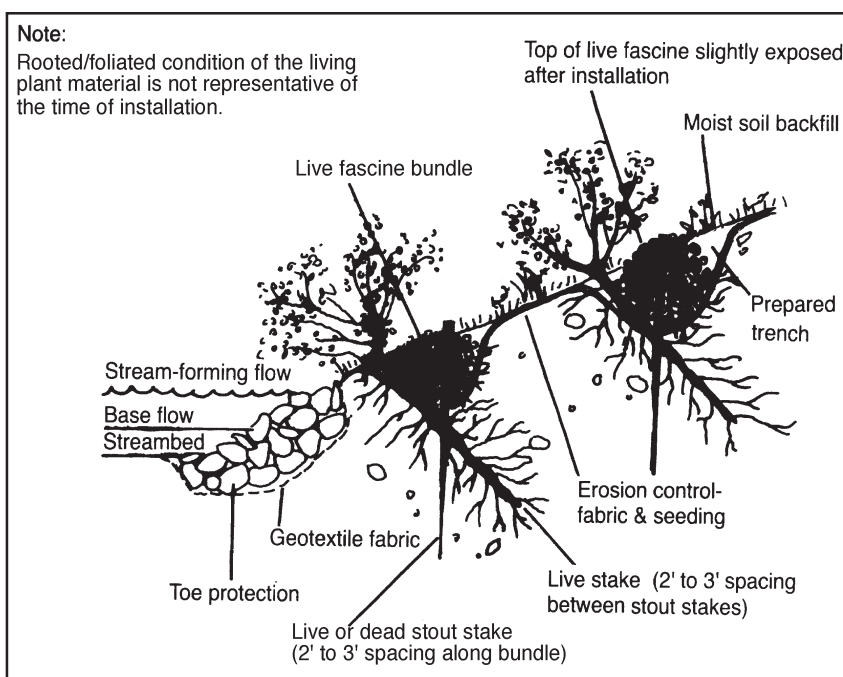


Figure 4. Live fascine cross section

Table 1. Timing of Construction and Resources

Activity	Time Frame	Sample Schedule
Stabilize bank if necessary	Period of low flow prior to live fascine installation	September 1
Bank excavation to 1:2 or 1:3 slope	December to March (but just prior to fascine installation)	November 25-30
Cut willows for fascines, keep moist at project site	December to March	December 1
Construct fascine at project site, keep moist at project site	December to March	December 2
Entrench and install fascines	December to March	December 3

Table 2 . Materials and Equipment

Activity	Required Materials	Required Equipment
Bank excavation, if needed		Backhoe. Alternately: hand tools (shovels, mattock) & wheel barrow.
Excavate trenches		Hand tools (shovels, mattock), wheel barrow, & measuring tape. Alternately: backhoe.
Construct live fascine bundle	willow (<i>Salix</i> spp.) or red-osier dogwood (<i>Cornus stolonifera</i>) cuttings, bailing twine	Saws, loppers, knives, & saw-horse type frame.
Install fascine	Live willow stakes, dead stakes	Sledge hammers & hand tools (shovels, mattock).

Materials & Equipment

The type of equipment required to install a live fascine streambank stabilization project will vary depending on the size and scope of the project, the labor available and the condition of the streambank itself (see Table 2). The tall, steep banks requiring excavation will probably need a backhoe. A backhoe may also be handy to dig the trenches for the live fascines on projects that effect longer stretches of streambank. If plenty of hand labor is available and the site permits, hand tools may be all that is required.

Maintenance

When properly designed and installed, maintenance of live fascines should be minimal. Inspect the fascine installation after high water events during the first year and once a year thereafter. Small washouts should be dealt with as soon as practicable and can be stabilized using the same or related biotechnical practice. Remove any accumulated debris which would threaten the health of the plants.

Streambank stabilization with a live fascine is achieved through live plant material. As with any live plant, health, growth and form need to be evaluated periodically to assure its continued function. As willows grow and mature, they lose their vigor and become subject to insect and disease problems. They also become brittle with age causing them to break, fall into the stream and contribute to channel obstructions. These problems can be avoided by periodic pruning of the willows to a convenient height, or down to a stump. The willows will re-sprout and the function of the stabilization practice will be maintained.

References:

Firehock, K. and J. Doherty, 1995, A Citizen's Streambank Restoration Handbook, Izaak Walton League.

Pennsylvania Department of Environmental Resources, Division of Scenic Rivers, 1986, A Streambank Stabilization and Management Guide for Pennsylvania Landowners.

Schiechtl, H., 1980, Bioengineering for Land Reclamation and Conservation, University of Alberta Press.

USDA, Natural Resource Conservation Service, 1992, "Soil Bioengineering for Upland Slope Protection and Erosion Reduction", Engineering Field Handbook, Chapter 18.

USDA, Natural Resource Conservation Service, 1996, "Streambank and Shoreline Protection", Engineering Field Handbook, Chapter 16.

This Guide is one of a series of Ohio Stream Management Guides covering a variety of watershed and stream management issues and methods of addressing stream related problems. The overview Guides listed below, are intended to give the reader an understanding of the functions and values of streams. For more information about stream management programs, issues and methodologies, see *Guide 05 Index of Titles* or call the ODNR Division of Water at 614/265-6739. All Guides are available from the Ohio Department of Natural Resources. Single copies are available free of charge and may be reproduced. Please contact:

ODNR Public Information Center
1952 Belcher Drive Bldg. C-1
Columbus, Ohio 43224-1386
614/265-6605

The guides are also available on-line as web pages and PDF files so you may print high quality originals at your location. You will find the guides on-line at:

<http://www.dnr.state.oh.us/odnr/water/pubs/onlnpubs.html>.

Prepared by the Ohio Department of Natural Resources, Mark Ervin, Division of Forestry, principal author. Input from staff of several ODNR divisions, and local, state and federal agencies are used in the development of the Ohio Stream Management Guides. Funding for the production of the Ohio Stream Management Guides is provided in part through a federal grant under Section 319 of the Clean Water Act.

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