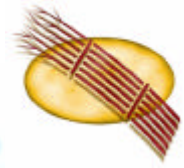


# Brushmattress



## Description

The brushmattress is the soil bioengineering version of rock rip-rap. A brushmattress is a protective mat of cuttings placed on the stream bank and staked sufficiently to hold it in place. This mat provides 100% coverage in the area that it is placed. Brushmattresses have also been referred to as live brush mats or brush matting.

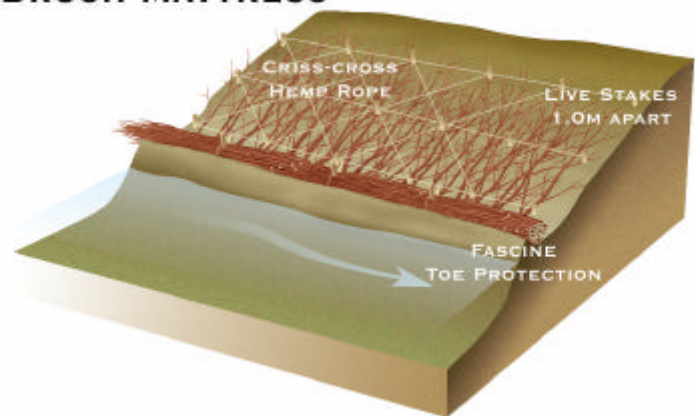
## Purpose

Brushmattresses are a simple and cost effective means of protecting stream banks against erosion. The cuttings will root along the entire length of the structure, providing long-term protection. If access is available, brushmattresses can also be easily constructed with earth moving machinery which greatly increases the amount of brushmattress that can be installed.

## Application

Brushmattresses are not recommended for stream banks steeper than 2.5:1 nor should they be used on stream banks where mass wasting occurs. A properly staked brushmattress can withstand considerable stream velocities, but must have a secure toe. In most cases, a single fascine provides sufficient protection.

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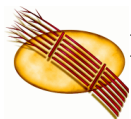
The toe or bottom of the brushmattress should be at or below the mean low water level of the stream. When placing on erosive, soils the brushmattress should cover the entire bank from the low water mark to the high water mark. This is not required in compact soils such as clays, but the height of the brush mattress should extend 1.5 metres up the **streambank** from the waters edge. The thickness of the structure can vary, but should be a minimum of 10 cm thick.

They are resilient to ice damage, both immediately after construction and when growing. Brushmattresses can be used on C, E, F, and G channels. They can tolerate deposition of sediments, especially once growing and if designed with the appropriate species.

## Construction Guidelines

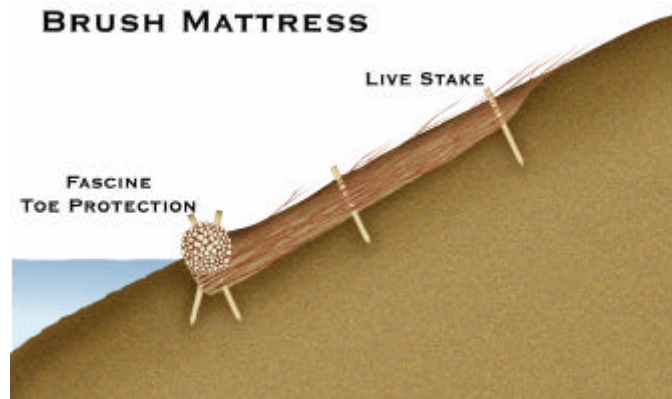
To construct a brushmattress, follow these steps:

- Collect a supply of fresh, live, dormant cuttings. Mature stems with diameters over 2 cm work best. Cuttings should be relatively unbranched, and 1/4 longer than the height of the brushmattress. If the bundles of cuttings are considerably longer than the height of the brushmattress they can be cut to length in the bundle. Heavily branched cuttings can be used if the larger side branches are trimmed.
- If you are using fascines as toe protection, construct them, following the directions in the fascine method. If other methods are to be used, such as rip-rap, install it at this point.
- If you are using machinery, excavate a shallow bench about the length and height of the brushmattress. Make sure the base is free from holes or large divots as the brushmattress must have complete contact to the ground. With hand installation, excavating the entire length of the slope not required, but good contact to the ground is important. Dig a small trench 15-20 cm deep just below the waterline and flush with the plane of the slope.
- Place the first layer of cuttings on the ground. Criss-cross the cuttings (see figure). As in brushlayering, the first layer should be between 2 to 4 cm thick. The growing tips all face the same direction, in this case uphill. If the cuttings are not long enough to cover the slope they must be overlapped by at least 40 cm. All of the cut ends should butt up against the bottom of the trench or existing toe protection.
- Place soil on the cuttings. Dry, mobile soil works best. Wet or clumped soils are difficult to work with and tend to leave spaces. Sift the soil onto the cuttings, working it with shovels or boots, ensuring that there are no empty spaces in the cuttings. If you are using a back hoe to place the fill, take the bucket and pour some water on the brush. This will also help to pack the soil tightly.
- Place the next layer of cuttings, making sure the cut ends touch the bottom of the trench. Add soil. Repeat until the desired thickness of the brush mattress is achieved.



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- Place the fascine at the stream edge, on top of the butt ends of the cuttings. Stake fascine securely, following the guidelines listed in the fascine method.



- Place soil around the fascine.

- Move along the bank, repeating these steps.

The finished brushmattress should be partially covered in soil.

- Once all of the live material is placed the brushmattress is ready for staking. As with installing fascines, live stakes should be used where possible. In compact soils wooden stakes will work. Place stakes through the mattress in a grid fashion approximately 1 metre apart. The first row of stakes should be close to the bottom of the mattress. Drive the stakes in  $2/3^{\text{rd}}$ s of the way. Tie in hemp rope, wire, or cord in horizontal and diagonal runs. Drive in the stakes until the cord is tight. Stakes should reach a minimum of 45 cm into the ground.
- Avoid using one continuous piece of rope or cord. This will make it impossible to pull all of the stakes out.
- Be aggressive when staking the upstream edge of the brushmattress. Like fascines, a failure at this end could be detrimental to the entire structure.

## Materials

Here's a list of what you will need:

- a ready supply of fresh, dormant cuttings. Availability, size, and species similar to that of fascines. You will use a lot of material. A brushmattress 15 cm thick, 2 m high, and 10 m long could use 25-35 bundles of cuttings.
- sharp pruning shears.
- chainsaw and appropriate safety equipment - if bundles need cutting to size.
- sledgehammer, deadblow hammer
- shovels, rakes
- earth moving machinery
- livestakes, or 2"x2"s, or angled 2"x4"s, stakes should be a minimum of 50 cm



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- long.
- hemp rope 5 - 10 mm, or light gauge fencing wire, or plastic cord.

## **Cost and Maintenance Needs**

Most of the effort required to construct a brushmattress is in the form of labour. Like fascines, live stakes, and brushlayers, costs can be kept to a minimum with free live material donor sites and volunteer labour. Staking will incur costs for the rope, wire, or wooden stakes. Costs will also rise if machinery is used to prepare the site and construct the mattress. Installation rates also vary considerably. If machinery is used 10-15 linear metres per hour is possible. Hand installation is considerably slower, 2 to 5 metres per hour. Maintenance of established brushmattresses is minimal.

## **Integration**

Brushmattresses can be used in conjunction with:

- fascines
- vortex weirs
- live stakes

## **Demonstrations**

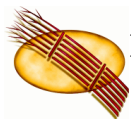
This type of habitat structure has been applied in the following demonstration projects:

- Project #91, Tioga Wildlife Area - Pine River
- Project #135, Halls Creek Project
- Project #44, Strausberg Creek
- Project #46, Kolb Creek
- Project #42, Soper Park - Mill Creek
- Project #50, Colonial Creek
- Project #51, Bechtel Park
- Project #117, Harding Property

## **For More Information**

Please refer to the following authors and their respective publications located in the bibliography:

Schiechtl and Stern. 1996.  
Schiechtl, 1980  
Leiser. 1994



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