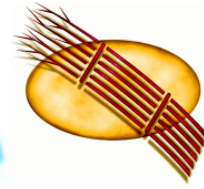


Brushlayers



Description

In brushlayers, the cuttings are arranged perpendicular to the slope, and are used in two forms; cut slope brushlayers and fill slope brushlayers. Cut slope brushlayers are brushlayers placed on benches dug into a slope. Fill brushlayers are imbedded between layers of soil fill.

Purpose

Brushlayers can be excavated into eroding streambanks where the protruding tips assist in managing runoff and reducing the downslope movement of soil. The branches in brushlayers also serve to reinforce the soil, making them useful in areas where mass wasting is a problem. A brushlayer can also act like a horizontal slope drain, effectively moving water within the slope to the surface.

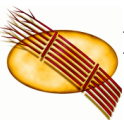
Application

Like fascines, brushlayers can be used to terrace a slope, breaking it up into smaller sections, and effectively reducing erosion. But unlike fascines, they are excavated farther into the slope, and can be used in areas where shallow mass wasting is a problem. Brushlayers also provide immediate stability to soils that are placed as fill.

Mass wasting, or movement (more popularly known as landslides) is a complex and potentially dangerous phenomenon. While brushlayering is an effective solution if applied properly, care should be taken when trying to stabilize large slopes, slopes with known deep soil movements, abundant groundwater discharge, or where property values are high. If confronted with these scenarios, we strongly recommend consulting with your local Ministry of Natural Resources, or Conservation Authority office prior to construction.

Both cut and fill brushlayers are susceptible to undercutting. When used on streambanks it is critical to ensure the base or toe of the slope is protected in some way, be it with fascines, tree revetments, or existing vegetation.

Cut slope brushlayers should not be used on slopes steeper than 2:1. Nor should they be used where mass wasting occurs in layers deeper than 0.75m. The depth of the bench or brushlayer can vary, but should be a minimum of 0.5m and a maximum of 1.25m. Cut slope brushlayers should also have long straw mulch placed on the slope between brushlayers. This mulch can also be seeded. Straw should only be used on slopes no steeper than 2:1.



Fill brushlayers should also have mulch placed between the brushlayers, and on slopes steeper than 2:1, a coir or erosion control blanket should be used. This blanket is anchored in place by wrapping it around the **lifts, or layers** of soil. Fill brushlayers can be up to 4m long.

Brushlayers in both cut and fill scenarios can be built to varying thickness, but should be a minimum of 10cm thick. Spacing on slopes is the same as for fascines. Brushlayers must not extend out of the slope a distance greater than 1/3 their total depth, but must extend at least 1/4. It is these exposed tips that serve to catch soil as it moves down the slope.

Construction Guidelines

To construct cut slope brushlayers, follow these steps:

- Collect a supply of fresh, live, dormant cuttings. Mature stems with diameters over 2cm work best. Cuttings should be relatively unbranched, and 1/3 longer than the depth of the bench. If the bundles of cuttings are considerably longer than the depth of the bench they can be cut to length in the bundle. Heavily branched cuttings can be used if the larger side branches are trimmed.
- Excavate the first bench at the bottom of the slope. The surface of the bench should angle back into the slope, 10-25 degrees off horizontal (see figure).
- Place the first layer of cuttings on the bench. All of the cut ends should be touching the back of the excavation, and all of the growing tips pointing out of the slope. Criss-cross the cuttings. The first layer should be between 2 – 4 cm thick. *Note if using textiles or coir, the top edge of the coir would be tucked onto the bench before placing the first layer of brush.*
- Place soil on the cuttings. Dry, mobile soil works best. Sift the soil onto the cuttings, working it with shovels or boots, ensuring that there are no air voids in the cuttings. Place the next layer of cuttings and repeat. By building the brushlayer in several individual layers, you can ensure that there are no air voids.
- Move up the slope, repeating these steps. As you progress up the slope, try building two benches at once. Soil from the upslope bench can be moved downslope to be placed on the downslope cuttings.
- Once the brushlayers are complete, place mulch on the exposed soil between the brushlayers.



Fill slope brushlayers are constructed in the same way as listed above, except that the soil between the lifts is placed during construction, and usually moved by machinery.

Materials

You will need a ready supply of fresh, dormant cuttings. Availability and size are more important than species, so most of those listed in Appendix B will work. In addition, you will need the following equipment and materials:

- sharp pruning shears.
- chainsaw and appropriate safety equipment - if bundles need cutting to size.
- straw mulch or erosion control blankets
- shovels
- earth moving machinery (fill brushlayers only).

Cost and Maintenance Needs

Brushlayers require more effort to construct than do fascines. Costs in terms of financial resources are difficult to estimate. In the case of cut brushlayers the costs can be minimal if the live materials are collected from free sites and are installed by volunteers. Fill brushlayers tend to be considerably more expensive, since they usually require the use of heavy equipment to move and place fill. Fill brushlayers on large sites may also require the involvement of a civil or geotechnical engineer. The geotextiles and/or natural geofabrics that are often used also tend to be expensive, varying in price from \$0.50/m to \$2.0/m.

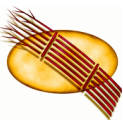
Maintenance of established brushlayers is minimal. The species used in brushlayers often only survive long enough to allow pioneering vegetation to become established, so control of willows or poplars in the future is rarely required.

Effort, like cost, is also variable. Cut brushlayers can be built at a rate of 0.5 m to 3 m per hour (measured across the slope as a finished brushlayer), fill brushlayers at a rate of 0.5 – 6 m per hour.

Integration

Brushlayers can be used in conjunction with:

- fascines
- live cribwalls
- tree revetments



BRUSHLAYERS

- rock revetments
- live stakes

Demonstrations

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

- Project #12, Plumb Creek C.U.R.B. Project
- Project #24, Brault Property
- Project #47, Schneider Creek
- Project #64, Highland Creek Rehabilitation Project - Markham Branch
- Project #80, Williamsburg Community Biotechnical Works
- Project #100, Scotts Plains Park
- Project #117, Harding Property
- Project #139, Cairns Boulevard

For More Information

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

Schiechl and Stern. 1996.
 Gray and Sotir. 1996.
 Schiechl, 1980
 210-EFH, 10/92, 1992

- Figure - Cut slope brushlayer, cross section, and overhead view, on streambank.
- Figure - Fill slope brushlayer, cross section only, on streambank.

