Brushlayering with Soil Wrap


This technique consists of live cut branches (brushlayers) interspersed between layers of soil wrapped in natural or synthetic geotextile materials. The brush is placed in a crisscross or overlapping pattern so that the tips of the branches protrude just beyond the face of the fill, where they act as horizontal drains and improve slope stability by redirecting the flow direction. Natural geofabrics, such as coir netting, are typically wrapped around the soil layer to provide additional soil surface protection and reinforcement. **Refer to Manufacturer Directory - Geotextiles/Geosynthetics**.

Conditions Where Practice Applies

Brushlayering with geotextile soil wraps can be used to stabilize very steep slopes. They provide an alternative to vertical retaining structures for grade separation purposes and in situations that require avoiding right-of-way encroachment at the base or top of slopes. Geotextile soil wraps can also be used to protect slopes that are subject to periodic scour or tractive stresses, such as drainage channels or upper portions of streambanks.

Brushlayering with soil wrap was used to stabilize and revegetate eroding banks at Whiskeytown Lake, Whiskeytown National Recreation Area, CA.

Materials

Long branches of trees and brush which are capable of vegetative propagation, usually willows. The length of the branches will vary with the type of application (embankment or buttress fill) and desired depth of reinforcement; ideally they should be long enough to reach the back of a buttress fill. The inert construction material consists of natural geofabrics such as coir netting, or synthetic, polymeric geogrids. Natural geofabrics or geogrids are then wrapped around the soil layers to protect the slope face and provide a stable planting surface. **Refer to Manufacturer Directory - Geotextiles/Geosynthetics**.

Advantages

Once the live cuttings become established, their root systems become entangled with the soil wrap and/or geogrid, binding the entire system together in a unitary, coherent mass. When used along streams, vegetated soil wraps provide habitat for fish and wildlife.

Brushlayering with soil wrap was used to stabilize this streambank in Sulphur Creek (Redding, CA), and provide riparian cover at the same time.

Disadvantages

Must be implemented during the dormancy period of vegetation. Will not be suitable for the stabilization of very thick organic soil horizons.

Implementation

Begin at the base of the slope and proceed upward. See typical drawing below for the step by step procedures of brushlayering with soil wrap. The vegetated soil wrap structure should be supported on a rock toe or base and be battered or inclined at an angle of at least 10 to 20 degrees to minimize lateral earth forces. A trench should be excavated to a competent horizon as well as below the likely depth of scour.

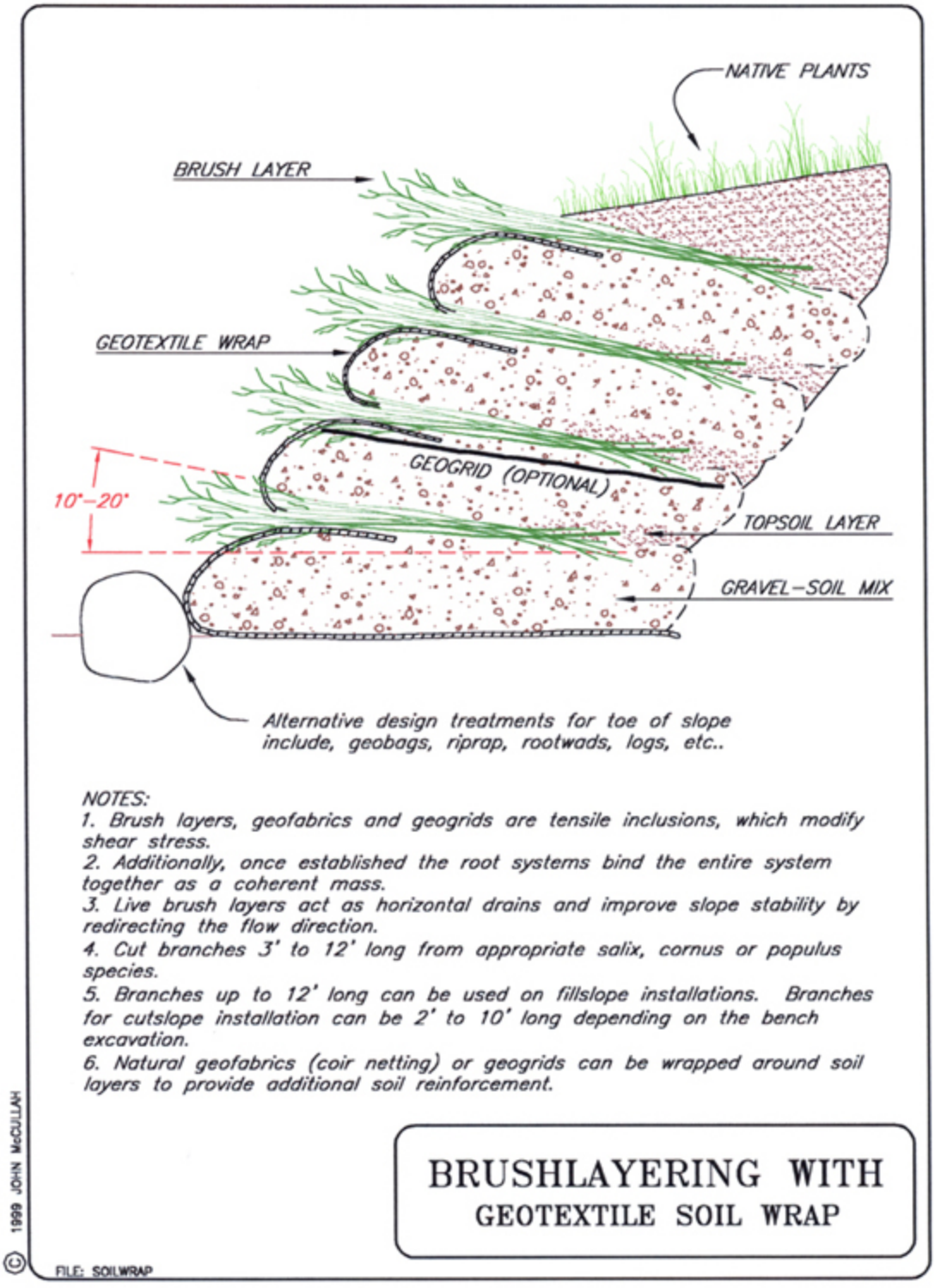
The fabric is installed by placing it on top of the soil so that at least 0.5 m (3 feet) can be anchored by wooden stakes to the soil-gravel layer. Allow 2 m (6 feet) of fabric to extend beyond the brushlayer so that it will lap

over and cover the soil-gravel mix , then stake into place. Crisscross layers of dormant cuttings and/or transplants on top of the soil wrap, placing the cut ends into the slope with the tips extending beyond the edge of the bench (no more than ¼ of the total branch length). Care should be taken to place the branches at random with regard to size and age and species composition. Deposit a layer of topsoil over the cuttings and tamp into place.

Repeat the branch, topsoil, and wrapped soil-gravel mix layering sequence until the desired bank height is achieved. Fill slopes can be created at the same time a brushlayer is installed. On a cut slope and existing streambanks, each layer is excavated at the time the brush layer is installed.

Finished Installation

7 Months Later



Typical Drawing: Brushlayering with Geotextile Soil Wrap

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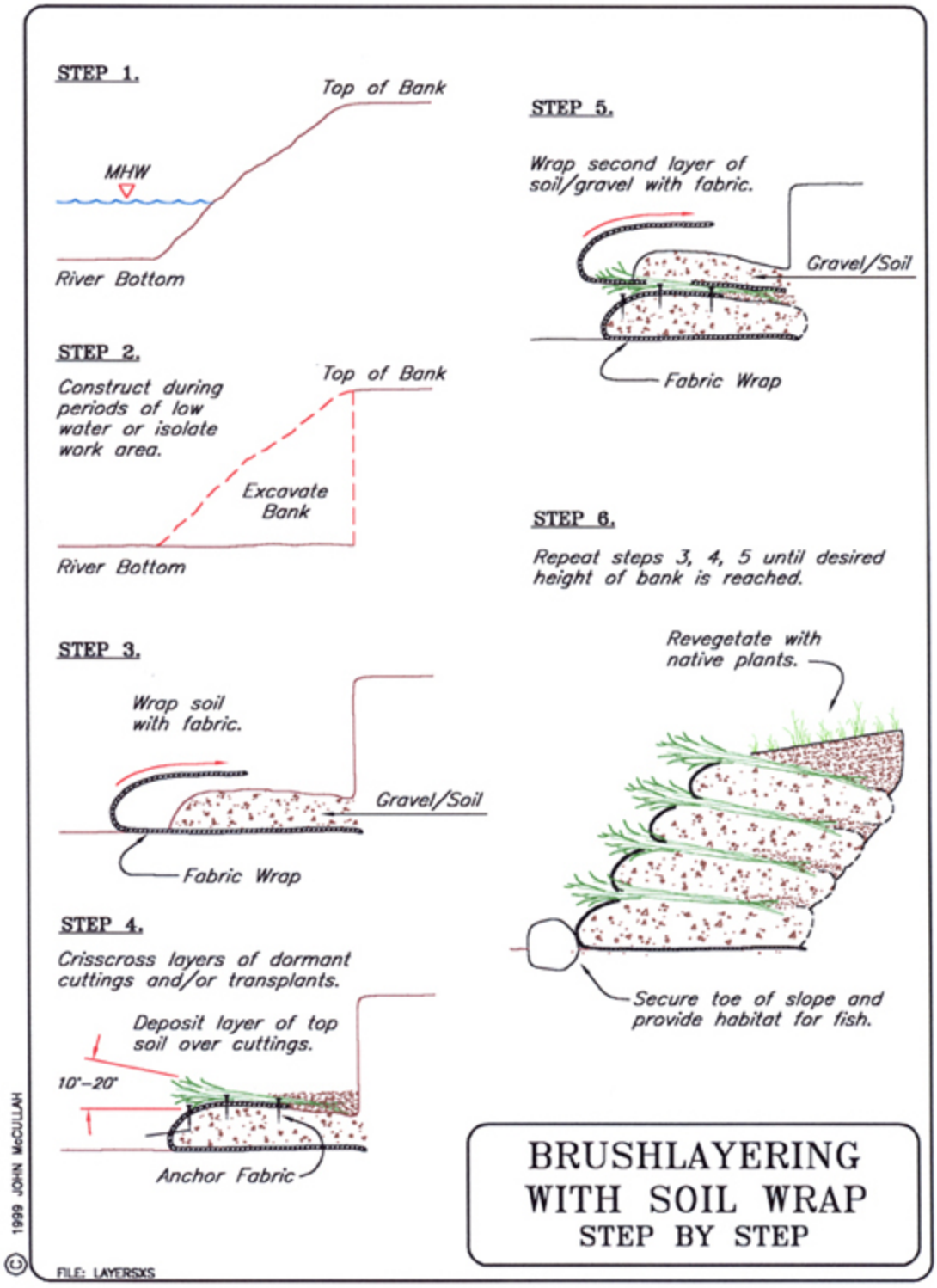

Typical Drawing: Brushlayering with Soil Wrap, showing step by step process of installation

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Costs

Material acquisition costs depend on the type of fabric material selected, i.e., whether natural fabric, synthetic geotextile, or polymeric geogrid. Installed unit cost ranges for different fabric materials are shown in Table 2.

Table 2. Installed unit costs for different fabric materials
(adapted from Washington State, 2003)

Fabric Materials	Cost per meter^2 (yard^2)
Woven Coir Fabric	$2.40 – $3.60 ($2.00 – $3.00)
Nonwoven Coir	$1.20 – $2.40 ($1.00-$2.00)
Nonwoven Geosynthetic	$0.60 – $0.84 ($0.50-$0.70)
Biodegradable Geotextile Fabric	$3.36 – $3.60 ($2.80-$3.00)

An order-of-magnitude cost estimate for brushlayers with soil wrap can be made from relative cost comparisons for different biotechnical bank protection techniques, as shown in Table 3. Costs are shown for soil reinforcement and brushlayers, respectively. These cost comparisons are based on various bank treatments installed primarily in Washington State between 1995 and 2000. Costs are for materials and construction and do not include design or post-construction components of the project. Brushlayering with Soil Wraps will cost more than live brushlayering used alone because of the presence of geotextile or geogrid reinforcements, and their material acquisition costs. Note that soil reinforcement costs differ significantly, most likely because of varying material costs for different types of fabric or geogrid reinforcing materials.

Table 3. Installed unit costs for biotechnical bank protection techniques
(adapted from Washington State, 2003)

Fabric Materials	Unit of Measure	Unit Cost
Soil Reinforcement	Linear meter (linear foot)	$164-$1312 ($50-$400)
Brushlayers and Mattresses	Linear meter (linear foot)	$121-$164 ($37-$50)


The brushlayering with soil wrap technique was used in this excavated stream crossing to stabilize streambanks and provide habitat. (Whiskeytown Logging Road Removal Project, Whiskeytown NRA, CA.)

References

Washington Dept of Fish & Wildlife (2003). *Integrated Streambank Protection Guidelines*, published in co-operation with Washington Dept. of Transportation and Washington Dept. of Ecology, April 2003.

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