

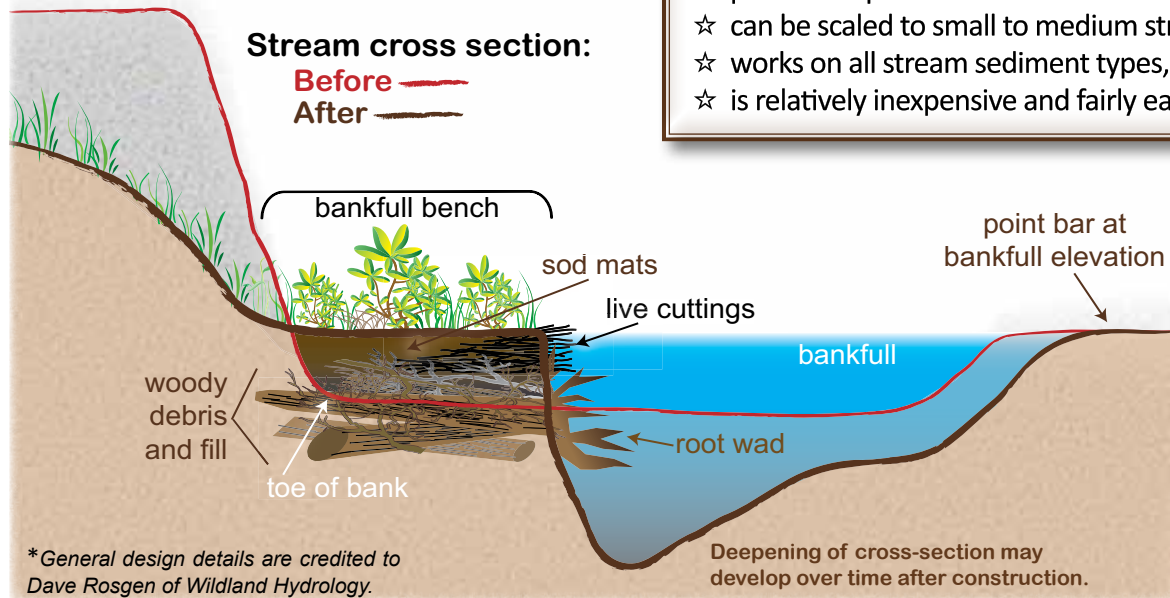
Stream Restoration: Toe Wood-Sod Mat

Purpose of a Toe Wood-Sod Mat

All streambank restoration project goals should be to: 1) restore channel function, dimensions and connection to the floodplain, 2) provide short-term protection that promotes natural long-term stability, 3) allow the channel to adjust over the long-term, 4) protect meanders (a.k.a., sinuosity) of a stream to prevent a meander cutoff. A toe wood-sod mat provides the opportunity to add stability, habitat, and streambank protection where it is needed.

The toe wood-sod mat is a preferred design because it:

- ☆ restores channel dimensions (width & depth),
- ☆ protects a once vulnerable and unstable cutbank,
- ☆ restores the connection to the floodplain with a bankfull bench,
- ☆ incorporates transplanted sod mat(s) and live cuttings that grow quickly and develop dense roots,
- ☆ utilizes all natural materials using local vegetation and sod,
- ☆ provides aquatic and terrestrial habitat,
- ☆ can be scaled to small to medium streams,
- ☆ works on all stream sediment types,
- ☆ is relatively inexpensive and fairly easy to install.



Construction of a Toe Wood-Sod Mat:

The cutbank is renovated by angling back the upper bank and excavating or filling in (depending on stream width and site restrictions) the lower bank with a bankfull bench. The bench consists of a bottom layer of logs, branches, brush, roots and soil as fill. Root wads can be incorporated to provide additional roughness and habitat. The fill is covered with a layer of live cuttings then with a top layer of sod mats and transplants set at *bankfull stage* (the flow at which the channel fills the banks and just begins to overflow onto the floodplain), which is level with the point bar. The stream bed may deepen with time as the stream develops its proper dimensions. In some cases, rock vanes may be installed up and downstream of the mat depending on how flow is impacted. A permit is needed from the DNR to construct a toe wood-sod mat. Permits may also be required from local and federal agencies. Contact your DNR Area Hydrologist for permit information.

Streambank restoration fundamentals:

Several factors need to be considered when proposing a streambank restoration project, like a toe wood-sod mat:

Evaluate the current and future watershed condition. Often, the presence of cutbanks indicates watershed-scale channel incision due to channel straightening, changes in the watershed that have introduced low-sediment water (dam, urbanization, tiling), or increased flood magnitude (see Resource Sheet #1). Before taking action, consider the purpose and scale of a restoration.

Determine if there really is an erosion problem. Channel erosion is natural channel adjustment to change. Occasional cutbanks are a natural stream feature that provide unique habitat. For example, a straightened ditch that is forming new meanders is adjusting towards a more stable form. Yet there are cases where local protection of infrastructure is necessary, and so determining if erosion is a problem is important.

Contact Information

DNR Ecological & Water Resources:

Stream Habitat Program
500 Lafayette Road, Box 25
St. Paul, MN 55155, (651) 259-5100

Public Water Work Permit Program

500 Lafayette Road, Box 32
St. Paul, MN 55155
(651) 259-5700

DNR website:

<http://mndnr.gov>



Toe Wood-Sod Mat: Construction Examples

Spruce Creek



Unstable bank encroaching on a picnic shelter. Toe of bank is eroding causing slumping and stream is overwide.



Construction of bankfull bench. A layer of woody debris and fill was placed along the bank toe then covered with live willow cuttings (in foreground).



Collection of local dogwood and willow sod mats with very dense root mats.



Placement of final layer of sod mats on the constructed bench at bankfull elevation.



Finished bank stabilization project: Vegetated bankfull bench and a graded streambank protected with erosion control blankets.

Buffalo River



Unstable bank and failing flood control dike protecting a mobile home park. The project started with the placement of woody debris and insertion of root wads.



The completed woody debris layer with incorporated root wads. The upper bank was regraded with a more gentle slope.



Dirt was added as fill and rooting material to the woody debris layer.



Locally collected red-osier dogwood and willow sod mats were placed on the constructed bench at bankfull elevation.



Project was completed with a vegetated bankfull bench and a re-graded upper bank seeded with native seed mix. New growth was thriving the next summer.