Practice Title

Bioengineering

Photo(s)



Live dormant willow cuttings are often used to make stakes and fascines, as seen in the first two photographs above. The last photograph shows how vegetation can be incorporated into a traditional bank armoring project to provide habitat, cooler water temperatures through shading and long-term stability for the project.

Mulch is added to fascine trenches to enhance the growing medium (above). Volunteers plant potted trees streamside (right).

Summary of Practice

Bioengineering is the use of natural materials and vegetation for erosion control and stream bank stabilization. Dormant woody stakes, posts and fascines can be used to stabilize eroding banks, and bare-root or transplanted trees can be used on top of the bank in the riparian/flood plain. The increase in woody vegetation can stabilize eroding banks and provide wildlife habitat and a source of organic material for the stream and its inhabitants. Properly selected and planted vegetation can withstand flooding and high velocity water and often can be used instead of costly structural practices.

Once established, these plants on the stream bank and floodplain will dissipate water flow energy, and their roots will help stabilize the soil. Well-established vegetation is one of the best

long-term protections against bank erosion and channel migration. One study showed that bare banks are 10,000 times more susceptible to erosion than their vegetated counterparts. Vegetation can be used independently or in combination with other streambank protection measures (riprap, in-stream structures, etc.) Vegetation is the only streambank protection method that can repair itself when damaged.

Impact on Stream and Floodplain Processes and Functions

Below a stream's waterline, vegetation can effectively protect a bank in two ways: first the root system helps to hold the soil together and increases overall bank stability by forming a binding network. Second, the exposed stalks, stems, branches and foliage provide resistance to the stream flow, causing the flow to lose energy by bending the plants rather than by removing soil particles. Above the waterline, vegetation prevents surface erosion by absorbing the impact of falling raindrops and reducing the velocity of surface runoff. Furthermore, during the growing season vegetation takes water from the soil providing additional capacity of infiltration and may improve bank stability by water withdrawal. The vegetation also provides numerous habitats for wildlife, shades and cools the water and adds essential organic material (food) to the stream.

Impact on Your Property

Bioengineering can be an effective way to stabilize a problem stream reach and at the same time introduce visually pleasing vegetation. The successful establishment of bioengineering materials is the most long-term method by which to stabilize stream banks and protect property loss and damage. Coupled with other engineering methods, the outcome can prove to be very desirable. As long as proper native vegetation is selected, bioengineering has little if any negative impacts on your property.

Impact on Neighbor's Property

As bioengineering follows the natural stream design method, the impact on neighboring properties is generally positive. Vegetation can improve the look of property while performing its stability functions. It is important that neighbors are aware of the vegetation installed so they don't attempt to remove or cut it. Depending on where the bioengineering materials are installed, it may be necessary for property owners to alter their regular vegetation maintenance methods.

Recommended Use

Bioengineering methods are best used on steep slopes and stream banks where erosion is threatening and stability is needed quickly. The initial establishment of the vegetation and its

roots can prove challenging as it is very vulnerable to the impacts of erosion during this stage. The materials must remain relatively undisturbed until the roots have time to develop. Rip rap and other engineering practices can effectively provide protection long enough for the bioengineering materials to establish hardy root systems. Preventative plantings on non-eroding streambanks are a common-sense and most-economical approach to stopping erosion before it starts.

Word of caution: Even a mature forest cannot hold against a stream channel that has become unstable due to other influences. Bioengineering is therefore not a fix-all method and often must be used in the terms of a comprehensive natural stream design system. Please contact info@catskillstreams.org to schedule a site visit from a local resource professional that can advise on the best options for your streamside.

Permits Needed

Streambank stabilization will require a DEC Article 15 Stream Disturbance Permit. An ACOE permit is required when more than 25 cubic yards of fill material will be used below the "ordinary high water mark" (the approximate yearly flood level); the DEC can advise you about determining these limits.

Resources (Links, Articles, etc.)

http://ceres.ca.gov/foreststeward/html/bioengineering.html

http://wlapwww.gov.bc.ca/kor/fsh/wrp_site/photo/bighorn_creek/2000/bighorn_creek_bioeng2000/index.html

http://www.riparianbuffers.umd.edu/fact/FS729.html

http://www.dnr.state.oh.us/water/pubs/fs_st/streamfs.htm

http://www.gcswcd.com/stream/library/

http://www.catskillstreams.org/stewardship_streamside_rb.html

Photo Sources

Greene County Soil and Water Conservation District
http://wlapwww.gov.bc.ca/kor/fsh/wrp_site/photo/bighorn_creek/2000/bighorn_creek_bioeng2000/gallery.html
http://www.fxbrowne.com/html/Services/Updates/Stream%20Restoration.htm

Text Sources

Thigpen, Janet. 2006. Stream Processes: A Guide to Living In Harmony with Streams. Chemung County Soil & Water Conservation District. Available of web: http://www.chemungcountyswcd.com/homepage.html.