Article 145

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Bioengineering in Four Mile Run, Virginia

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In some urban streams, the goal for stream restoration is very limited—to stabilize severely eroding banks using native plant materials. Traditionally, eroding banks were "protected" by armoring them with large rocks known as rip-rap. While rip-rap is effective in preventing erosion on small streams, it often eliminates the natural vegetation that contributes to stream quality.

Bioengineering, on the other hand, can protect the banks from eroding sediments while providing quality streamside vegetation. A good example of a site where bioengineering has been demonstrated is Four Mile Run, an urban creek in Northern Virginia (Table 1).

Four Mile Run drains an urban watershed of some 20 square miles, that is about 40% impervious (Figure 1). Many of the small headwater streams that drained to Four Mile Run have been enclosed in stormdrain pipes. Over 35 stream miles have been lost in this manner over many decades of development (Waye 1994.) As a consequence, Four Mile Run is heavily influenced by stormwater runoff. Both water quality and aquatic habitat are poor. The remaining natural channels exhibit significant bank erosion, with vertical banks ranging from three to eight feet tall.

Table 1: The Four Mile Run "Prescription"

Location:	Falls Church, VA
Watershed size:	20 square miles
Degree of Imperviousness:	40 percent

Restoration Step	Application in Four Mile Run
Control Urban Hydrologic Regime	N/A
Remove Urban Pollutants	N/A
Restore Instream Habitat Structure	N/A
Stabilize Channel	Stabilize severe bank erosion with live fascines
Replace / Augment Riparian Cover	Planted willows
Protect Critical Stream Substrates	N/A
Recolonize Stream Community	N/A

The Izaak Walton League coordinated a cooperative effort to demonstrate that bioengineering techniques could stabilize eroding banks. The League also wanted to show that a combination of citizens and public agencies could implement these techniques in a cost-effective manner. For demonstration purposes, the League looked for a stream reach with good access, no tree canopy, and eroding bank heights less than four feet. A site meeting these requirements was found in an open and unwooded park setting, adjacent to a greenway heavily used by pedestrians, joggers, and bicyclists. Figure 2 shows the project site before stabilization.

The project began in February 1994. The concept for bank stabilization was to employ bioengineering on the inside of a shallow bend. (An earlier project had placed rip-rap on the outside of the bend where erosional energy was greatest.) The bioengineering treatment involved regrading the bank to achieve a more gentle slope (2:1 horizontal to vertical.) Two shallow trenches were constructed parallel to the stream on the bank contour (see Figure 3). Fascines or bundles of dormant willows and dogwood were then placed in trenches along the contours of the bank. Each fascine was about seven feet long, with the rooted ends facing upstream.

The site has been frequently inspected to see how well it holds up to erosive stormflows. Figure 43.4 shows the site two weeks after installation, shortly before the grass had become fully established. Within 10 weeks, the willows and dogwoods had sprouted, and a thin layer of fine silt had been deposited over the erosion control fabric. The growth and sprouting of the fascines was not as great as expected during the growing season, possibly because the fascines were not completely dormant at the time of planting. Overall, plant growth was relatively sparse, and some weeds had invaded the site. After four months, some erosion was reported at the toe of the bank, and the designers considered placing a rip-rap layer to protect the base of the slope. Inspection during the second growing season has indicated greater sprouting success for the willows and dogwoods.