

Freedom Park Stream Restoration Project Repair

by Pete Romocki and Chris Matthews

Note: This original project was written up in Land and Water Magazine in December of 2004.

Project Background:

THE Little Sugar Creek Environmental Restoration Initiative encompassed a stream restoration, greenway trail development and overall enhancement of a stream corridor through the greater Charlotte, North Carolina metropolitan area. It covered a 15-mile section of Little Sugar Creek running south from Uptown Charlotte to the North Carolina/South Carolina state line. Phase 2 of this initiative was a joint effort between Mecklenburg County and the EEP known as the Freedom Park Stream Restoration Project. The EEP-funded project was one of the largest of its kind in the state, placing more than 1,500 linear feet of stream on a new alignment as much as 150 feet from its current location. The Little Sugar Creek flows through the entire length of Freedom Park, a distance of more than 4,500 linear feet. Freedom Park is in a highly urbanized setting two miles south of the central business district. The 14-square-mile watershed is virtually built-out, with the only development occurring on in-fill locations. Therefore, urban runoff and storm water are the main contributors to stream degradation along this section of the creek.

Historical records indicated that Little Sugar Creek was likely channeled and straightened in the early 1900s to improve storm water conveyance and allow urban development to occur on the floodplain. In the 1970s and '80s, the creek was showing signs of instability due to upstream development, so a concrete and grouted rip-rap liner was installed along the banks to provide stability and prevent erosion. The stream remained in this state for the next 25 to 30 years.



Restored stream project. Photo taken September 2006 by Doug Smith.

In 2002, Mecklenburg County awarded a contract to demolish the concrete banks in preparation for the upcoming restoration project. The demolition ran concurrently with the design and permitting of the channel restoration.

In 2003 a restoration of Little Sugar Creek that passes through Freedom Park was commissioned. HDR, the national engineering consulting firm, and a local environmental specialty firm, Habitat Assessment and Restoration Program Inc., were selected to design the project based on past experience in the watershed, availability to devote technical expertise and other resources to this complex project and a familiarity that had been formed through previous work with EEP. The team performed an extensive watershed survey, a sediment transport study, a reference reach analysis and a site survey to achieve a permissible and stable design. The final design incorporated natural channel techniques to enhance and create habitat, provide stability, improve water quality, control storm water runoff and provide a more aestheti-

cally pleasing stream ecosystem.

Project Update:

Approximately one year after the completion of the initial project some areas were experiencing significant erosion on the stream banks. Specifically, this was occurring at locations where planted vegetation had failed due to nutrient poor soil conditions and where the straw/coconut erosion matting that was used to initially preserve the diverse custom seed mix was no longer in place.

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The problems developed along areas of the stream banks that were experiencing high shear stress loads from occasional intermittent high volumes of storm water

flow. The owner of the project site bought attention to these stream bank areas of concern and the engineer, HDR took on the task of correcting the deficiencies in the stream banks design. The original work included installation of root wad sections in high velocity areas. The repair effort of this project only involved some of the original straw/coconut erosion blanketed areas.

The initial design of the stream banks utilized a jute netted coconut/straw erosion blanket to protect the banks from the expected high shear stress loads. This

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product was selected because of its ability to completely biodegrade. Coconut/straw erosion blankets typically have the ability to withstand shear stresses in the 2.0 to 3.0 pounds/square foot range after being vegetated. Evident after the fact was that flow conditions were exhibiting shear stresses considerably greater than what banks without vegetation could survive. Typical stream bed erosion protection is accomplished using turf reinforcement mats (TRMs). TRMs are composed of nonbiodegradable materials, usually some type of plastic, and can survive shear stresses of 10 lbs./ft² or more after being fully vegetated.

HDR chose not to use TRMs because of the non-biodegradable nature of the product. It can be detrimental to the environment as snakes and other fauna that inhabit riparian areas have been seen getting caught in the plastic matrix, particularly the nettings. HDR has also made it a point to design their stream projects such that the combination of slope and vegetation allow for a stable stream bank.

If the soils allow proper vegetative growth and the banks have been constructed properly, based on a thorough examination of the hydraulic pressures in the system, TRMs may not be necessary. The issue at Freedom was that the extremely poor soil conditions prevented the establishment of temporary and permanent vegetation. This was especially true of the woody vegetation which

wooden stakes approximately every 2 square feet (Ecostakes).

The repair work was completed by a four man crew in about four days by North State Environmental, Inc. They hydroseeded the cleared banks using a browntop millet variety grass seed. The netless excelsior blanket was then installed onto the seeded banks and finally the heavy woven coir matting was laid



Exposed coir mat where vegetation is still being established. Photo taken 2006 by Doug Smith.

provides a root mass adequate to keep stream bank soils in place during flood events. The banks were thus vulnerable to the high velocity floods that occur in the park with the original erosion materials selected.

The Freedom Park project had strict environmental requirements from HDR to be constructed with materials that were completely biodegradable. This requirement eliminated the option to use traditional TRMs. In the redesign of the failed eroded areas HDR surveyed the marketplace for other available options. Selected was a combination of biodegradable erosion blanket materials. Utilized was a netless excelsior blanket (Curlex NetFree) and a heavy woven 700 gm./sq. meter coir mat used in combination with each other. The coir mat was installed on top of the netless excelsior and both were anchored down using wood one foot long

down on top of it and staked. The contractor installed the netless excelsior blanket on a large area and had the intention of installing the coir mat over it the next day. Unfortunately a significant storm occurred that evening and damaged the entire area that had been laid. They were able to reclaim most of the netless excelsior fiber, redistribute it and then secure it with coir mat. The lesson learned is to install the coir mat on top of the netless excelsior as soon as possible to prevent damage.

Significant rain had also occurred less than 10 days after the installation and the repaired areas appeared to have held up good during this first test. The site was again inspected six months later again with very good results. Vegetation had become well established and the combination of blanket materials appeared to be doing the trick.



Installation of coir woven mat on top of net free excelsior using one foot long wood stakes. Photo taken May 2005 by Pete Romocki.

In September 2006 the project was once again inspected and found to be surviving well. This was an experimental project for HDR in that it is the first case

where a net free product was installed under coir mat as a “composite” solution for a stream bank restoration project. Stream bank restoration projects are

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unique in that all biodegradable “natural” components are required. It makes erosion control of high shear stress level areas difficult because TRMs cannot be used. The use of Curlex NetFree as a part of a component system for protecting stream banks in high shear stress areas is now part of HDR’s arsenal of solutions. **L&W**

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