FACTS

ROLLMAX™ ROLLED EROSION CONTROL

NORTH AMERICAN GREEN®

CASE STUDY

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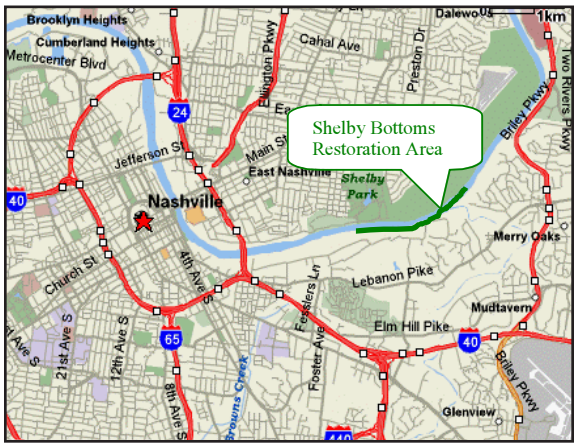
C125 BioNet Blankets & Bioengineering Techniques Restore River Banks in Nashville, Tennessee

Background

One of the true jewels of Nashville, Tennessee's Metro Park and Greenway System is 810 acre Shelby Park. The park offers five miles of paved, multi-use trails and another five miles of primitive hiking trails. The trails provide visitors with a boardwalk, scenic overlooks, interpretive stations and seven rustic bridges. The area is also well known as a haven for migrating birds and other wildlife. But a **one mile long section** of the Cumberland River along the greenway had been experiencing extreme scour and bank failure along the bank.



Problem

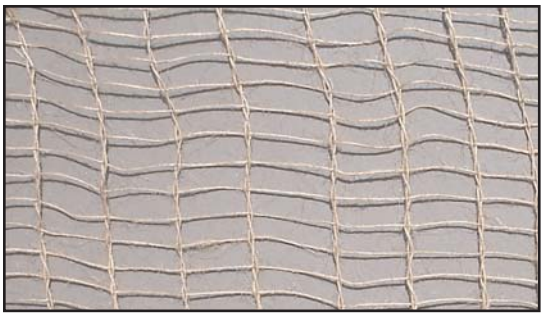
The slopes along the river had become steep and badly eroded. Trees were falling into the river because of the large amount of soil missing from around their roots. An entire mile of shoreline had been eroded to nearly a vertical gradient by waves generated by wind, river taxis, barges, and large boats, as well as fluctuations in the river level following strong storms. It was obvious that large amounts of soil would be needed to reconstruct the bank and that this new soil must be protected immediately and permanently. However, due to the location, no mechanized equipment could gain access to the shoreline.

Eroded banks along the Cumberland River are unsightly and pollute the waterway.

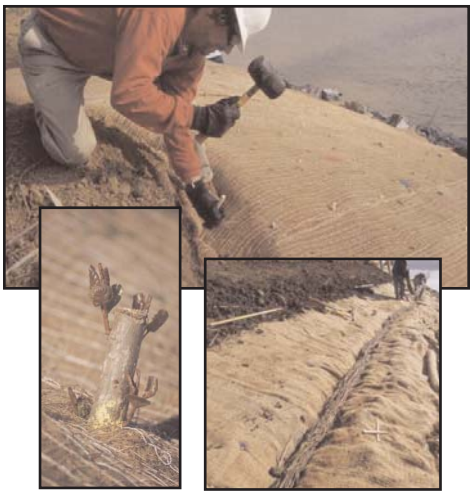
To protect against constant shallow wave action, a rock toe was established using barges and drag lines. *Hand labor was used to fine-grade the bank and install the erosion control measures called for in the design. The contract was let to Jen-Hill Construction Materials on February 1st, 2000 and had to be completed before April 1st, 2000 (end of dormant season).* Solutions for this stretch of river also required attention to the maintenance and enhancement of wildlife habitat, along with the demand for a natural system to protect water quality. In light of these demands, a "bioengineered" approach proved to be the most suitable. In this context, bioengineering refers to the practice of using differing types of vegetation, planting techniques, soil manipulation, and fully biodegradable erosion control products to control soil erosion and stabilize the bank through biomass. When designed properly, bioengineered erosion control systems continue to increase their resistance to erosion as plants mature and propagate. In many cases, bioengineering can be utilized in conjunction with, or as an alternative to, hard armor solutions such as rock riprap while providing the same or greater levels of erosion control performance.

Solution

As always, budgets play a key role in the ability to turn a design into a reality. Erosion control professionals at *Jen-Hill Construction Materials assumed the challenge* of developing the design and performing the reconstruction of the shoreline, as well as supplying all the materials needed, including vegetation, through their native riparian nursery. Based on stream modeling, it was determined that the erosion control performance of the North American Green C125 BioNet (BN) would be required to provide temporary erosion control while vegetation established. C125BN is a temporary erosion control blanket composed of fully biodegradable components, including a 100% coconut fiber matrix sewn with biodegradable thread on 1.5 inch centers



Leno woven nets (above) feature double twisted strands in the machine direction that provide higher strength and integrity to the BioNet blankets than that of cross-lay nets (below).



Installation of the C125BN (top) included an anchor trench at the top and hardwood EcoSTAKEs to secure the blanket. Fascines are placed in a trench on top of the blanket (right), and live stakes (left) begin to sprout leaves in only a few weeks.

between two jute nets. Coconut fiber gives the C125BN exceptional soil coverage for superior erosion control and good moisture retention at the soil surface for quick seed germination. The top net features a "Leno" weave that enhances the blanket's strength and erosion resistance while reducing the risk of wildlife entanglement as compared to cross-lay nets. This construction allows the C125BN to function for up to 24 months.

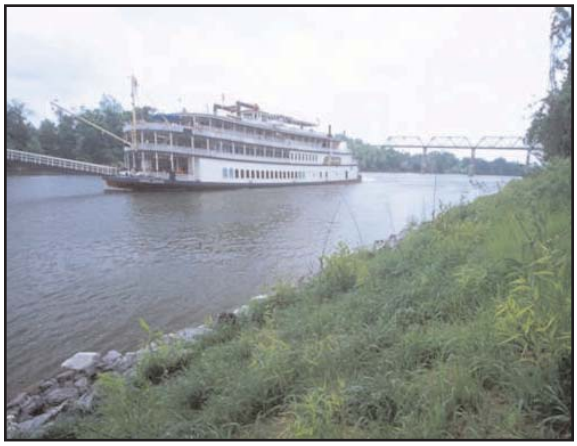
Aside from proper erosion control blanket selection, bioengineering projects are dependent on selecting the right plant species to be used as well as the design placement of the plants. The diversity of plants chosen would eventually grow into a very thick, hearty mass of vegetation that would absorb the energy of the water without allowing significant soil loss. Included among the plants used and their type of propagation were:

Live staking – cottonwood, willow, elderberry, dogwood
Fascines – willow, cottonwood
Brush layering – various live plants, bare roots
Seeding – native grasses

Before installation of the C125BN, the river bank was regraded to a gradient of nearly 1:1 (H:V), followed by an application of seed. C125BN was then applied to protect the newly seeded slope. In keeping with the natural design of the project, North American Green's 6 and 12 inch long wooden EcoSTAKEs™ were used to secure the C125BN. Live plants were then placed through the blanket or cradled by the blanket using the plurality of techniques mentioned above. Installation of all blanket and plant materials started February 1st 2000 and was completed on April 8th, 2000.

Results

Jen-Hill Construction Materials followed a strict schedule of watering the newly installed plantings by pumping water from the river and spraying it onto the bank from a boat at a rate of 27,000 gallons per acre per week. Such intensive watering was necessary to quickly establish the live plants and ensure a high survival rate. This was indeed the case as the live plantings and grass began to establish, resulting in very well established vegetation by the end of June.



Intensive maintenance encouraged vegetation to become well established within one month (above), and fully established within three months (below).

The 100% biodegradable aspect of the C125BN lends itself well to all the engineered vegetation establishment methods used on this project. *Its benefit was realized quickly when, two weeks after installation, on March 19th, flow velocity in the stream increased to 96% above its base flow and remained there for 36 hours. Discharge in the river increased from 647 cubic feet per second (cfs) to over 81,000 cfs, increasing the depth of water from 16.96 feet to over 30 feet and remained there for about 48 hours. This dramatic increase in erosive forces stressed the newly installed C125BN and the vegetation that accompanied it. However, by providing immediate coverage for the soil, the dense coconut fiber mulch and high strength nets of the C125BN were able to prevent soil loss from the bank, resist physical damage, and avoid the loss of any plant materials.*

Th e C125BN, with it's dense coconut fiber mulch, provided early soil protection and allowed a survival rate of greater than 85% for all plant types. Exceptional mulching characteristics inherent of the coconut fiber promoted establishment of the plants much more quickly than could normally be expected. North American Green's C125BN played a significant role in the rehabilitation of this portion of the Cumberland River by enhancing the area's overall aesthetic and natural appeal. Five years after completion, the Shelby Bottoms project is a prime example of how bioengineering techniques can provide a high level of erosion control performance while maintaining an environmentally safe habitat.