Naturally Strong Coir Fibers Help Restore Health to Ailing Streams

By Gregg Northcutt

Over the past eight years of reconstructing and restoring damaged streams and wetlands to provide more natural functions, Matt Hanewald and his partner, Bill Noel, have learned the value of using proper practices and materials for protecting stream banks from the erosive forces of flowing water – from both the stream itself and from stormwater runoff.

"We start with the engineering specifications and then choose the best materials to meet those specifications," says Hanewald. His erosion control products of choice are those made of all-natural, fully biodegradable coir (coconut fiber) fiber.

Their work also features the plentiful use of trees to revegetate the riparian corridors. Hanewald estimates the company has planted more than 600,000 trees on its various projects in the last two years.

The two partners own and operate Southeastern Trees, based in Walhalla, SC. The company specializes in erosion control and revegetation of stream and wetland restoration projects in Georgia, North Carolina, South Carolina and Tennessee.

Although they've worked on sections of streams as long as 3 miles, most projects are from about ½ to 1½ miles in length. Their projects have ranged in size 80 to 1,000 acres. "Not many other contactors in this part of the country offer the types of water way restoration services that we do," Hanewald says.

Keeping current

Hanewald has undergraduate and graduate degrees in environmental sciences while Noel has undergraduate and graduate degrees in forestry and botany. The two have continued their education, taking various courses that feature stream restoration techniques developed by noted hydrologist Dave Rosgen. Selected employees also attend these courses. The staff keeps up on the latest ideas and technologies by participating in regional stream restoration clinics and workshops. "We want to stay at the forefront of this evolving field," Hanewald says. "We also learn a lot from our experiences in the field and by talking with others who design and install restoration projects."

Much of their work involves mitigation banks. "Mitigation banks essentially take a degraded aquatic resource, both streams and wetlands, and implement restoration activities that provide an ecological lift to producing stream and wetland credits," Noel explains. "These credits can then be sold to Section 404 CWA (Clean Water Act) permittees as compensatory mitigation for permitted impacts within the bank service area."

Permitted impacts can include construction of culverts and installation of French drains in streams and wetlands associated with road construction or commercial development. A mitigation bank must be created under a formal agreement, a banking instrument, between a bank sponsor and regulatory agencies, Noel notes. "The banking instrument formalizes the number of stream and/or wetland credits that a particular bank will produce," Noel says. "A permittee can then purchase these credits as compensatory mitigation for aquatic impacts associated with development projects somewhere else."

In the case of Southeastern Trees, the company works with various private investment firms and state agencies in creating mitigation banks. The company's work begins after hydrologist and environmental engineers have completed the design for the restoration project.

Protecting the slopes

Usually, a stream restoration projects involves a waterway or wetland that has been degraded. This can result from an activity, such as straightening a stream channel, draining a wetland, or relocating a streams, carried out years ago to dewater a site to make it more productive for agriculture, Noel notes. "The main goal in a stream restoration project is to restore a stable dimension, pattern and profile for a degraded waterway, he says. "This can be accomplished by carrying out activities such as reconnecting stream flows to former flood plains, reducing channel slope by adding meanders to straightened streams, creating a new stream flood plain at a lower elevation, or adding physical structures called vanes to reduce erosive forces."

This work, which is done in the summer and fall, includes the services of heavy equipment contractor who uses dozers, track hoes, pans and skid-steer loaders, as appropriate to sculpt the new channel and streambanks. Once this is completed, the riparian corridor is revegetated with a mixture of native woody and herbaceous riparian species appropriate for the hydrologic regime being restored adjacent to the waterway. Eventually, the roots of this vegetation will anchor the soil and protect against the natural erosive forces associated with local rainfall and waterway. However, until the vegetation can establish a viable root mat, Hanewald and his crew normally install erosion control blankets made from coir.

Disturbed areas are stabilized as the project progresses. "We seed and install the blankets immediately after shaping a section of the project," Hanewald says. "These blankets will control erosion for several years until the vegetation develops enough to hold the soil in place. Eventually, the blankets decompose naturally."

Depending on project specifications, he installs one of two types of completely biodegradable woven coir blankets made by RoLanka International, Inc. One, BioD-Mat 40, is recommend for slopes up to 2:1 in steepness, flow rates up to with 8 cubic feet per second and shear stresses up to 3 pounds per square foot. The other, a heavier one with a denser weave, is recommend for slopes steeper than 1:1, maximum flow rates of 12 cubic feet per second and shear stresses as high as 4.5 pound per square foot.

"These blankets offer the strength and useful life required for our projects," Hanewald says. "We install them from the toe of the slope and as far up the streambank as needed, depending on the volume of water in the stream and average high water levels. In some instances, the blankets may cover only the bottom three feet or so of a streambank. In others they may extend 18 ft. up from the toe."

He secures the blankets with 2 x 2-inch, 2-foot long hardwood stakes installed 3 or 4 feet apart. "With this spacing, our blankets have withstood numerous floods," Hanewald say. "We've had some mats work loose when we've place the stakes farther apart."

More coir benefits

Unlike coir blankets made of mattress coir yarns, the two products that he uses are made of stronger, more flexible and more durable brown bristle coir fibers. Their ability to retain moisture also aids in establishing vegetation. "We've tried blankets made from other types of natural products but they're not as strong and they don't hold up as well as the RoLanka's BioD-Mat blankets," he says. Hanewald also likes the unique mesh structure of the woven coir

blankets. “Vegetation grows right up through the open areas and the loose weave is friendly to wildlife,” he says. “Birds and snakes can become entangled in synthetic netting. But we’ve had no problems with that because the mesh flexes.”

He and his crew plants containerized or bare-root trees and shrubs on the slopes and other areas of the riparian corridor. The planting season extends from about the end of November until mid-April in the southeastern U.S. The winter season provides the advantages of cooler, wetter weather. Also the plant material is dormant during this time of year which minimizes planting stresses.

Hanewald reports that only about half the trees survive at least a year when planted in the summer. That compares to a one-year survival rate of 85 percent when the company plants the trees in the winter. “We plant right though the blankets, cutting through the mesh just enough to install the plants,” Hanewald says. “That hasn’t affected the integrity of the blankets.

When engineers specify extra toe protection from stream flow velocities, he uses another type of coir product, BioD-Watl. Normally, he selects the nine-inch diameter product. “We use it to buffer the hydraulic forces of the stream to prevent undercutting of the streambank,” Hanewald says. This product, also made by RoLanka, is made of cleaned mattress coir fiber, which is uniformly and light-packed inside a high-strength bristle coir netting.

Field report

One of Southeastern Trees’ recently-complete mitigation bank projects involved a 300-acre site in Franklin County, GA.

“The Wehadkee and Little Wehadkee creeks that flowed through this area had been ditched and straightened more than 80 years ago to drain the wetland for farming,” Hanewald explains. “Over the years, the ditch had dug itself deeper and deeper, creating a very steep bank, until the stream was about 10 feet below the surrounding area. As a result, the water table dropped down to the stream level, eliminating the existing flood plain, and the steep banks prevented wildlife from reaching the stream.”

Based on measurements from stable “reference reaches” (a reference reach provides stable dimension, pattern and profile measurements from similarly sized streams or from stable reaches upstream or downstream of the restoration site) engineers designed the restoration project to re-create a more stable stream channel with the resulting environmental benefits. This project restored about two miles of stream.

“A heavy equipment contractor specializing in stream reconstruction rerouted the channel to put it back into its original flood plain and flow pattern in another area of site and filled in the eroded ditch,” Hanewald says. “We installed the BioD-Mat 70 coir blanket on the streambanks, seeded the disturbed areas with native wetland grasses and planted native shrubs and trees, including a lot of oaks, to provide habitat for wildlife, like deer and turkeys.”

In restoring the stream and wetlands, he and his crew planted about 90,000 trees and installed coir blankets. “The project turned out exceedingly well,” Hanewald says. “We’ve been very happy with our success using the coir mats. We’ve seen no reason to try a different type of blanket.”

Fig.1-Two types of coir blankets stabilize banks of steam in Georgia

For this project in Georgia, coir blankets designed for flows up to 8 feet per second were installed on the upper parts of the stream bank, while a heavier style, made for flows of 12 feet per second, where installed on the lower portions.

Fig.2-Coir blankets protect South Carolina streambanks

Woven, biodegradable coir blankets were used to control erosion on the steep banks at this site in South Carolina. This was part of project to stabilize the slopes following installation of an underground utility line which crossed the stream at this location.

Fig.3-Vegetated coir blankets

Grass is growing up through the coir erosion blanket about four to six weeks after the blankets were installed to temporarily control erosion on this slope until the vegetation can establish to hold the soil in place.