Natural-Fiber Products can Help Reduce the Short and Long-Run Costs of Controlling Sediment

By Greg Northcutt

Biodegradable sediment control products can play a key role in protecting water quality during and after soil-disturbing activities at construction sites. Done properly, erosion control practices, such as establishing perennial vegetation or installing grade control structures, turf reinforcement mats or gabions, can reduce the need for sediment control practices by stabilizing the soil permanently. However, when construction activities prevent the use of permanent erosion control practices, sediment control measures can be installed around the perimeter of the site and around storm drain inlets to trap sediment in stormwater runoff until erosion control measures can be installed.

Dealing with Challenges

Silt fence, made of non-degradable synthetic fabric, and straw bales have been among the more popular, traditional sediment control practices. These materials can pose some challenges to project owners and contractors. Consider silt fence. “In a highly dynamic construction environment, maintenance of silt fence can be very costly,” says erosion and sediment control consultant John McCullah, CPESC, Salix Applied Earthcare, Redding, CA. “In some cases, it may be impossible to prevent construction activities from destroying them and trucks from running over them and damaging the products. In addition, there are the added costs of removing, transporting and disposing of the silt fence fabric when the project is completed.”

As a result of such problems, some contractors tend to leave silt fence in place after it has served its purpose. That’s the assessment of erosion and sediment control consultant, Jerald Fifield, CPESC, CISEC, president of HydroDynamics, Inc., Parker, Colo. “If silt fence is visible from the road, contractors usually remove it at the end of the project,” he says. “Otherwise, they often leave it standing after vegetation has been established.” “Some contractors are beginning to consider how difficult it is to go back and remove some types of sediment control devices,” adds McCullah. “For example, anyone who has tried to pick up and remove a wet, soggy straw bale encrusted with mud knows just how difficult that can be.”

Biodegradable alternatives

In the past few years, a variety of biodegradable sediment control products made from natural fibers, including coir (coconut fiber), have been developed. Unlike synthetic materials, such as silt fence, they can be left in place to degrade naturally. In the process, these organic materials help support establishment of vegetation, which provides permanent erosion control.

The lower profile of some biodegradable sediment control products, such as sediment logs or wattles, offer another advantage. Typically, they protrude no more than about 12 to 18 in. when installed according to manufacturers' specifications. That compares to a silt fence which usually stands about 3 ft. high. Most of the time silt fences are fail and create more erosion as the 3-ft tall silt fences have to hold more water than they could hold. The lower profile allows the excess water to move freely and reduces the risk additional erosion. Combined with the greater strength and durability of the coir wattles, these products can withstand damage from equipment traffic better than silt fence or rock barriers. This can reduce the costs of maintaining sediment control devices during construction activities. A growing number of project owners and contractors are recognizing the advantages of biodegradable sediment control products for controlling sediment along the perimeters and around storm drain inlets on active construction sites.

"In the correct applications, silt fence can be a very good sediment control practice," notes Jennifer Hildebrand, CPESC, CPSWQ, a stormwater compliance manager with Weis Builders, based in Minneapolis, Minn. However, she reports, on her projects, where removal of silt fence is difficult or where it is subject to traffic damage, contractors are turning to other solutions. "Perimeter sediment control practices have changed dramatically," she says. "Instead of just silt fence, more and more contractors are also using alternatives, including biodegradable products, such as wattles." Alex Zimmerman, CPESC, with CSI Geosynthetics, an erosion control consulting firm based in Vancouver, Wash., also reports a decline in the amount of silt fence used for perimeter sediment control on his projects as some project owners and contractors choose biodegradable products instead.

More natural advantages

Yanking silt fence out of the ground not only involves extra labor expense, it may also disturb the soil that create risk of more erosion, requiring extra time, labor and materials to repair the damage. "Unless vegetation is well-established, removing silt fence may disrupt fragile vegetation leaving bare spots," says Fifield. "If not protected from rain and runoff, these exposed areas can erode. Sometimes, on a good silt fence installation, equipment may be required to pull up the fabric. The equipment, itself, can also tear up the soil surface." Zimmerman notes another reason for the growing popularity of biodegradable sediment control products in his area. "More and more developers and builders are looking for softer, greener alternatives to synthetic materials," he says.

Unlike synthetic materials, sediment control products made from natural fibers, add organic matter to the soil. As this organic matter breaks down over time it releases carbon, improving the soil. “Often, construction activities remove the nutrient-rich topsoil, leaving the much less productive sub soils on site,” says consultant McCullah. “The carbon in biodegradable fibers is often a source of food for soil microbes, which help break down these subsoils to start the process of re-building the soil.”

A strong, durable fiber

Biodegradable sediment control products made of coir are well suited for construction site applications, reports Lanka Santha, P.E., CEO of RoLanka International, Inc., which manufactures a variety of erosion and sediment control products made from coir.

“Coir is an abundant, renewable, natural resource that is strong and durable” he says. “It does not absorb water and it traps sediment in runoff better than straw or wood fiber. Also, coir decays at a much slower rate, holds it shape and structure for a longer time and wildlife won’t eat it.” One of the company’s biodegradable sediment control products, BioD-SiltCheck™, functions as a check dam. It features a coir fiber log body, which filters and reduces the speed of flowing water. Available in 9-in. or 12-in. sizes, this body is connected to two coir filter aprons on either side and is placed perpendicular to the flow. The upstream apron prevents flowing water from undercutting the filter body, while the downstream apron prevents erosion caused by water flowing over the device. “It can be installed in flow channels as a better alternative to silt fence, conventional wattle, rock and straw bale check dams.” Santha says.

Another of the company’s products, BioD-Watl™, coir wattle, consists of a lightly-packed roll of coir fiber, wrapped in a coir twine netting and ranging in size from 6 to 20-in. in diameters. It is designed to filter sediment along site perimeters and around catch basins. Like the sediment control product, BioD-Watl is wrapped in strong coir twine netting with 2 in. x 2 in opening that are designed to avoid trapping or injuring wildlife. Unlike straw or wood fiber wattles, these coir wattles are very flexible and easy to work. No special equipments are necessary to install them in catch basins. Also making loops of the flexible wattle will allow breathing space and prevent blocking the catch basin.

RoLanka’s newest sediment control product is Super-Wattle™. The latest advance in wattle technology, this patented, all-natural and biodegradable product is designed to avoid common failures of conventional wattles. Available in 9 or 12-in sizes, it features one closely-woven coir apron on the upstream side. This apron prevents runoff

from flowing under the wattle. In conventional wattle applications, it is common to experience runoff flow beneath the wattle between anchoring stakes. It requires no anchor trench. Instead, it is held in place by metal staples driven through the apron. This avoids the time and labor required to dig an anchor trench and to drive wooden stakes through the wattle to hold in it place. Often, these stakes can flatten the wattle, increasing the potential for overtopping. In addition, eliminating the anchor trench increases the effective height of the Super-Wattle compared to a conventional wattle of the same diameter. "It can be installed along slope contours to shorten slope length, reducing runoff velocity, and to trap sediment," Santha says. "It can also be installed at the base of slopes, around the perimeter of construction sites as a better alternative to silt fence, conventional wattles, and straw bales."

The keys to success

Regardless of type of product used to control sediment at construction sites – either biodegradable or not – Fifield emphasizes the importance of proper application. "Correct installation and maintenance of these products are critical," he says. For example, a sediment control barrier placed in front of a storm drain inlet that is in a sump should be high enough to create a pond that allows for deposition of sediment in runoff waters. "If runoff is flowing over the top or around the ends of the barrier, whether its rock, bagged compost or a fiber roll, you're discharging sediment into the inlet," Fifield says. "However, by allowing runoff to pond in front of the barrier, some sediment can be removed."

It's a similar story when using wattles or sediment logs to control sediment in a drainage channel during construction activities. Most wattle products must be trenched in and extended up the side slope to perform properly, he notes. If the remaining freeboard isn't high enough for runoff to discharge over a low point, water will flow around the edges, eroding the channel side slopes. Also, if the diameter of the wattle is too small, the sediment controlling benefits are minimal. Wattles must also be properly secured, Fifield notes. "I've seen cases where the contractor failed to provide breathing space when placing wattles in front of a curb inlet in a sump. Then, during a storm, the runoff shoved the wattles into the inlet, plugging it up and causing the area around it to flood."

Whatever sediment control product is used on a project, it's important to remember that the design criteria and expected performance standards are critical to the success of the project, Hildebrand adds. "Along with these standards, keep in mind that maintenance and removal are integral parts of that process," she says. "As an industry, we are often looking for one type of solution and the reality is that a combination of practices which complement one another is often our most effective solution."