



Woods Hole Sea Grant Program
Cape Cod Cooperative Extension



Biodegradable Erosion Control

Shoreline stabilization projects may be necessary in some cases to preserve property but should not be undertaken lightly. Erosion with the potential to endanger safety, property, or access should be well documented before such projects are considered. As soon as a structure (soft or hard) is in place to retard erosion in a specific area there is a decrease in the amount of sediment supplied to adjacent downdrift properties by natural longshore transport processes. Regular placement of nourishment sand may offset this reduction, but this will be a process that must be repeated throughout the lifespan of the property to have the desired effect. Construction of "hard" coastal engineered structures (CES),

such as a seawall, revetment, etc., on an eroding shore may eliminate the fronting beach, lead to end scour and alter adjacent properties. Even "soft" methods (i.e., fiber rolls, coir sand envelopes, sand fence, nourishment, etc.) have the potential to alter natural coastal processes. Herein I'll use the term biodegradable erosion control (BEC), referring to methods that include fiber rolls, sand envelopes, and erosion control mats, made from coir, jute, and hemp. BEC degrades over time, an example being fiber rolls (see photo below) which degrade rapidly when exposed to sunlight, lessening their erosion protection over time with a typical lifespan of five to 10 years.



According to the Wetland Protection Act (310 CMR 10.23): “Coastal engineering structure means, but is not limited to, any breakwater, bulkhead, groin, jetty, revetment, seawall, weir, riprap or any other structure that is designed to alter wave, tidal or sediment transport processes in order to protect inland or upland structures from the effects of such processes.” BEC methods may be permitted where a CES is prohibited, provided that a BEC does not alter natural wave, tidal or sediment transport processes. This is one aspect of what makes a BEC soft, the other aspect being that the stabilization should be somewhat temporary in nature. A boulder in a revetment would persist in the placed location for longer than the life of any home it might be protecting, a BEC biodegrades and is intended to be replaced by root systems from native plants that are effective at stabilizing shorelines, but would still allow erosion under some conditions. A soft method needs both of these aspects. Geotextile sandbags could be considered temporary, as they can be cut open and removed at any time, however they can get quite hard and reflect wave energy in a way comparable to a rock CES. Conversely, a BEC that never degrades and allows erosion would perform similarly to a CES. Some Massachusetts conservation commissions have taken the approach of requiring that soft alternatives have certificates indicating that they are biodegradable. If requiring a BEC, careful consideration should be given to the entire stabilization plan.

For example, a fiber roll project has more facets than just a roll of coir material, including:

1. Netting to contain the coir in a roll shape;
2. Connectors to tie the rolls to one another;
3. An anchoring system to secure the roll in place;
4. A cable to connect the anchor to the roll;
5. A fabric/cloth/textile to retain fill material.

1. Netting

Some contractors have discontinued the use of plastic netting on fiber rolls in favor of biodegradable hemp or coir. Plastic netting can trap and kill some animals that make use of this habitat zone. Other contractors favor a coated metal mesh for its potential to maintain shape under some wave energy. However, when exposed to wind/



waves/sunlight, the degradable material inside the mesh can be battered out leaving a metal assortment of mesh and cables behind (see photo previous column).

2. Connectors

Metal connectors (ex. hog rings) link into the netting to help secure the rolls and for repairing any potential rips in the netting. Alternatively, hemp or jute can be used to “sew” the netting shut again. It can take more time to repair by “sewing” than by just hooking in another link, but there is potential for these metal links to fall out of the material and enter the environment.

3. Anchoring System & Cable

Certain portions of the project do not lend themselves towards a biodegradable option. This may be necessary at some sites because if the anchors or cable are compromised the rolls can mobilize and float around waterways becoming a hazard for navigation. Steel earth anchors can be driven into the ground, with the environmental benefit of not requiring holes, digging, or concrete. Installation cables range from iron hooks and propylene rope, to hemp twine, to galvanized steel cable, to stainless steel cable, which are connected to a steel anchoring system (eg., duckbill anchor). Some areas can support simple wooden stake and hemp twine to “staple” the BEC to the substrate. This is typically done on a flat bottom and not on a sloping coastal bank (see photo below).



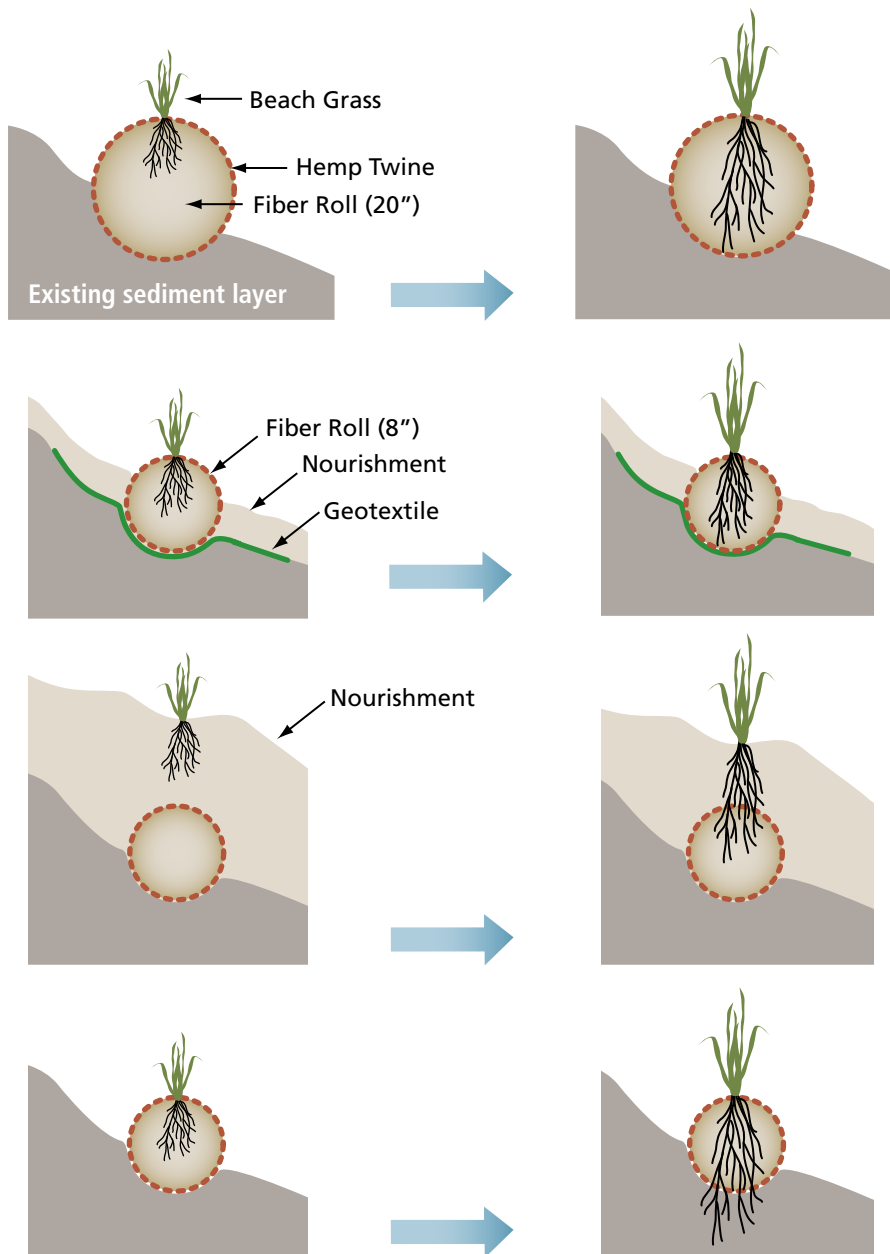
4. Fabric/Cloth/Textile:

A common CES construction practice is to line the excavated area with geotextile before placing bedding stones and a top layer of revetment boulders. This practice has carried over to BEC methods. The geotextile (aka., poly-filter cloth, filter fabric, silt fence, etc.) material allows water passage while retaining fill material and soil particles. Geotextiles are usually woven, knitted or non-woven from a synthetic polymer such as polyester or polypropylene. Woven geotextiles are functional for strength and

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Initial Planting

Growth to Minimum Root Depth



Some types of geotextile, used in conjunction with BEC, are also known as landscape fabric. Sold at garden supply stores, it stops weed growth by preventing sunlight penetration while still allowing water permeability. Roots are not intended to be able to penetrate the fabric, so small holes are cut into the fabric to allow the planting of desired vegetation. American Beachgrass is often the vegetation of choice for planting into BEC on coastal banks. Fiber rolls are cylindrical structures available in various diameters (6-20" is the typical range), densities (5-9 lbs/ft³ is the typical range), and lengths. When installing beachgrass the recommended depth is about 8", which is in the range of most fiber roll diameters. However, the USDA minimum root depth for American beachgrass is 20", which is at the

top of the diameter range for a minimum root depth. This indicates that it is likely that beachgrass will be impeded by the geotextile, making it unable to stabilize the shoreline to its full potential. This can be partially offset by placing a thick layer of compatible sediment on top of the BEC and making sure it stays covered in perpetuity, however the root systems will likely never be able to attach to the natural coastal bank underneath the stabilization alternative with geotextiles. The bottom row of the four scenarios above is the only one to allow vegetation to connect to the existing sediment layer. When planting larger shrubs, such as beach plum, the plant may be installed between fiber rolls so long as an adequate hole is cut into the fabric.



Two examples of geotextiles becoming exposed after erosion, reducing the effectiveness of the shoreline stabilization attempt.

filtration, such as revetment construction over soft soil. Non-woven geotextiles look like felt and can be used for erosion control. These materials are advertised as being “inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.” While these materials are never intended to see the light of day, they are not designed to break down quickly, rarely are suitable habitats if exposed, and eventually may be exposed if the BEC has exceeded its lifespan and shoreline retreat continues. If a BEC is required for a project, then a biodegradable fiber erosion control mat (available in a wide variety of weights, thicknesses, and mesh sizes) might be more appropriate than a material that will not degrade over time.

Root information available at:

<http://plants.usda.gov/java/profile?symbol=ambr>

and

<http://plants.usda.gov/java/profile?symbol=PRMA2>



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This document, a collaboration of the Woods Hole Sea Grant Program and Barnstable County's Cape Cod Cooperative Extension, should be cited as follows: Biodegradable Erosion Control by Greg Berman.

