

# Shore Erosion Control The Natural Approach



*Photo courtesy of Johann Martinez*



# WHY THE NATURAL APPROACH?

Throughout the years, the natural erosive force caused by wave activity has impacted the Chesapeake Bay shoreline. Along with naturally occurring erosion, recreational activities (boating) and development have accelerated the rate of shoreline erosion. When water regularly interacts with the base of the bank, erosion can occur. Erosion results in the loss of approximately 260 acres of land each year at a mean rate of 0.6 feet per year throughout Maryland. Sediment from erosion builds essential marsh habitats, but causes turbidity and nutrient loading that adversely affect living resources.

Traditionally, reduction of shoreline erosion has been accomplished by structural means, such as a stone revetments or wooden bulkheads. Structural armoring may be the only solution along very exposed, high-energy shorelines or along heavy boat traffic areas. However, many shorelines along the Bay's tributaries and protected coves can benefit from an alternative, non-structural technique.

A "Natural Approach" incorporates marsh vegetation into the project design to enhance the habitat value of an area. This conservation practice can reduce the loss of valuable waterfront land, protect property, and decrease the amount of sediment entering the Bay's waters. In many cases, the vegetated marsh fringe serves as a buffer strip that works as

a filter for runoff and pollutants. By trapping this sediment, the vegetative beach will grow wider and actually push the high tide away from the base of the bank. This "Natural Approach" for shoreline erosion works on a variety of shorelines, but each case should be evaluated separately.

The purpose of this guide is to illustrate and discuss four "Natural Approaches": stone groins with marsh plantings, marsh edge stabilization, stone sills with marsh plantings, and coir fiber log reinforcement.

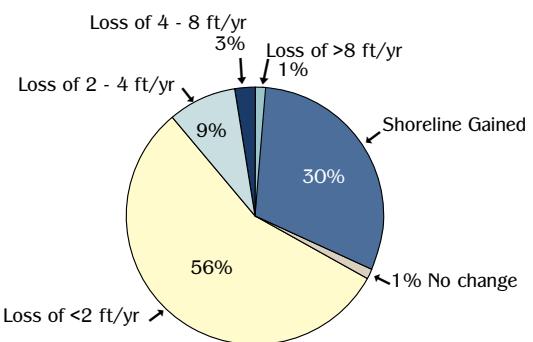


**BEFORE:** Loss of upland from shoreline erosion in the Chesapeake Bay.



**AFTER:** Stone groins and marsh fringe constructed to address the erosion problem.

## Shoreline Change Trends in the Chesapeake Bay



A study by Maryland Geological Survey (2003) evaluated the change in shoreline location over time. For example, 56% of Maryland's shoreline eroded at a rate of less than 2 feet per year in each of the last 50 years.

## HOW WILL THE NATURAL APPROACH BENEFIT YOU?

- Reduces construction costs.
- Restores marine habitat and spawning areas.
- Assists with maintaining water quality.
- Prevents further bank erosion and property loss.
- Creates a natural and aesthetic appearance.
- Establishes a beach where boat launching, sunbathing and swimming can occur.

# WHAT APPROACH WILL WORK FOR YOUR SHORELINE?

Basic site characteristics can be used to evaluate the potential success of a “Natural Approach” along an eroding tidal shoreline. These characteristics include:

- The distance in miles of open water (called “fetch”) should be 3 miles or less.
- The location of shoreline in relation to prevailing winds.
- Evidence of existing marsh grasses or submerged aquatic vegetation near the project site.
- Erosion rate trends.
- Shallow water depth near the shoreline.
- Plenty of sunlight.

The *Project Selection Criteria* chart can assist you in determining the characteristics of your shoreline and the potential options that can be used to address an erosion problem.

Erosion Control Project Selection Criteria*			
ENERGY ENVIRONMENT	Low Energy	Medium Energy	High Energy
Shoreline Location	creek or cove	minor river major tributary	main stem of Bay
Water Depth (ft)	less than 1.0	1.0 to 2.0 2.0 to 4.0	4.0 to 15.0
Fetch (miles)	0.5 to 1	1.0 to 2.0 2.0 or more	2.0 or more
Erosion Rate (ft/yr)	less than 2	2 to 4 4 to 8	8 to 20
Erosion Control Treatment Options	Non-structural Projects beach replenishment fringe marsh creation marshy islands coir log edging, groins	Hybrid Projects marsh fringe w/groins marsh fringe w/sills marsh fringe w/breakwaters beach replenishment w/breakwaters	Structural Projects bulkheads revetments stone reinforcing groins & jetties
Cost per foot (\$)	\$100-200	\$100-250 \$400-550	\$600-1,000

\* DNR SEC Program

## WHAT SHOULD YOU PLANT?

Marsh grasses commonly planted for shore erosion control are cordgrasses. These grasses are planted in the intertidal zone (smooth cordgrass) and above the mean high tide (saltmeadow hay). They are adapted to a wide range of salinities and form dense, protective root mats.

Other grasses typically used include switch grass, soft stem bullrush and three square. Disturbed areas above the beach can also be planted and stabilized. The types of grasses used on the bank/bluff vary according to the site.

Spring is the best time to plant grasses because it gives the plants an entire growing season to become established and take a firm hold before winter sets in.



Marsh grasses provide wildlife habitat and stabilize the shoreline.

# STONE GROINS



*Undercut shoreline leads to the collapse of the bank and forested shoreline buffer.*

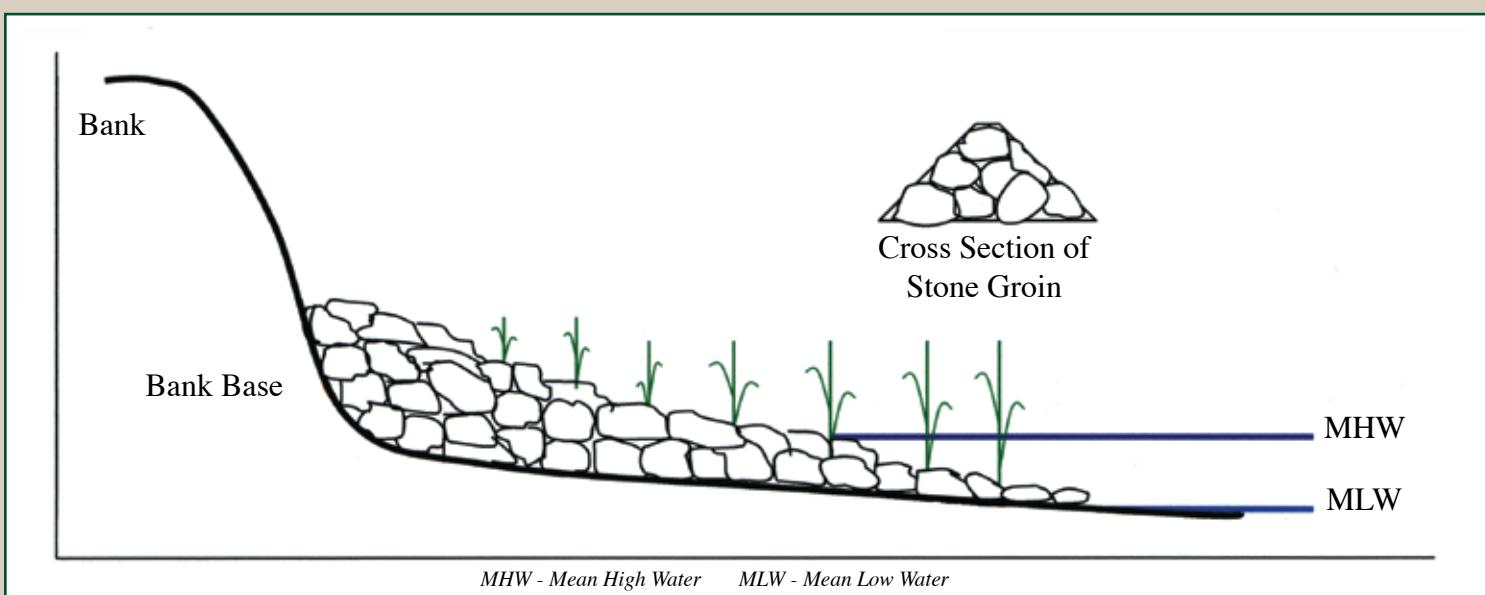


*Sand fill is placed and graded to the water's edge.*

**S**tone groin shoreline stabilization projects utilize stone placed perpendicular to the shoreline. These structures reduce wave energy and retain sands and sediments.

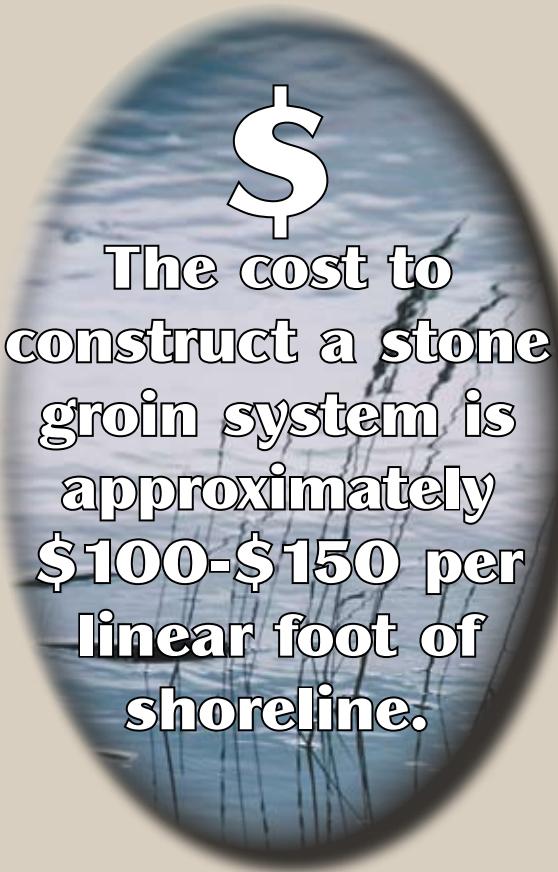
The groin structures protect the newly installed sand fill and planted marsh vegetation from erosive forces and allow establishment of the grasses. Healthy vegetation contributes greatly to the stability of the bank/bluff by holding sand on the beach in place with its root system.

The marsh plantings serve as a shoreline vegetative buffer. Buffers trap sediment, absorb nutrients, and link aquatic and upland wildlife habitats. Combining a tidal wetland buffer with a healthy upland vegetated buffer creates the best protection for Bay water quality.



*Profile of typical stone groin and cross section used to stabilize eroding banks.  
Note: Plants are placed between groins on the sand fill.*

# With Marsh Plantings



DNR SEC

Stone groins are installed to protect sand fill and eventually the marsh plantings.



DNR SEC

Project completed. The marsh plantings will grow to fill the entire sand fill area.

## CONSTRUCTION PHASES:

Stone groins are small structures built perpendicular to the shoreline. Groin systems are about 1 to 2 feet higher than the ground surface and about 30 feet long.

The typical construction process includes:

1. Bank clearing and pruning of trees to reduce shade.
2. Temporary access road is established to import stone to the site.
3. Stone groins built approximately every 50 feet along the shoreline.
4. Beach areas between stone groins are filled with sand on a 10:1 slope.
5. Planting of marsh grasses.
6. Installation of goose exclusion fence.

# MARSH EDGE



Marsh edge deteriorated by erosive forces.

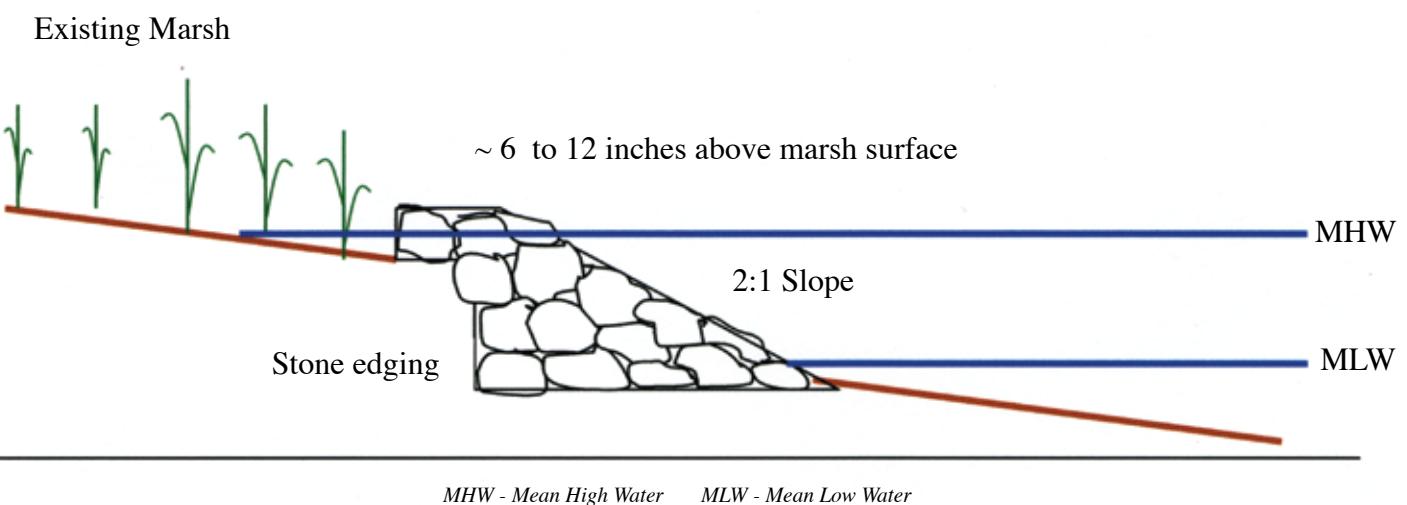


Placement of filter cloth under the stone is essential to ensure project success.

When a healthy fringe marsh exists along the shoreline, but is being eroded, marsh edge stabilization represents a potential low cost, low maintenance solution.

Marsh stabilization projects simply place filter cloth and stone at the edge of an existing marsh slightly above the level of the marsh surface. The structure follows the edge of the marsh and protects it from erosive forces such as boat wakes, tidal fluxes, and wind or storm generated waves.

These projects assist with maintaining a shoreline's natural vegetative buffer that is essential to the protection of the bank. Fringe marsh systems are essential to the health of the Chesapeake Bay. They filter upland runoff, absorb nutrients and sediments, and protect water quality.



Profile of a typical marsh edge stabilization project used to prevent wetland edge loss.

# STABILIZATION

\$  
The cost to construct a marsh edging project is approximately \$125-\$150 per linear foot of shoreline.

*"The Marsh Edging program is one more important tool for use in reversing the damaging action of erosion on our vital salt marshes of Delmarva".*

— Joe Coyne, Dorchester County



*Project completed. Tidal wetland protected from further erosion.*



*One Year Later - Successful protection of the wetland and adjacent properties.*

## CONSTRUCTION PHASES:

Marsh edge stabilization provides a protective barrier along the existing tidal wetland to maintain vegetation and prevent potential erosion of upland.

The typical construction process includes:

1. Temporary timber mats installed for access to marsh area by heavy equipment.
2. Stone brought to site and stockpiled or immediately installed.

3. Filter cloth and stone placed along marsh edge at a 2:1 slope.
4. Stone structure placed approximately 6 to 12 inches above marsh surface.
5. Minimal planting needed directly behind new stone edging.

# STONE SILLS



Severe erosion on an 8 foot high unvegetated bank.



Audrey Bryson

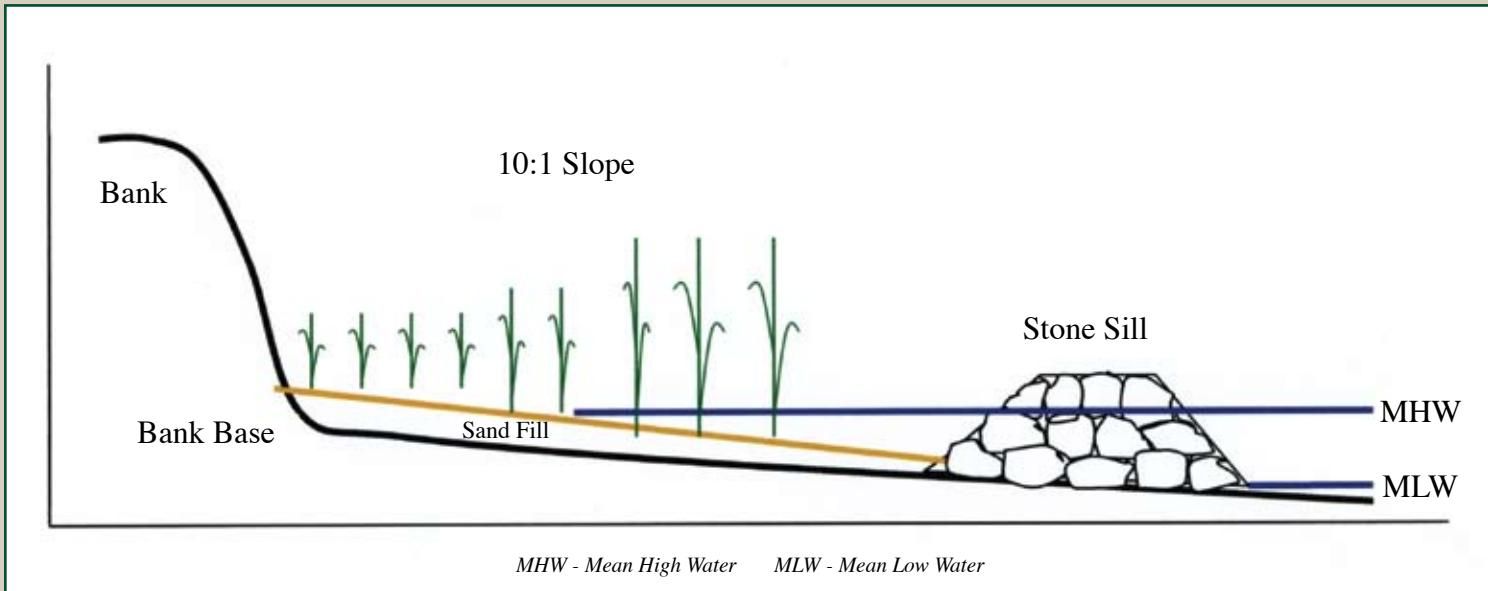
Planting native vegetation in the sand fill.

Stone sills are built parallel to the shoreline and use sand fill to build a marsh terrace averaging 22 feet in width. Most sill projects provide a higher level of protection against erosion than the options previously discussed.

Sills are used along shorelines with moderate wave action and erosion. They are often selected for areas where the water is considerably deeper in front of a shoreline.

The health of the planted marsh behind the sill and access to these areas can be improved by creating openings for fish, horseshoe crabs, and turtles along the length of the project.

Openings in the structure allow tidal flushing and maintain the land and water connection. A variety of designs for sill openings are available.



Profile of a typical stone sill stabilization project with sand fill and marsh plantings.

# With Marsh Plantings



**The cost to construct a stone sill project is approximately \$150-\$200 per linear foot of shoreline.**



*Project completed. Wildlife and aquatic habitats are restored.*



*One Year Later - Extensive grass stand works to filter nutrients and sediments.*

## CONSTRUCTION PHASES:

Stone sills are typically constructed in the water, a maximum of 30 feet from the shoreline and built to a maximum of 1 foot above the high tide line.

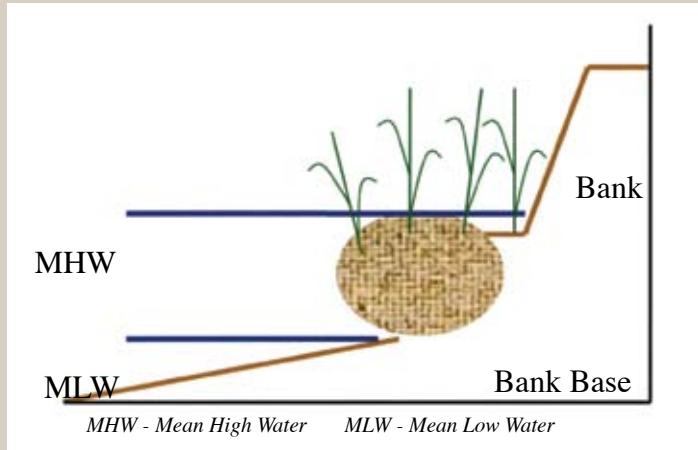
The typical construction process includes:

1. Trees pruned along the shoreline to remove shade.
2. Filter cloth placed on existing bottom.
3. Stone placed on filter cloth in water to build sill.
4. Sand fill added and graded.
5. Marsh grasses planted on the sand fill.
6. A goose exclusion fence installed to protect the new plants.

# COIR FIBER LOG REINFORCEMENT



Coir fiber logs reduce wave energy to allow the marsh vegetation to take hold.



Profile of an installed coir fiber log stabilizing the base of bank.  
Coir fiber logs cost approximately \$5 per linear foot.

Coir fiber logs represent an all-natural product that can be used to deal with low wave energy along a shoreline or bank.

They are used in combination with marsh plantings to provide a natural shore erosion and restoration approach. As opposed to stone, coir fiber logs will disintegrate over time leaving the shoreline completely restored to its original state.

Coir fiber logs are inexpensive and easy to handle, so minimal assistance is required to implement this practice.

A New and  
Natural  
Technique

## MAINTAINING YOUR PROJECT

Proper maintenance is vital to the success of any project. The grass plantings require special maintenance considerations. Debris, such as driftwood, dead grasses and trash, can smother or shade out the grasses and must be cleaned out periodically. Trees are usually pruned during the preparation of a site, but should be checked yearly to maintain adequate sunlight levels for 6-8 hours per day.

The presence of small trees, shrubs, and other grasses (like *Phragmites spp.*) compete with the marsh grasses and stifle their growth. It is critical that non-planted species be removed periodically to maintain the health of the marsh grasses. Foot traffic must be kept to a minimum and damaged areas need to be replanted to protect the sand fill. In times of drought, newly planted upland grass areas that do not get flooded by normal tides may need to be watered.

Newly planted vegetation is a favored food source for geese. An exclusion fence, generally made of oak stakes and string, is recommended during the first two years of the project. The fence can be removed after that time, but replanted areas should remain protected. The property owner is responsible for maintenance and should seek follow-up technical assistance when needed.

# MEETING YOUR PROJECT NEEDS

## TECHNICAL ASSISTANCE

Planning and managing a shoreline erosion control project can be challenging. Resource Conservation & Development Councils and the Maryland Department of Natural Resources Shore Erosion Control Program can provide technical assistance throughout all or particular stages of a project. Assistance is available to property owners, local governments, communities, and businesses. Examples of technical assistance include:

- Evaluating sites, assessing problems and recommending potential solutions;
- Identifying cost, maintenance and regulatory requirements, and;
- Providing general contracting and project management services.



*Carol Hollingsworth, NRCS*

*The Maryland Eastern Shore RC&D coordinator provides guidance to volunteers during a planting at a project site.*

## PROJECT MONITORING

In 2006, RC&D staff initiated a pilot study to monitor 35 marsh creation/protection projects in Maryland. The purpose of the study was to determine the success of these projects at abating erosion and maintaining marsh and bank stability. The results of the pilot study is quite promising and indicated that 83% of banks inspected were stable (no undercut or slumping) and 74% of the planted or protected marshes exhibited minimal loss (<25%) or no erosion. The stone structures in 71% of the projects were found to be in excellent condition and show little or no displacement. Over all, 32 of 35 projects ranked from good to excellent condition. The pilot project was been continued into a full study to assess an additional 225 out of 258 projects that have been implemented by ESRC&D. The results of the extended study will be completed and available in Spring 2008.

## FINANCIAL ASSISTANCE

Choosing the ‘Natural Approach’ could make you eligible for loans or grants. Implementing shoreline erosion control projects with natural components has definite benefits for the health of Maryland’s waterways. The State is willing to support shoreline restoration and protection efforts through a range of financial opportunities listed below. RC&D Councils can assist you with determining which financial opportunities would best fit your project needs and objectives.

Organization	Program	Type	Applicant	Contact Information
Maryland Department of Natural Resources	Non-structural Erosion Control	Zero Interest Loans	100% for Local Governments; \$25,000 maximum for private owners	Shore Erosion Control Program Phone: (410) 260-8523 <a href="http://www.dnr.state.md.us/grantsandloans/sec.html">www.dnr.state.md.us/grantsandloans/sec.html</a>
Maryland Department of the Environment	Maryland Linked Deposit	Low Interest Loans	All property owners and all types of projects eligible	Water Management Administration Phone: (410) 537-3574 <a href="http://www.mde.state.md.us">www.mde.state.md.us</a>
Maryland Department of the Environment	Small Creeks and Estuaries	75% / 25% Cost Share Grants	Local Governments; any type of projects eligible	Water Management Administration Phone: (410) 537-3574 <a href="http://www.mde.state.md.us">www.mde.state.md.us</a>
Chesapeake Bay Trust	Living Shoreline Initiative, General Program	50 /50 Preferred Match	Community Projects; Local Governments, Non-Profit	Phone: (410) 974-2941 Email: <a href="mailto:postmaster@cbtrust.org">postmaster@cbtrust.org</a> <a href="http://www.chesapeakebaytrust.org">www.chesapeakebaytrust.org</a>

## To get site inspection and design assistance for a “Natural Approach” to control shoreline erosion, contact:

**Resource Conservation and Development (RC&D) Councils** plan and manage natural resource conservation projects resulting in prudent land use and sound management and enhancement of natural resources. RC&D is the grass roots arm of the US Department of Agriculture, Natural Resources Conservation Service (NRCS) and operates as a 501C3 Non-profit Corporation. RC&D provides site visits, technical assistance, plan review, project management, contractual and other services on shore erosion issues.

Contact the Local RC&D Council or visit the website at [www.md.nrcs.usda.gov](http://www.md.nrcs.usda.gov).

Maryland Eastern Shore RC&D	(410) 822-9300	<a href="http://www.md-esrcd.org">www.md-esrcd.org</a>
Southern Maryland RC&D	(301) 932-4638	<a href="http://www.somdrcc.org">www.somdrcc.org</a>
Western Maryland RC&D	(301) 733-7276	<a href="http://www.wmarylandrcd.net">www.wmarylandrcd.net</a>

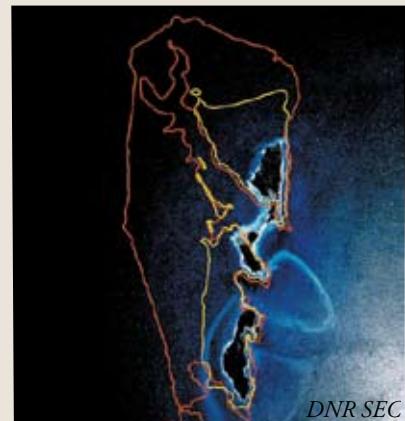
**Maryland Department of Natural Resources (DNR)** Shore Erosion Control Program was established to provide technical and financial assistance to waterfront property owners for shoreline stabilization projects. In 1985, the Maryland Legislature created the Non-structural Shoreline Erosion Control Program as part of the Governor’s Chesapeake Bay Initiative to provide incentives for the use of natural stabilization methods as described in the publication through site visits, assessments, cost estimates and standards as well as 10-year interest free loans.

Contact the SEC Program at (410) 260-8523 or visit the website at [www.dnr.state.md.us](http://www.dnr.state.md.us)

**Maryland’s Coastal Program** is a networked program designed to protect coastal and marine resources. DNR is the lead agency for this program, but works through partnerships and provides funding to local governments, state agencies, non-profit organizations, and universities. The program addresses a variety of coastal issues including provision of public access, nonpoint source pollution reduction, coastal hazards mitigation, habitat and living resources protection, and growth management.

The program has supported development of a web portal, *Maryland Shorelines Online*. The portal provides data distribution capabilities, Internet mapping tools, and information about shoreline hazard activities in the State of Maryland. The site focuses on shoreline management as it relates to shore erosion, sea level rise, coastal flooding, and promoting innovative methods for shoreline protection and restoration. The interactive mapping tools hosted on the site provide users with the opportunity to assess historical shoreline change trends, as well as site-specific information on shoreline conditions.

For technical information and online mapping/analysis go to: [shorelines.dnr.state.md.us](http://shorelines.dnr.state.md.us) or call the Maryland Coastal Program at 410-260-8743 or 8730.



Historical shorelines depict the loss of land from erosion at James Island, MD.

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Assistance provided by David Wilson, Jerry Walls, Bhaskaran Subramanian, and Nancy Basil, ESRC&D. All photos provided by Jerry Walls unless otherwise noted. All shoreline project profiles created by Audra Luscher.

Financial assistance provided by the CZMA of 1972, as amended, administered by the Office of Coastal Resource Management, NOAA. A publication of the Maryland Coastal Zone Management Program, Department of Natural Resources pursuant to NOAA Award No. NA03NOS4190086

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