





## **OUTLINE**

- Erosion & traditional approaches
- Living shorelines- what is it?
- Maryland's Living Shorelines program
  - LS Law
  - Products
  - Funding- loans, grants, etc
- How are projects in MD performing?
   Lessons learned.
- Strengths of the Program
- Moving forward





## MARYLAND Traditional Methods of Erosion Control Methods

## Erosion is a natural phenomenon



Rip-rap or Revetment

#### Wooden Bulkhead







## Problems Associated with "Structural" Approach













## Recognizing the Problem

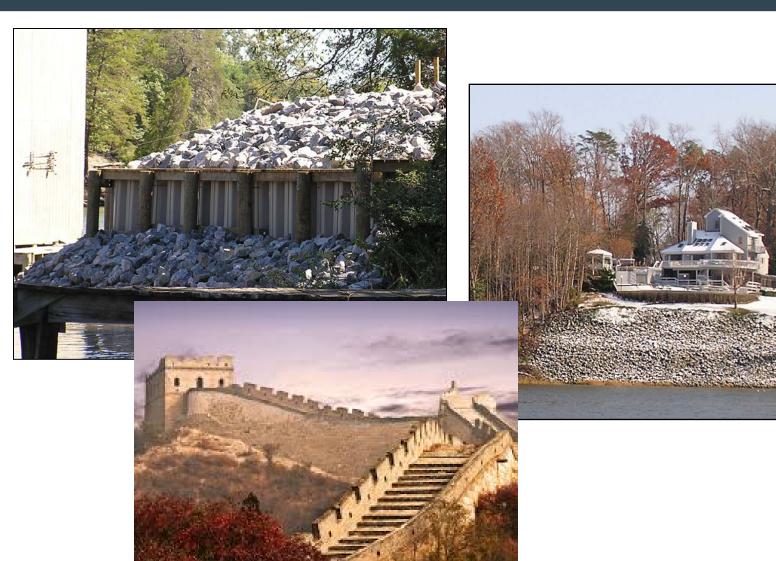
MD shorelines approximately 7,000 miles.



 Erosion affects all 16 coastal counties along the Chesapeake Bay and Coastal Bays watersheds.



## Excessive ??







Rate of change	Shoreline Length	
	Miles	%
Accretion	2,006	30
No Change	75	1
Slight erosion 0 to -2 feet/year	3,740	56
Low erosion -2 to -4 feet/year	618	9
Moderate erosion -4 to -8 feet/year	173	3
High erosion Over -8 feet/year	48	1
Total	6,659	100







Low Erosion: 2-4 ft/y

Slight Erosion: 0-2 ft/y







Moderate Erosion: 4-8 ft/y

High Erosion: 8+ ft/y







## LIVING SHORELINES





## Our Definition....

- "..... a suite of techniques which can be used to minimize coastal erosion and maintain coastal process".
- Techniques may include the use of fibre coir logs, sills, groins, breakwaters or other natural components used in combination with sand, other natural materials and/or marsh plantings.
- These techniques are used to protect, restore, enhance or create natural shoreline habitat.





## "Biological" Advantages of Living Shorelines



 Provides shallow water habitat that results in higher abundance and diversity of aquatic species both nearshore and offshore.



 Helps to maintain a link between aquatic and upland habitats, providing shoreline access for wildlife and recreation.



Maintains natural aesthetic.



## "Physical" Advantages of Living Shorelines



 Improve water quality by settling sediments and filtering pollution.



Absorb wave energy.



 Maintain natural shoreline dynamics and sand movement.



Costs comparable to "structural" options.





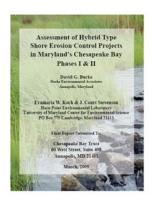
## Limitations



Not effective in all situations.



 Limited number of marine contractors with knowledge/expertise in living shorelines.

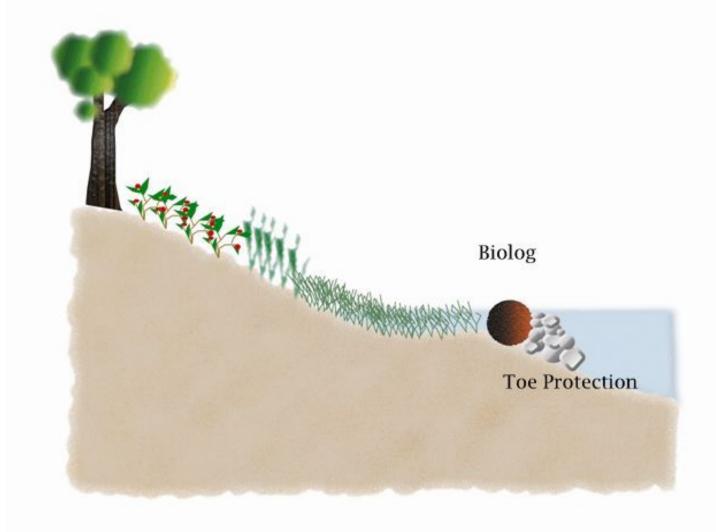


Limited detailed science/literature.





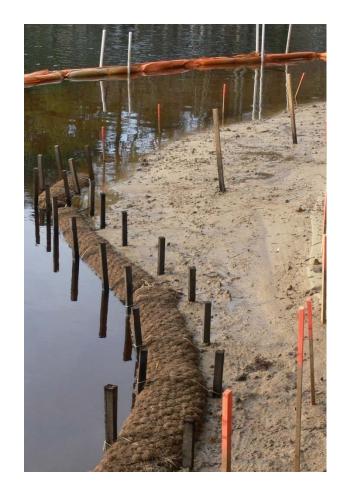
## Biolog Based Designs







## Biolog Projects

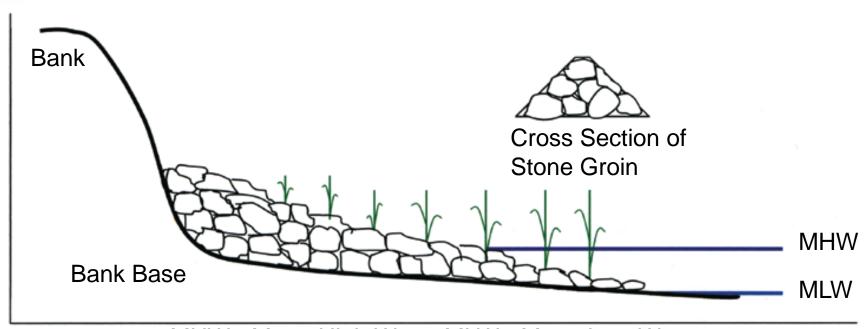








## Cross-Section of a Typical Groin



MHW - Mean High Water MLW - Mean Low Water

Profile of typical stone groin and cross section used to stabilize eroding banks.

Note: Plants are placed between groins on the sand fill.





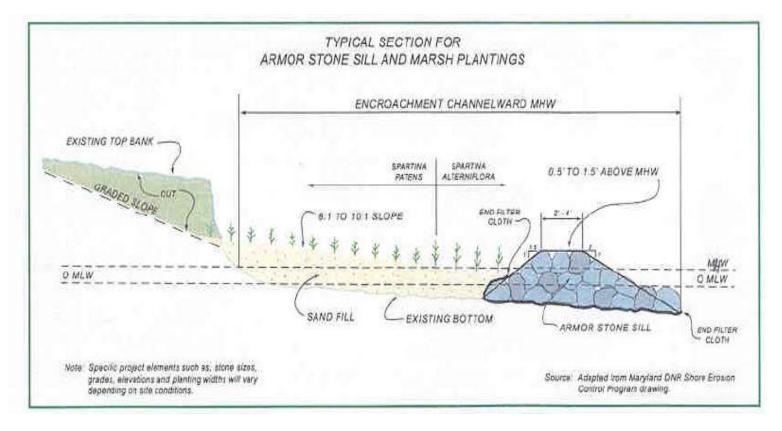
## Groins







## Sill Design



- S. alterniflora is planted from mid-tide to mean high water
- S. patens is planted above mean high water





## Sills with Marsh Plantings







## Sills with Marsh Plantings











## Living Shorelines Protection Act of 2008

- -Bill passed into Law October 2008; regulations implemented in February 2013.
- -Previously, Living Shorelines were "recommended" but not required.
- -The law provides the regulatory agency with a strong foundation to promote alternate shoreline erosion control measures.
- -The Law clearly states: "Improvements to protect a person's property against erosion shall consist of non-structural shoreline stabilization measures (i.e. living shorelines) except where the <u>person can demonstrate such measures are not feasible</u>, or where <u>mapping indicates areas that have been deemed appropriate for structural shoreline stabilization measures"</u>.





## Prior to Feb. 4, 2013

- Erosion control measures considered in order of preference
  - No action
  - Nonstructural shoreline stabilization
  - Structural measures to stabilize nonstructural stabilization
  - Revetments
  - Breakwaters
  - Groins
  - Bulkheads



COMAR 26.24.04.01



## Post- Feb. 4, 2013

- Regulations implemented February 4, 2013
- Order of preference
  - No action
  - Relocation of structures
  - Nonstructural shore erosion control project
  - Structural shore erosion control project with MDE approved
- Waiver





## LS Waiver Request Form



## Living Shoreline Waiver Request Maryland Department of the Environment Water Management Administration



The Living Shoreline Protection Act of 2008 requires that improvements to protect a person's property against shoreline erosion consist of marsh creation or other nonstructural shoreline stabilization measures (i.e. Living Shorelines) that preserve the natural environment unless:

- A) The project shoreline is mapped by the Maryland Department of the Environment (MDE) as an area appropriate for structural shoreline stabilization measures, or
- B) The applicant can demonstrate to MDE's satisfaction that nonstructural measures are not feasible due to excessive erosion, severe high energy conditions, or the fact that the waterway is too narrow for effective use of nonstructural shoreline stabilization measures.

A person meeting any of these conditions should provide the information requested below, which will help to demonstrate that nonstructural shoreline stabilization measures are not feasible for the project site and provide the basis for the issuance of a waiver by MDE exempting the property owner them from the requirement to construct a living shoreline.

1.	Name of Property Owner:		
2.	Address of Property Owner:		
3.	Address of Project Site:		
4.	Previous MDE permit number (if known):		

Please refer to the Living Shoreline Waiver Diagram on Page 3 and the Living Shoreline Waiver Flowchart on Page 4 when you answer the questions in the following table.

NUMBER	CATEGORY	QUESTION	ANSWER
1	Navigation	Distance in feet from the Mean High Water Line to the edge of the closest mapped or unmapped navigable channel.	
2 Width of Waterway		Distance in feet from edge of worksite shoreline perpendicular across the waterway to the opposite shoreline.	
3		Depth of the water in feet from the Mean Low Water Line to the bottom or to e of the shoreline bank.	

Water Management Administration Page 2 of 2

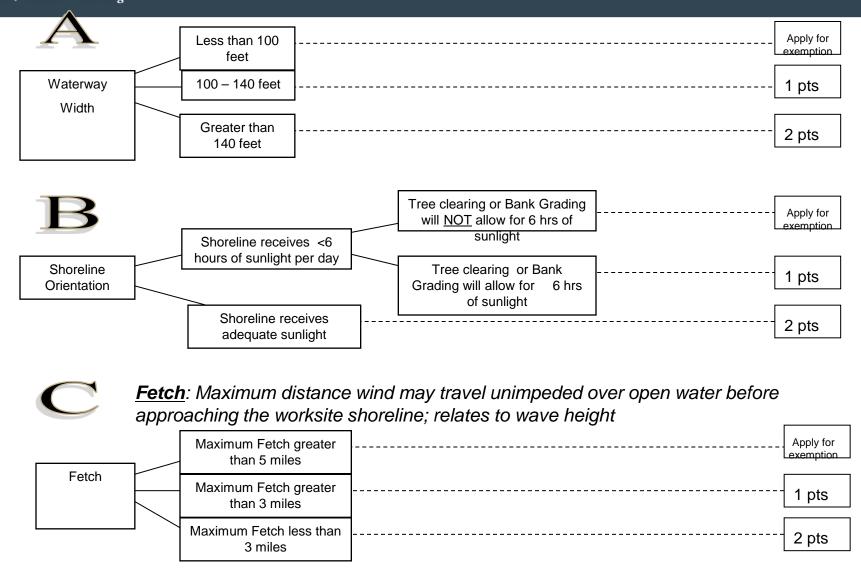
NUMBER	CATEGORY	QUESTION		ANSWER	
4	Depth of Waterway	Depth of water in feet relative to the Mean Low Water Line at the channelward extent of the proposed nonstructural shoreline erosion control measure.			
5	Fetch	Distance in feet from the edge of the worksite shoreline across the closest waterway in the direction of prevailing summer/winter winds to the opposite shoreline.	way in the direction of		
6	Bank Orientation	Provide a compass direction perpendicular to the line of the worksite shoreline. Direction can be given as NE, SW, etc. or as a compass heading (i.e., 45°, 225°).	the worksite shoreline. Direction can be given as		
		Firmness of bottom material or substrate?		Soft	
7	Bottom Substrate	Describe the composition of the bottom material or substrate (i.e., sand, mud, silt, clay, gravel)?  Explain:			
	Sensitive Species	Will project construction adversely impact fish, plant, or wildlife habitat? If unknown, leave this section blank. MDE will coordinate with the Maryland Department of Natural Resources to determine if there are any potential impacts to sensitive species.	Yes	No	
8		How will a structural shore erosion control project minimize impacts to fish, plant and wildlife habitat?  Explain:			
	9 Site Access	Is access to the work site via water impractical?		No	
9		How will the worksite be accessed to facilitate construction of the project?  Explain:			

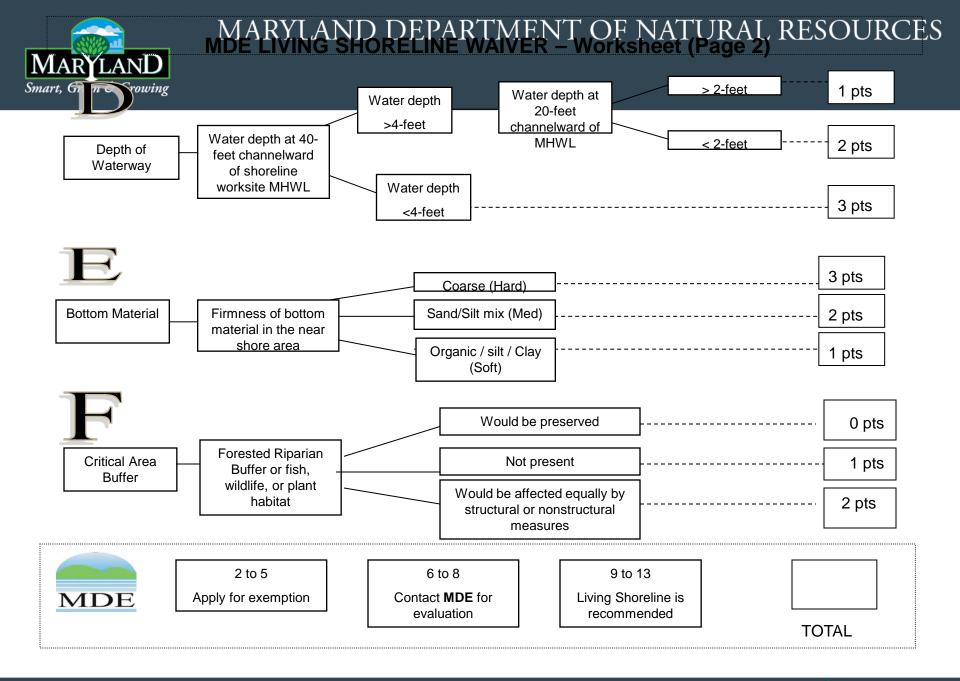


# MARYLAND Smart, Green & Growing

#### MARYLAND DEPARTMENT OF NATURAL RESOURCES

## MDE LIVING SHORELINE WAIVER – Worksheet (Page 1)

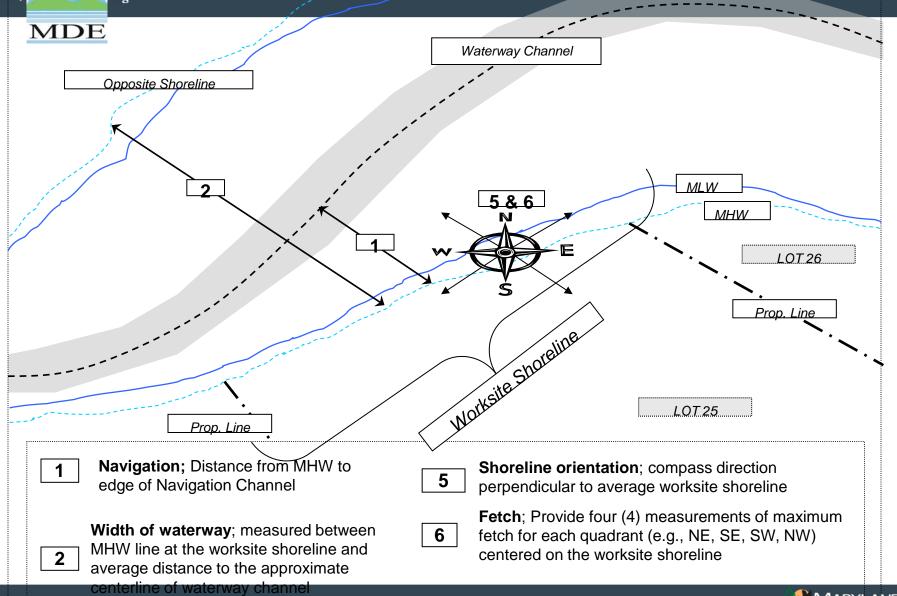






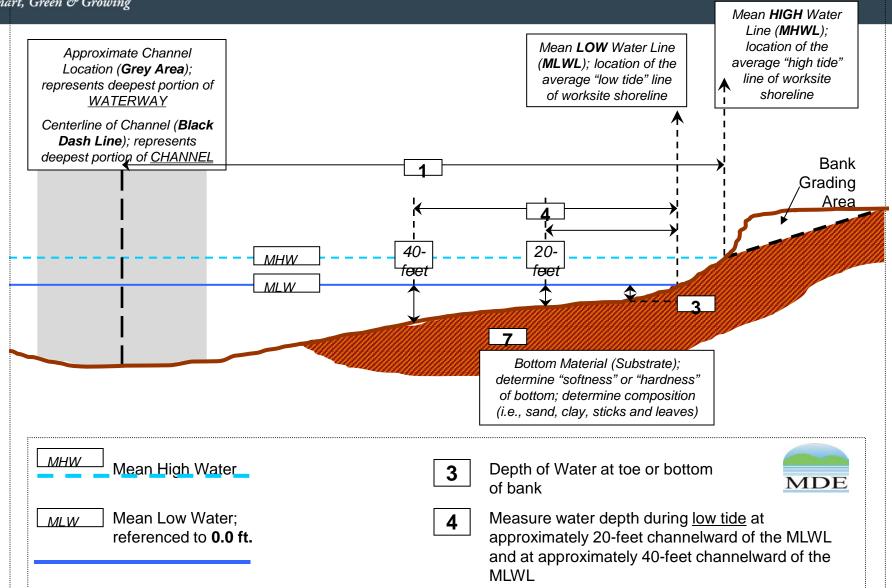
# MARYLAND Smart, ving

## MARYLAND DEPARTMENT OF BATURAL RESOURCES





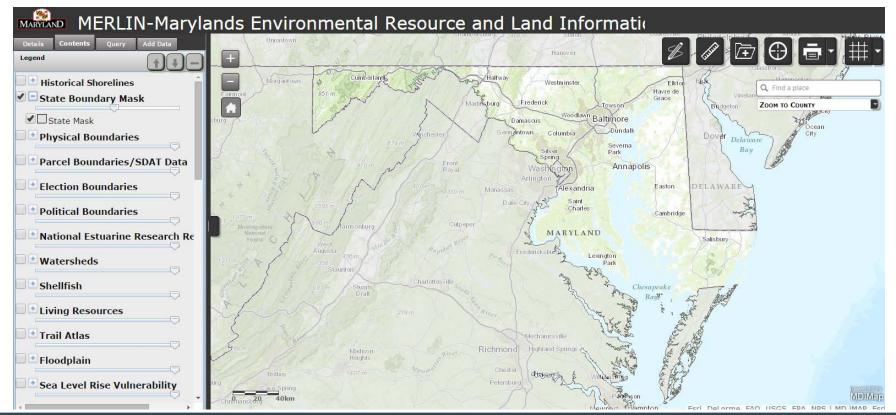
## MARYLAND DEPARTMENT OF NATURAL RESOURCES MDE LIVING SHORELINE WAIVER – EXHIBIT A (CROSS SECTION)





### **MERLIN**

- Maryland's Environmental Resources & Land Information Network
- http://www.mdmerlin.net/index.html





# MARYLAND Smart, Green & Growing

#### MARYLAND DEPARTMENT OF NATURAL RESOURCES

## Coastal Atlas

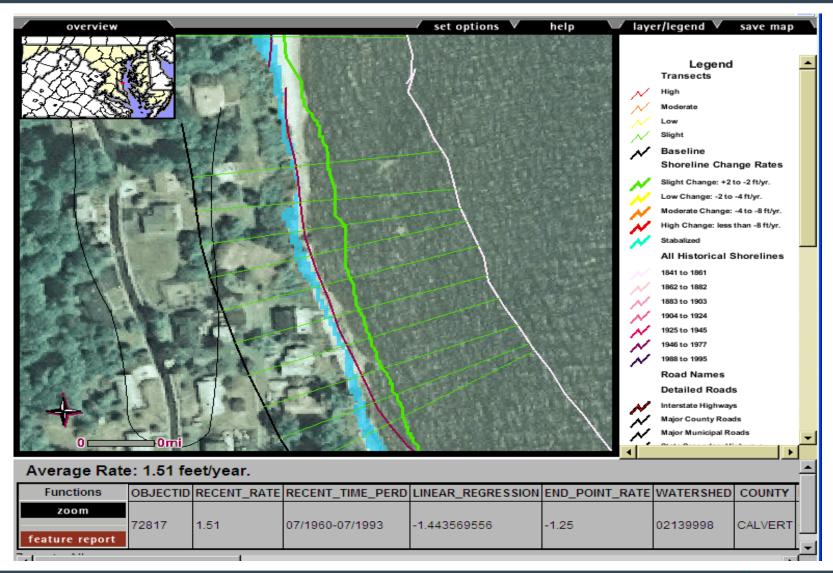
- Online mapping and planning tool
- Partners: DNR, MES, Univ. of MD, TNC and NOAA
- Visualize, query, map, and analyze available data to better manage our marine and estuarine resources.



http://gisapps.dnr.state.md.us/coastalatlas/iMap-master/basicviewer/index.html



## Historic Erosion Rate





## **Project Criteria**

## Project Selection Criteria DNR-SCMS

			DITAL SCHIE		
Creek, Cove >	Minor River >	<b>Major Tributary</b>	> Bay		
Water Depth -1.0 ft	-1.0 to -2.0	-2.0 to -4.0	-4.0 to -15.0		
Fetch 0.5 mile	1.0 to 1.5 mile	2.0 or more	2.0 or more		
Erosion 2 ft/yr or les	ess 2 to 4 ft/yr	4 to 8 ft/yr	8 to 20 ft/yr		
Low wave energy	> Medium wave	energy >	High wave energy		
Non-Structural	> Hybrid	>	Structural		
Type I	Type II		Type IV		
Beach replenishment	Marsh fringe w/ston	e groins	Bulkheads		
Fringe marsh creation	Marsh fringe with st	one sills	Revetments		
Marshy islands	Marsh fringe with st	one breakwaters	Stone reinforcing		
Coir logs edging and groins	Marsh edging with s	stone	Pre-cast concrete units		
	Stabilization of streat vegetation and stone				
Type III					
Stone breakwaters with beach replenishment and appropriate vegetation					
Least expensive	> Medium priced	> High price	d > Expensive		
\$100 - \$200/L.F.	\$250 - \$400/L.F.	\$450 - \$600/L.F	. \$500 - \$1,500/L.F.		

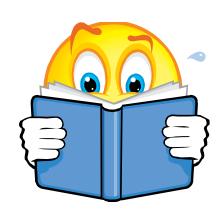








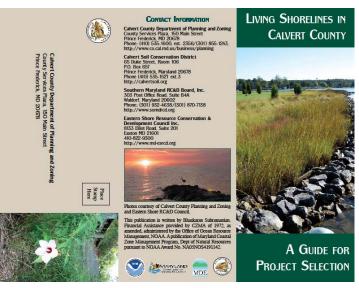
## **OUTREACH & EDUCATION**

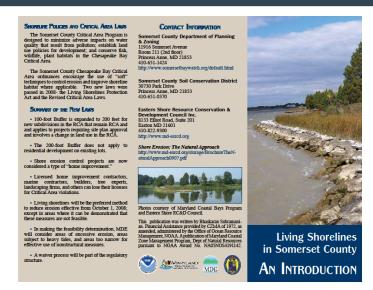




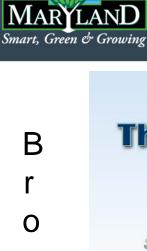


## **Outreach Materials**



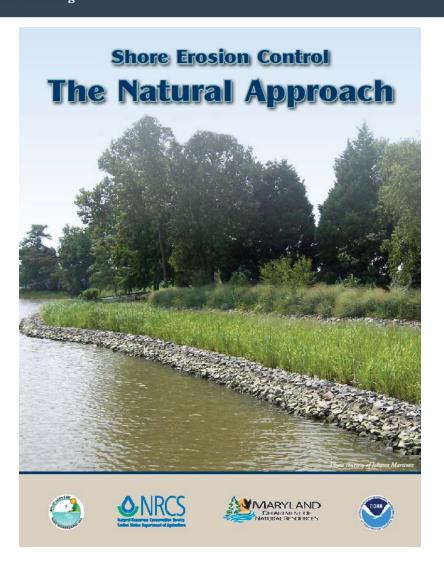


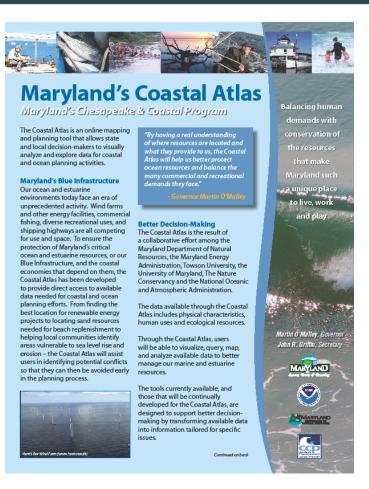




### **Outreach Materials**

Drochure:





### **Factsheets**





# Interpretive Panels







# Homeowners' Workshop



You're invited!!! Saturday September 27th, 2008 9 am to 3 pm







# LS Professionals' Workshops



#### LIVING SHORELINES PROFESSIONALS' TRAINING SESSION

**SEPTEMBER 28, 2009** CALVARY UNITED METHODIST CHURCH



The State of Maryland passed the new Living Shorelines Protect

FREE training excession will be held in Annapolic at the Calvary Church on September 28, 2009 (Monday; 9:00 a.m.- +:00 p.m.). We cordially invite you to be a part of this event and help to move the ecience forward.

Though it is a FREE event, epace is limited. So, please reserve you spot now! To register contact Dionne Bell, MD Cheespeake & Coastal Program Ph: +10.260.8732 OR dball@dnr.state.md.us.



- Paet projecte: What worked and what didn't
- Projects in different energy systems (low, medium, and high)
- Permits and regulatory guidelines
- Technical tools and Shorelines Online
- Quality control of projects



sistance provided by the Coastel Zone Management Act of 1972, as amend y the Office of Ocean and Coastel Resource Management, National Ocean Idministration (NOAA). A publication of the Maryland Coastel Zone Manage setment of Natural Resources posturent to NOAA Award No. NAO?NOA



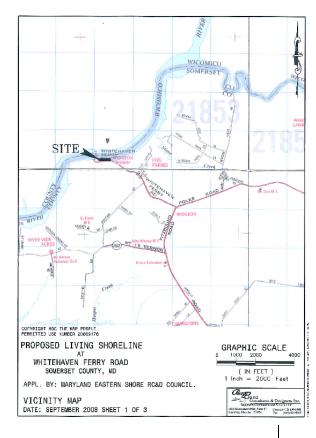








### Grants



**Design Grant** 

### Erosion Rate Study Grant

309-01: Supplemental Project A

Task Title: Calvert County Shore Erosion Rate Verification

et: Federal: \$ 14,659 Non-Federal <u>\$ 0</u>

roject Term: July 1, 2008 - March 31, 2009

g Recipient: Maryland Department of Natural Resources Resource Assessment Service

Maryland Geological Survey

Task Description: In making decisions about development along its tidal shorelines, it Achiert County Department of Planning and Zoning has at its disposal two obsordine change studies - one by a graduate student at the University of Maryland (Downs, 198) and the other by the Maryland Gological Survey (MSG) (Hemesees and others, 2003; which is currently being used for Maryland Shorelines Online (MSO). Both studies involved digitzing instorical shorelines and determining shorelines are for change. However, the two studies differed in their sources and dates of historical shorelines, the digitzing techniques, and, not suprisingly, their results. Discrepancies between the tw studies have left county planners in a quandary as to which study better serves their net to make informed decisions.

Downs (1993) unalyzed historical shoreline change between 1848 and 1971 along a 60 km stretch of Cadvert Courty, using sixteen NOAA T- cheets (nopspraphs sheets) and two sets of vertical aerial photography (see Appendix I). In digitzing the sources, Downs used a popular and tested method of the time—metric mapping. The shoreline that the extracted from non-tide-coordinated serial photos followed the wetted perimet (wet-dry jime) on the beach.

Several years later, MGS mapped shoreline change and determined erosion rates for tic reaches of shoreline statewide. For the Chesspeake Bay shoreline bordering Calvert County, the set of instorcial shorelines spanned the period 187-1995 (see Appendix 1) MGS digitzed seven of the recent (1944 & 1963) NOAA T-sheets that Downs (see Appendix 1) MGS degitzed seven of the recent (1944 & 1963) NOAA T-sheets that Downs in the MGS elected to digitze shorelines from an in-house set of Historical Shoreline maps (Coulswright, 1975) derived from those T-sheets. Shorelines depicted on Historical Shoreline maps had been traced from the original T-sheets, projected ont UISGS 75. mimute topographic quadrangles, and redrawn by hand along the bayward edge of the shoreline. MGS subsequently digitzed the bayward edge of that shad drawns shoreline. In addition to T-sheets and maps derived from them, MGS interpreted the land-water interface from non-tide-coordinated digital orthophotoquads flown in 1993.

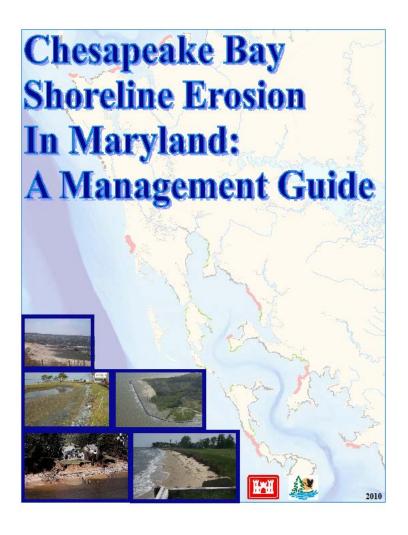


**Design Grant** 





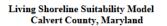
# U.S. Army Corps of Engineers



- Identify areas vulnerable to effects from shoreline erosion over 50 years.
- Provide information using GIS to screen and evaluate potential impacts from shoreline erosion.
- Present data and studies to support shoreline erosion project formulation.



# LS Suitability Study for Counties





Hybrid design option

Final Report Submitted to

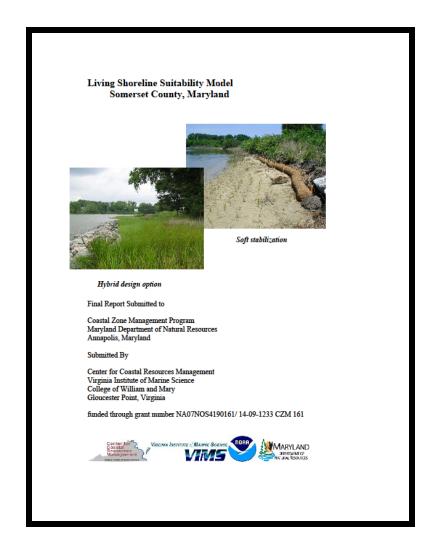
Coastal Zone Management Program Maryland Department of Natural Resources Annapolis, Maryland

Submitted By

Center for Coastal Resources Management Virginia Institute of Marine Science College of William and Mary Gloucester Point, Virginia

funded through grant number NA07NOS4190161/14-09-1233 CZM 161







# MARYLAND DEPARTMENT OF NATURAL RESOURCES Financing Options in MD

Program	Organization	Contact Information		
Shoreline	Maryland	Shore Erosion Control Program		
Conservation Services	Department of	Phone:		
	Natural	(410) 260-87986		
	Resources	Website:		
	(DNR)	www.dnr.state.md.us/grantsandloans/sec.html		
Maryland Linked	Maryland	Water Management Administration		
Deposit	Department of the Environment (MDE)	Phone:		
		(410) 537-3119		
		Website:		
		http://www.mde.state.md.us/AboutMDE/grants/index.asp		
Small Creeks and	Department of the Environment (MDE)	Water Management Administration		
Estuaries		Phone:		
		(410) 537-3908		
		Website:		
		http://www.mde.state.md.us/AboutMDE/grants/index.asp		
Living Shoreline	'	Phone:		
Initiative	Trust (CBT)	(410) 974-2941		
		Website:		
		www.cbtrust.org		
CBT/FAF Partnership	Fish America	Website:		
		http://www.fishamerica.org/grants		
Small Watershed Grants	NFWF	Grant Programs; Website: <u>www.nfwf.org</u>		





### Shoreline Conservation Services Loan Program

MARYLAND DEPARTMENT OF NATURAL RESOURCES
ECOSYSTEM RESTORATION SERVICES
SHORELINE CONSERVATION AND MANAGEMENT SERVICE
(410) 260-8523

#### FINANCIAL ASSISTANCE FOR SHORE EROSION CONTROL PROJECTS\*

TYPE OF PROJECT	TYPEI	TYPE II	TYPE III
TYPE OF FUNDS USED	STATE	STATE	STATE
TYPE OF ASSISTANCE**	LOAN	LOAN	LOAN
LOAN INTEREST	0%	0%	0%
LOAN TERM	5 YEARS	15 YEARS	20 YEARS

Type I Projects: Marsh creation/protection using natural/living materials

Type II Projects: Marsh creation/protection with stone edging, stone sills and/or stone groins, with sand fill and marsh plantings

Type III Projects: Marsh creation/protection with stone breakwaters, with sand fill & marsh plantings

#### APPLICANT

#### **EXTENT OF ASSISTANCE\*\*\*\***

	EXTERT OF ACCIONATOR		
COMMUNITY ASSOCIATIONS/NON-PROFIT ORGANIZATIONS/SERVICE ORGANIZATIONS	75% NTE \$20,000	100%	100%
MUNICIPALITY - PUBLIC LANDS	75% NTE \$20,000	100%	100%
MUNICIPALITY - SPONSORING PRIVATE OWNERS/BUSINESSES	75% NTE \$20,000	LOAN FORMULA ***	LOAN FORMULA ***
COUNTY - PUBLIC LANDS	75% NTE \$20,000	100%	100%
COUNTY - SPONSORING PRIVATE OWNERS/BUSINESSES	75% NTE \$20,000	LOAN FORMULA ***	LOAN FORMULA ***
COUNTY - SPONSORING COMMUNITIES/NON-PROFIT ORGANIZATIONS/SERVICE ORGANIZATIONS	75% NTE \$20,000	100%	100%

<sup>\*</sup> Financial Assistance provided based on project priority and availability of funds

#### Loan Formula:

 Next
 \$20,000
 50/50%
 \$10,000
 \$10,000

 Next
 \$20,000
 25/75%
 \$5,000
 \$15,000

Above \$100,000 10/90%

No financial assistance provided for structural/barrier type projects



<sup>\*\*</sup> Matching grants are not available

<sup>\*\*\*</sup> Loan Formula as established in Natural Resources Article, Section 8-1005 of the Annotated Code of Maryland



# How are MD Projects doing?

- Assessment study analyzed:
  - Marsh erosion

Structure condition

Non-planted vegetation





### Marsh Erosion



No erosion



> 50% erosion





# Structure Displacement







Displacement





# Non-Planted Vegetation







### Results

• Out of 177 projects, **131** of them were good or better.

Maintenance- Crucial for the success of a project.



### Probable Causes of Decreased Performance

- Poor engineering and/ construction.
- Poor execution of Plans.
- "Incorrect" planting.
- Choice of marsh grasses.
- Boat wake.
- Lack of maintenance.





# Strengths of the Program

Increased collaboration between agencies

 Coastal Atlas- huge asset to make more informed decisions and recommendations

 Workshops- effective in getting contractors and agencies to talk to each other instead of "at each other"





# Moving forward...

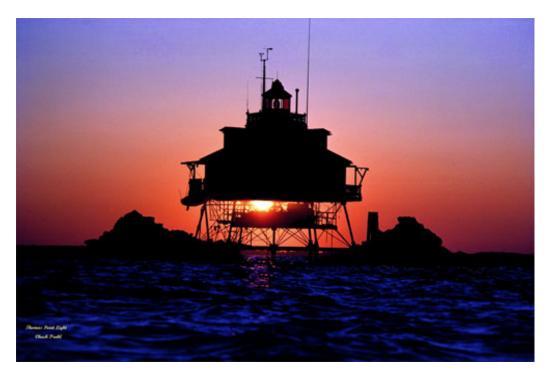
- More buy-in needed from marine contractors, engineers, etc
- Information such as littoral drift map, LS Suitability models, etc could help
- \$\$\$ to try some innovative and out-of-the-box design for projects
- Consistent permitting process and knowledgeable permit reviewers





### Conclusion

- Living shorelines- very effective in "reducing" erosion and creating/restoring habitats.
- LS Program- many components.
- Collaboration with partners- crucial for a comprehensive program







# Bhaskaran Subramanian, Ph.D. Program Manager, SCS

Ph: (410) 260-8786/ (443) 454-1638

E-Mail: bhaskar.subramanian@maryland.gov

### Website:

http://www.dnr.maryland.gov/ccs/livingshorelines.asp



