Maryland’s Living Shorelines Program

Bhaskaran Subramanian
Groton, CT
June 24, 2015
• 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
• Stumbling blocks
• Moving forward
Erosion is a natural phenomenon

Rip-rap or Revetment

Wooden Bulkhead
Recognizing the Problem

- MD shorelines approximately 7,000 miles.

- Erosion affects all 16 coastal counties along the Chesapeake Bay and Coastal Bays watersheds.
<table>
<thead>
<tr>
<th>Rate of change</th>
<th>Shoreline Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Miles</td>
</tr>
<tr>
<td>Accretion</td>
<td>2,006</td>
</tr>
<tr>
<td>No Change</td>
<td>75</td>
</tr>
<tr>
<td><strong>Slight erosion</strong></td>
<td></td>
</tr>
<tr>
<td>0 to -2 feet/year</td>
<td>3,740</td>
</tr>
<tr>
<td><strong>Low erosion</strong></td>
<td></td>
</tr>
<tr>
<td>-2 to -4 feet/year</td>
<td>618</td>
</tr>
<tr>
<td><strong>Moderate erosion</strong></td>
<td></td>
</tr>
<tr>
<td>-4 to -8 feet/year</td>
<td>173</td>
</tr>
<tr>
<td><strong>High erosion</strong></td>
<td></td>
</tr>
<tr>
<td>Over -8 feet/year</td>
<td>48</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,659</td>
</tr>
</tbody>
</table>
Slight Erosion: 0-2 ft/y

Low Erosion: 2-4 ft/y
Moderate Erosion: 4-8 ft/y

High Erosion: 8+ ft/y
Living Shorelines
“...... 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.
• 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
Profile of typical stone groin and cross section used to stabilize eroding banks.

Note: Plants are placed between groins on the sand fill.
Groins
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
Breakwaters
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 person can demonstrate such measures are not feasible, or where mapping indicates areas that have been deemed appropriate for structural shoreline stabilization measures”.

• 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
• 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
The Living Shoreline Protection Act of 2006 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 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.

<table>
<thead>
<tr>
<th>NUMBER</th>
<th>CATEGORY</th>
<th>QUESTION</th>
<th>ANSWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Depth of Waterway</td>
<td>Distance in feet from the Mean High Water Line to the edge of the closest mapped or unmapped navigable channel.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Fetch</td>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Bank Orientation</td>
<td>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°).</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Bottom Substrate</td>
<td>Firmness of bottom material or substrate? (Hard, Soft)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sensitive Species</td>
<td>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.</td>
<td>Yes No</td>
</tr>
<tr>
<td>9</td>
<td>Site Access</td>
<td>Is access to the work site via water impractical? (Yes, No)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>How will the worksite be accessed to facilitate construction of the project? Explain:</td>
<td></td>
</tr>
</tbody>
</table>
**Waterway Width**

- Less than 100 feet
  - 1 pts
- 100 – 140 feet
  - Applies for exemption
- Greater than 140 feet
  - 2 pts

**Shoreline Orientation**

- Shoreline receives <6 hours of sunlight per day
  - Tree clearing or Bank Grading will NOT allow for 6 hrs of sunlight
    - 1 pts
- Shoreline receives adequate sunlight
  - Tree clearing or Bank Grading will allow for 6 hrs of sunlight
    - 2 pts

**Fetch**

- Maximum Fetch greater than 5 miles
  - Apply for exemption
- Maximum Fetch greater than 3 miles
  - 1 pts
- Maximum Fetch less than 3 miles
  - 2 pts

*Fetch: Maximum distance wind may travel unimpeded over open water before approaching the worksite shoreline; relates to wave height*
**MDE LIVING SHORELINE WAIVER – Worksheet (Page 2)**

- **Depth of Waterway**
  - Water depth at 40-feet channelward of shoreline worksite MHWL
    - Water depth >4-feet
    - Water depth <4-feet

- **Bottom Material**
  - Firmness of bottom material in the near shore area
    - Coarse (Hard)
    - Sand/Silt mix (Med)
    - Organic / silt / Clay (Soft)

- **Critical Area Buffer**
  - Forested Riparian Buffer or fish, wildlife, or plant habitat
    - Would be preserved
    - Not present
    - Would be affected equally by structural or nonstructural measures

---

**2 to 5**
Apply for exemption

**6 to 8**
Contact MDE for evaluation

**9 to 13**
Living Shoreline is recommended

**TOTAL**

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**Notes:**
- Water depth at 20-feet channelward of MHWL
  - >2-feet 1 pts
  - <2-feet 2 pts

- Water depth at 40-feet channelward of shoreline worksite MHWL
  - >4-feet 3 pts

- Firmness of bottom material in the near shore area
  - Coarse (Hard) 3 pts
  - Sand/Silt mix (Med) 2 pts
  - Organic / silt / Clay (Soft) 1 pt

- Forested Riparian Buffer or fish, wildlife, or plant habitat
  - Would be preserved 0 pts
  - Not present 1 pt
  - Would be affected equally by structural or nonstructural measures 2 pts
Opposite Shoreline

Lot 25

MLW

MHW

Width of waterway; measured between MHW line at the worksite shoreline and average distance to the approximate centerline of waterway channel

Navigation; Distance from MHW to edge of Navigation Channel

Shoreline orientation; compass direction perpendicular to average worksite shoreline

Fetch; Provide four (4) measurements of maximum fetch for each quadrant (e.g., NE, SE, SW, NW) centered on the worksite shoreline

Prop. Line

Waterway Channel

5 & 6

LOT 26

LOT 25

Prop. Line

W E N S
Approximate Channel Location (Grey Area); represents deepest portion of WATERWAY

Centerline of Channel (Black Dash Line); represents deepest portion of CHANNEL

Mean LOW Water Line (MLWL); location of the average “low tide” line of worksite shoreline

Mean HIGH Water Line (MHWL); location of the average “high tide” line of worksite shoreline

Bank Grading Area

Mean HIGH Water Line (MHWL)

Mean LOW Water Line (MLWL)

Bottom Material (Substrate); determine “softness” or “hardness” of bottom; determine composition (i.e., sand, clay, sticks and leaves)

MHW Mean High Water

MLW Mean Low Water; referenced to 0.0 ft.

3 Depth of Water at toe or bottom of bank

4 Measure water depth during low tide at approximately 20-feet channelward of the MLWL and at approximately 40-feet channelward of the MLWL
- Maryland's Environmental Resources & Land Information Network
- [http://www.mdmerlin.net/index.html](http://www.mdmerlin.net/index.html)
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://dnr.maryland.gov/ccs/coastalatlas
Historic Erosion Rate

Legend
- Trans acts
- High
- Moderate
- Low
- Slight
- Baseline
- Shoreline Change Rates
  - Slight Change: +2 to -2 ft/yr.
  - Low Change: -2 to -4 ft/yr.
  - Moderate Change: -4 to -8 ft/yr.
  - High Change: less than -8 ft/yr.
- Stabilized

All Historical Shorelines
- 1841 to 1861
- 1862 to 1882
- 1883 to 1903
- 1904 to 1924
- 1925 to 1946
- 1947 to 1967
- 1968 to 1985
- 1986 to 1995

Road Names
- Detailed Roads
- Interstate Highways
- Major County Roads
- Major Municipal Roads
- State Roads

Average Rate: 1.51 feet/year.

<table>
<thead>
<tr>
<th>Functions</th>
<th>OBJECTID</th>
<th>RECENT RATE</th>
<th>RECENT_TIME_PERIOD</th>
<th>LINEAR_REGRESSION</th>
<th>END_POINT_RATE</th>
<th>WATER_SHED</th>
<th>COUNTY</th>
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<tr>
<td>zoom</td>
<td>72817</td>
<td>1.51</td>
<td>07/1960-07/1993</td>
<td>-1.443569556</td>
<td>-1.25</td>
<td>02139998</td>
<td>CALVERT</td>
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</table>
# Project Selection Criteria

<table>
<thead>
<tr>
<th>Creek, Cove</th>
<th>Minor River</th>
<th>Major Tributary</th>
<th>Bay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Depth</td>
<td>-1.0 to -2.0</td>
<td>-2.0 to -4.0</td>
<td>-4.0 to -15.0</td>
</tr>
<tr>
<td>Fetch</td>
<td>1.0 to 1.5 mile</td>
<td>2.0 or more</td>
<td>2.0 or more</td>
</tr>
<tr>
<td>Erosion</td>
<td>2 to 4 ft/yr</td>
<td>4 to 8 ft/yr</td>
<td>8 to 20 ft/yr</td>
</tr>
</tbody>
</table>

- **Low wave energy** > **Medium wave energy** > **High wave energy**
- **Non-Structural** > **Hybrid** > **Structural**

- **Type I**
  - Beach replenishment
  - Fringe marsh creation
  - Marshy islands
  - Coir logs edging and groins

- **Type II**
  - Marsh fringe w/stone groins
  - Marsh fringe with stone sills
  - Marsh fringe with stone breakwaters
  - Marsh edging with stone
  - Stabilization of streambanks with vegetation and stone

- **Type III**
  - Stone breakwaters with beach replenishment and appropriate vegetation

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<table>
<thead>
<tr>
<th>Least expensive</th>
<th>Medium priced</th>
<th>High priced</th>
<th>Expensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100 - $200/L.F.</td>
<td>$250 - $400/L.F.</td>
<td>$450 - $600/L.F.</td>
<td>$500 - $1,500/L.F.</td>
</tr>
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</table>
Edgar W. Garbisch

• Founded Environmental Concern (St. Michael’s, Maryland) in 1972.

• Wrote The Do’s and Don’ts of Wetlands Construction: Creation, Restoration & Enhancement.

• One of the first large marsh/shoreline restoration projects at Hambleton Island in Talbot County.

"His work is interesting, but I don't want to see him running around the country like Johnny Spartinaseed."

- John Clark (Conservation Foundation)
High-profile sills with no gaps
Low-profile gapped sills
#1: Appropriate techniques in appropriate locations.

- No one technique works for all sites.

- Each site has its own peculiarities and each design should be developed individually.
#2: Balancing “habitat” with “shoreline protection”.

MARYLAND DEPARTMENT OF NATURAL RESOURCES

What Have We Learned Over the Last 37 Years?
Outreach Materials

B o o k s h e t s

Shore Erosion Control
The Natural Approach

Maryland’s Coastal Atlas
Maryland’s Chesapeake & Coastal Program

The Coastal Atlas is an online mapping and planning tool that allows state and local decision makers to visually analyze and explore data for coastal and ocean planning activities.

Maryland’s Blue Infrastructure
Our oceans and estuarine environments today face an era of unprecedented activity. Wind farms and other energy facilities, commercial fishing, diverse recreational uses, and shipping highways are all competing for use and space. To ensure the protection of Maryland’s critical ocean and estuarine resources, our Blue Infrastructure, and the coastal economies that depend on them, the Coastal Atlas has been developed to provide direct access to available data needed for coastal and ocean planning efforts. By finding the best locations for renewable energy projects to locate, and resources needed for beach nourishment to helping local communities identify areas vulnerable to sea level rise and erosion – the Coastal Atlas will assist users in identifying potential conflicts so that they can then be avoided early in the planning process.

Maryland’s Coastal Atlas
Balancing human demands with conservation of the resources that make Maryland such a unique place to live, work and play.

Maryland’s Coastal Atlas
Better Decision-Making
The Coastal Atlas is the result of a collaborative effort among the Maryland Department of Natural Resources, the Maryland Energy Administration, Towson University, the University of Maryland, The Nature Conservancy and the National Oceanic and Atmospheric Administration.

The data available through the Coastal Atlas includes physical characteristics, human uses and ecological resources. Through the Coastal Atlas, users will be able to visualize, query, map, and analyze available data to better manage our marine and estuarine resources.

Factsheets

"By having a real understanding of where resources are located and what they provide to us, the Coastal Atlas will help us better protect ocean resources and balance the many commercial and recreational demands they face.”

-Governor Martin O’Malley
Interpretive Panels

Living Shorelines, Naturally

First Person

Kevin Smith
Chief of Operations and Wetland Restoration, Maryland Department of Natural Resources

"First, we try to demonstrate that doing it well globally benefits communities, but we try to do it well locally, as well. We try to do it with the community, not just do it to the community."

Dave Wilson
Coastal Resource Conservation and Development Specialist, Maryland Department of Natural Resources

"We're trying to demonstrate how to do it well globally benefits communities, but we try to do it well locally, as well. We try to do it with the community, not just do it to the community."

George E. "Happy" Mayer Jr.
Assistant Director, Maryland Department of Natural Resources

"We're trying to demonstrate how to do it well globally benefits communities, but we try to do it well locally, as well. We try to do it with the community, not just do it to the community."

SHORE TO LOSE

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Living Shorelines in Bluff Situations: Calvert County

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

Living Shorelines in Somerset County

You’re invited!!!
Saturday August 16th, 2008
9 am to 3 pm
Bringing living shorelines home to you
LIVING SHORELINES PROFESSIONALS’ TRAINING SESSION
SEPTEMBER 24, 2009
CALVARY UNITED METHODIST CHURCH
711 BOWES BLVD
ANNAPOLIS, MD 21401

Dear Marine Contractors/Engineers/Consultants,

The State of Maryland passed the new Living Shorelines Protection Act of 2008 into law in October 2008. With this law, “Living Shorelines” are now the preferred method of shoreline erosion control.

In order to increase awareness about living shorelines and provide information to professionals who are venturing into these projects, a FREE training session will be held in Annapolis at the Calvary Church on September 24, 2009 (Monday 7:00 a.m. – 5:00 p.m.). We cordially invite you to be a part of this event and help to move the science forward.

Though it is a FREE event, space is limited. So please reserve your spot now. To register contact Denise Dell, M.D., Chesapeake & Coastal Program, Ph. (410) 260-8755. Or, visit the website: www.mdalz.org.

The topics that will be covered at the event include:
- What are living shoreline projects and why are they needed?
- Surveying shorelines
- Design options and choosing the appropriate practice
- Past projects: What worked and what didn’t
- Projects in different coastal systems (low, medium, and high)
- Permit and regulatory guidelines
- Technical tools and Shorelines Online
- Quality control of projects
- Optimizing survival of vegetation and aquatic species.

Sincerely,

[Signature]

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended, Title II, Section 201. Under the direction of the Maryland Coastal Services, Department of Natural Resources, Annapolis, MD. A publication of the National Center for Environmental Training, Department of Natural Resources, D.C. [Y0000000].
Design Grant

Erosion Rate Study Grant

Design Grant
• 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.
Living Shoreline Suitability Model
Calvert County, Maryland

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

Living Shoreline Suitability Model
Somerset County, Maryland

Hybrid design option

Final Report Submitted to
Coastal Zone Management Program
Maryland Department of Natural Resources
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Center for Coastal Resources Management
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Gloucester Point, Virginia

funded through grant number NA07NOS4190161/14-09-1233 CZM 161
<table>
<thead>
<tr>
<th>Program</th>
<th>Organization</th>
<th>Contact Information</th>
</tr>
</thead>
</table>
| Shoreline Conservation Services | Maryland Department of Natural Resources (DNR) | Shore Erosion Control Program  
Phone: (410) 260-87986  
Website: [www.dnr.state.md.us/grantsandloans/sec.html](http://www.dnr.state.md.us/grantsandloans/sec.html) |
| Maryland Linked Deposit | Maryland Department of the Environment (MDE) | Water Management Administration  
Phone: (410) 537-3119  
Website: [http://www.mde.state.md.us/AboutMDE/grants/index.asp](http://www.mde.state.md.us/AboutMDE/grants/index.asp) |
| Small Creeks and Estuaries | Maryland Department of the Environment (MDE) | Water Management Administration  
Phone: (410) 537-3908  
Website: [http://www.mde.state.md.us/AboutMDE/grants/index.asp](http://www.mde.state.md.us/AboutMDE/grants/index.asp) |
| Living Shoreline Initiative | Chesapeake Bay Trust (CBT) | Phone: (410) 974-2941  
Website: [www.cbtrust.org](http://www.cbtrust.org) |
| CBT/FAF Partnership | Fish America | Website: [http://www.fishamerica.org/grants](http://www.fishamerica.org/grants) |
| Small Watershed Grants | NFWF | Grant Programs; Website: [www.nfwf.org](http://www.nfwf.org) |
**FINANCIAL ASSISTANCE FOR SHORE EROSION CONTROL PROJECTS**

<table>
<thead>
<tr>
<th>TYPE OF PROJECT</th>
<th>TYPE I</th>
<th>TYPE II</th>
<th>TYPE III</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF FUNDS USED</td>
<td>STATE</td>
<td>STATE</td>
<td>STATE</td>
</tr>
<tr>
<td>TYPE OF ASSISTANCE**</td>
<td>LOAN</td>
<td>LOAN</td>
<td>LOAN</td>
</tr>
<tr>
<td>LOAN INTEREST</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>LOAN TERM</td>
<td>5 YEARS</td>
<td>15 YEARS</td>
<td>20 YEARS</td>
</tr>
</tbody>
</table>

* Financial Assistance provided based on project priority and availability of funds
** Matching grants are not available
*** Loan Formula as established in Natural Resources Article, Section 8-1005 of the Annotated Code of Maryland

<table>
<thead>
<tr>
<th>APPLICANT</th>
<th>EXTENT OF ASSISTANCE****</th>
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</thead>
<tbody>
<tr>
<td>COMMUNITY ASSOCIATIONS/NON-PROFIT ORGANIZATIONS/SERVICE ORGANIZATIONS</td>
<td>75% NTE $20,000</td>
</tr>
<tr>
<td>MUNICIPALITY - PUBLIC LANDS</td>
<td>75% NTE $20,000</td>
</tr>
<tr>
<td>MUNICIPALITY - SPONSORING PRIVATE OWNERS/BUSINESSES</td>
<td>75% NTE $20,000</td>
</tr>
<tr>
<td>COUNTY - PUBLIC LANDS</td>
<td>75% NTE $20,000</td>
</tr>
<tr>
<td>COUNTY - SPONSORING PRIVATE OWNERS/BUSINESSES</td>
<td>75% NTE $20,000</td>
</tr>
<tr>
<td>COUNTY - SPONSORING COMMUNITIES/NON-PROFIT ORGANIZATIONS/SERVICE ORGANIZATIONS</td>
<td>75% NTE $20,000</td>
</tr>
</tbody>
</table>

Loan Formula:
- Project cost $0 to $60,000: 100% loan, $80,000 loan, $0 Property owner’s cash
- Next $20,000: 50/50% loan, $10,000 loan, $10,000
- Next $20,000: 25/75% loan, $5,000 loan, $15,000
- Above $100,000: 10/90% loan

No financial assistance provided for structural/barrier type projects
How are MD Projects doing?

- Marsh erosion
- Structure condition
- Non-planted vegetation
MARSH EROSION

No erosion
> 50% erosion
Structure Displacement

Excellent

Displacement
Non-Planted Vegetation

Excellent

Poor
• 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”
• Myths and misconceptions (*public & professionals-structural vs LS*): do they work or not?

• Numerous moving parts (*Corps concerns*)

• Cost (*structural vs LS*)

• Habitat conversion and tradeoff (*NMFS concerns*).
How did MD overcome barriers?

- Ongoing process: uphill task
- Dialogue/discussion
- Literature review
- Pre-app meetings
- Demonstration projects
- Mapping products and models
- Contracting community’s mistrust of the Regulators.
- Absence of clear guidance-evolving rules and changes in procedures.
- Consistency among Regulators.
- Search for “that model” project
- Standardization, cookie-cut method, etc.
• 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

Moving forward…
• 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/livingshoreslines.asp