Living Shorelines & Coastal Resiliency in Maryland

Bhaskaran Subramanian & Kevin Smith

Ecosystem Restoration Services
• “Ability to recover from or adjust easily to change”.
  – Merriam-Webster Dictionary

• Ecosystem Resiliency
  – “Ability of (natural or human) systems or communities to withstand or recover from the impacts of change”.
Habitat-Specific Guidelines

- Enhance the **resilience of bay**, aquatic and terrestrial ecosystems and/or increase on-site carbon sequestration.

- **Incorporate** factors associated with **climate change in all phases** of project.

- Compile a **compendium (shortlist) of BMPs** for habitat restoration project design.

- Conduct a GIS-based audit of DNR-owned lands to identify habitat restoration potential for **enhancing ecosystem resilience and/or increasing carbon sequestration**.
Enhancing Floodplain Resiliency In Maryland

Tidal
- Coastal Wetlands Initiative (CWI)
- Living Shoreline Program

Nontidal
- Restoration of floodplain Hydrology
- Identification of Wetland Migration Corridors
- Reforestation of Riparian Areas
Ditches: great for keeping water out

Coastal Wetlands Initiative (CWI)

- Restore Hydrologic Connection
- Increase Biotic and Physical Capabilities
- Restore Resilience of Degraded tidal Salt Marshes
- Increase Carbon Sequestration
Installing Ditch Plugs

Completed Ditch Plug
Little Blackwater Habitat Enhancement Project

Typical Ag Ditch
(4ft wide; 3ft deep)

Ditched Farm Fields

Little Blackwater River (Tidal Fresh Wetland System)
Constructed Marsh Runs

Little Blackwater Habitat Enhancement Project
Little Blackwater Habitat Enhancement Project

Completed Swamp Run - maintains continuum
700 Unit Housing Development Planned
(Elevation = 3.5 ft above Mean High Water)

Vulnerable?
Dichotomy?
Living Shorelines
Recognizing the Problem

- MD shorelines = Over 7,000 miles of Tidal Shoreline

- Erosion affects all 16 coastal counties along the Chesapeake Bay and Coastal Bays watersheds.
Traditional Methods of Erosion Control Methods

Wooden Bulkhead

Rip-rap or Revetment
Excessive ??
## Rate of change

<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>Slight erosion 0 to -2 feet/year</td>
<td>3,740</td>
</tr>
<tr>
<td>Low erosion -2 to -4 feet/year</td>
<td>618</td>
</tr>
<tr>
<td>Moderate erosion -4 to -8 feet/year</td>
<td>173</td>
</tr>
<tr>
<td>High erosion Over -8 feet/year</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>6,659</td>
</tr>
</tbody>
</table>
# Selection Criteria

## 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

#### Non-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

### Medium wave energy

- Hybrid

### High wave energy

- Structural

### Type IV

- Bulkheads, Revetments, Stone reinforcing, Pre-cast concrete units

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**Least expensive**

- $100 - $200/L.F.

**Medium priced**

- $250 - $400/L.F.

**High priced**

- $450 - $600/L.F.

**Expensive**

- $500 - $1,500/L.F.
• "... 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.
S. alterniflora is planted from mid-tide to mean high water

S. patens is planted above mean high water
“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, storm surge and flood waters.
- Maintain natural shoreline dynamics and sand movement.
- Often lower construction costs.
Limitations

• Not effective in all situations.

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

• Limited detailed science/literature.
The bill, passed into Maryland State Law October 2008, formalized current regulations into law.

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 Specifically Says: **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.
Coastal Atlas

- [http://www.dnr.state.md.us/ccp/coastalatlas/shorelines.asp](http://www.dnr.state.md.us/ccp/coastalatlas/shorelines.asp)
- 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.
Mapping Tools – Vulnerability Models

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 NOS4190161/14-09-1233 CZM 161

Living Shoreline Suitability Model
Somerset County, Maryland

Hybrid design option

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Living Shorelines, Naturally

MARYLAND DEPARTMENT OF NATURAL RESOURCES
Interpretive Panels

First Person

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

"The shoreline is constantly changing, and living shoreline projects are one way for us to adapt. Shoreline stabilization efforts are necessary to protect our natural resources and ensure the safety of the public."

Dave Wilson
Coastal Erosion Control Authority, Maryland Department of the Environment

"Shoreline management is a balance between coastal protection and habitat restoration. Our goal is to create a natural shoreline that provides ecological benefits and aesthetic value."

George E. "Happy" Mayer Jr., Town of Federalsburg, Mayor

"Shoreline stabilization projects are important for maintaining the health of our communities. By protecting our shorelines, we can ensure a sustainable future for our residents and visitors."

SHORE TO LOSE

Shoreline erosion is a growing concern for many coastal communities. Maryland is home to a diverse range of ecosystems that are vulnerable to the effects of erosion. As shorelines recede, habitats are lost, and infrastructure is threatened.

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Maryland Department of Natural Resources

Maryland, Smart, Green & Growing
Homeowners’ Workshop

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
LS Professionals’ Workshops

LIVING SHORELINES PROFESSIONALS’ TRAINING SESSION
SEPTEMBER 24, 2009
CALVARY UNITED METHODIST CHURCH
311 BOWIE BLVD
ANNAPOLIS, MD 21401

Dear Marine Contractors/Engineer/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 not the preferred method of shoreline erosion control.

In order to increase awareness about shoreline projects and provide information to professionals who are venturing into these projects, a FREE training session will be held at Calvary Church on September 24, 2009 (Monday 9:00 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! For registration contact Diane Dell, MD Chesapeake & Coastal Program, Ph: 410-269-6733 OR email nls@md.gov.

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 practices
- Past projects: What worked and what didn’t
- Projects in different ecoregions (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 Fund of MDE, as authorized by the General Assemblies of the State of Maryland.

[Signature]

Delmarva Shoreline Protection Program
Chesapeake Bay Environmental Center Living Shoreline Project

Pre-Restoration

During Construction

Post-Restoration
Windy Hill Farm Project (WHF)

Uncontrolled Runoff from Upland Areas
Pre- Restoration

4 ft. High Vertical Bluff
Spaniard Point Living Shoreline Project

Post- Restoration

Former Bluff

Headland Breakwater
Projects in the Pipeline

- City of Annapolis comprehensive shoreline management plan.
- Gunston School living shoreline project
- Ferry Point Habitat Enhancement project
- **Resiliency** means the ability to **BEND** and not **BREAK**.

- Living shorelines are effective in **REDUCING** erosion and **ENHANCING** shoreline habitat.

- Detailed study needs to be conducted to adequately assess living shoreline sustainability and resiliency over time.
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