Living Shorelines Projects: Have they Worked in Maryland?

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May 26, 2011
Shoreline Erosion

- Natural process caused by movement of water, waves, and wind.
- Human activities (high speed boating, shoreline hardening, etc.) can increase rates of erosion.
- Erosion becomes a problem when something is at risk for loss (property, critical habitat, etc.)
Protecting Shorelines the “Hard” Way

Wooden Bulkhead

Rip-rap or Revetment
Excessive Protection Techniques
Problems Caused by Structural Projects
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.
• Provide 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.

• Look natural rather than artificial
• 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.
# Erosion Rates

<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>Low erosion</td>
<td></td>
</tr>
<tr>
<td>-2 to -4 feet/year</td>
<td>618</td>
</tr>
<tr>
<td>Moderate erosion</td>
<td></td>
</tr>
<tr>
<td>-4 to -8 feet/year</td>
<td>173</td>
</tr>
<tr>
<td>High erosion</td>
<td></td>
</tr>
<tr>
<td>Over -8 feet/year</td>
<td>48</td>
</tr>
<tr>
<td>Total</td>
<td>6,659</td>
</tr>
</tbody>
</table>
Low Erosion: 2-4 ft/y

Slight Erosion: 0-2 ft/y
Moderate Erosion: 4-8 ft/y

High Erosion: 8+ ft/y
Living Shoreline Options
MARYLAND DEPARTMENT OF NATURAL RESOURCES
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.
MARYLAND DEPARTMENT OF NATURAL RESOURCES

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
North-East Fetch = 37.0 miles
East Fetch = 12.4 miles
South-East Fetch = 44.2 miles
• Discuss design options:
  – Goal: erosion control, habitat enhancement, etc.
  – Appropriate technique
  – Affordability

• Estimation of costs.
• Funding avenues
• Concept Plan.
• Get all the parties involved early on the process.
• Permits- Federal, State, Local (buffer management plan, erosion & sediment control).
# Project Selection Criteria

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

<table>
<thead>
<tr>
<th>Low wave energy</th>
<th>Medium wave energy</th>
<th>High wave energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Structural</td>
<td>Hybrid</td>
<td>Structural</td>
</tr>
<tr>
<td>Type I</td>
<td>Type II</td>
<td>Type IV</td>
</tr>
<tr>
<td>Beach replenishment</td>
<td>Marsh fringe w/stone groins</td>
<td>Bulkheads</td>
</tr>
<tr>
<td>Fringe marsh creation</td>
<td>Marsh fringe with stone sills</td>
<td>Revetments</td>
</tr>
<tr>
<td>Marshy islands</td>
<td>Marsh fringe with stone breakwaters</td>
<td>Stone reinforcing</td>
</tr>
<tr>
<td>Coir logs edging and groins</td>
<td>Marsh edging with stone</td>
<td>Pre-cast concrete units</td>
</tr>
</tbody>
</table>

**Type III**

- Stone breakwaters with beach replenishment and appropriate vegetation

<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>
</tbody>
</table>
PROJECT PROCESS: Construction & Maintenance
Example - I (before)
Example- I (during construction)

Sand placement  Rock placement

Contractor at work
Example- I (after construction)

Goose Fencing

Planting
Example- I (one year after completion)
Example - II (during construction)
Example- II (after construction)
Example- II (one year after completion)
• Factors analyzed:
  – Marsh erosion
  – Structure condition
  – Non-planted vegetation
No erosion  > 50% erosion
Structure Displacement

Excellent

Displacement
Non-Planted Vegetation

Excellent

Poor
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.
• Control the non-planted species.
  – Use of moderate quantities of weed killers.
  – Choice of the weed killer: broad-spectrum vs. specific.
• **Keep the sky clear for the plants.**
  – Uprooting young shrubs.
  – Pruning.

• **Clearing junk!!!**
  – Debris or dead tree trunks.
• Restore any damage in the stone structures.
• Maintenance- simple and yield great results.
• Survival of the marsh grasses = success of the living shorelines projects.
• Marsh grasses- need constant attention and care.
CONCLUSION: Keys to Success

- Good design
- Knowledgeable contractor
- Awareness
  - LS are not “zero maintenance”
- Property owners’ involvement
Healthy marsh grasses = Strong erosion protection

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