

Reality Check: Why Are Living Shorelines Projects Needed ?

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Why are Living Shorelines Projects Needed?

- **Standard Shoreline Practices**
 - **Bulkheads**
 - **Revetments**
 - **Riparian Buffer Removal**
- **Cumulative Impacts of Shoreline Hardening**
- **Maryland Shoreline Inventory**

How many shoreline miles are armored?

Standard Shoreline Practices & Ecosystem Effects

Standard Practices

Bulkheads



Bulkheads are vertical retaining walls

They do not reduce wave energy, they reflect it

Upland and wetland habitats are abruptly disconnected

They define a line for human landscapes

Ecosystem Effects of Bulkheads

Beach Erosion

2003



Mean Low Water before bulkhead with beach

2005



Mean Low Water after bulkhead with no beach

“Bathtub Effect”

the gradual disappearance of intertidal areas next to structures
leaving only riparian and sub-tidal habitats

Ecosystem Effects of Bulkheads

Tidal Marsh Erosion



Tidal marshes in front of bulkheads may gradually disappear due to reflected wave action and/or if they cannot retreat landward with rising sea levels

Ecosystem Effects of Bulkheads

Upland & Adjacent Shoreline Erosion



Storm erosion caused by wave reflection over top of bulkhead – repeated backfill with topsoil

Ecosystem Effects of Bulkheads

Habitat Connections Severed



Sharp divide between upland and wetland habitats prevents integrated vegetation buffer

Wildlife cannot easily move between aquatic and terrestrial habitats

Ecosystem Effects of Bulkheads

Marine Debris



Storm debris in tidal marsh



“Derelict” bulkhead on high-energy shoreline

Failed bulkheads become solid waste in the marine environment

Chemically-treated products continue to leach toxics

Standard Practices

Revetments or Riprap

Revetments provide protection with less impact than bulkheads

Slope allows for wave run-up

Spaces between stones reduce wave energy

Upland and wetland habitats not as severely disconnected



Ecosystem Effects of Revetments

Unnecessary Structures and Wetland Loss



No erosion problem

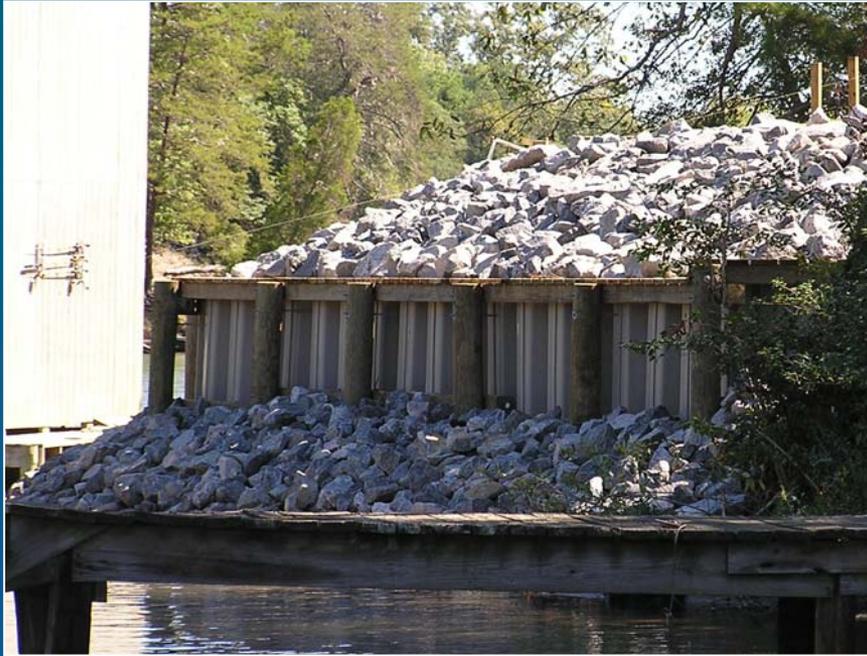
**House located >500 ft
landward**

**Tidal marsh covered by
unnecessary stone**

**Adjacent marsh erosion
from reflected wave
energy**

Ecosystem Effects of Revetments

Riparian Buffer Removal



Excessive Shoreline Hardening

the replacement of “soft” natural shoreline habitats with “hard” human structures in and adjacent to waterways

Standard Practices Unnecessary Riparian Buffer Removal



Cleared slope
Unstable

Natural slope
No erosion

Less soil stabilization
Less ability to filter runoff and groundwater
Less wildlife habitat

Standard Practices Wide Open Views



Wide open views are widely regarded as ideal for coastal homes

The costs of detrimental impacts to the aquatic ecosystem also need to be considered

Cumulative Impacts of Shoreline Hardening

Cumulative Impacts

Collective impact of many individual projects on entire ecosystem

Upland Development

+

Shoreline Stabilization Structures

Recent VIMS Research

Cumulative Impacts of Shoreline Hardening in Chesapeake Bay

Study	Results
<p data-bbox="42 339 504 396">Seitz et al 2006</p> <p data-bbox="42 505 774 714">Compared natural marsh, bulkhead, and revetment shorelines</p> <p data-bbox="42 839 768 971">Lynnhaven Elizabeth and York Rivers</p> <p data-bbox="42 1096 529 1233">Benthic prey and predators</p>	<p data-bbox="821 342 1870 491">More prey in shallow than deep habitats</p> <p data-bbox="821 645 1870 882">Crucial link between natural marshes, benthic prey and blue crab abundance</p> <p data-bbox="821 1033 1870 1282">Secondary effects of bulkhead and revetment may be as great or greater than direct effects</p>

Recent VIMS Research

Cumulative Impacts of Shoreline Hardening in Chesapeake Bay

Study	Results
<p data-bbox="65 401 662 532">Bilkovic & Roggero 2008</p> <p data-bbox="65 644 768 925">Compared bulkhead, revetment and natural shorelines on the James River</p> <p data-bbox="65 1053 639 1186">Fish communities in shallow water</p>	<p data-bbox="821 401 1837 615">Shoreline erosion control structures had negative impact on fish even in areas with low development</p> <p data-bbox="821 736 1856 872">Fish community integrity was lowest along bulkheaded shorelines</p> <p data-bbox="821 993 1837 1208">Ecological thresholds in nekton community integrity were evident at >23% developed land use</p>

Bilkovic D. M., M. M. Roggero. 2008. Effects of coastal development on nearshore estuarine nekton communities. *Marine Ecology Progress Series*. 358: 27–39, 2008.

Cumulative Impacts on Living Resources

Riparian Buffer removal and suppression

+

Upland-Wetland habitat interruptions

+

Wetland and Beach Loss

from unnecessary structures & reflected waves

=

Degraded Water Quality

+

Degraded Fisheries Habitat

Guiding Principles for Living Shoreline Projects

Preserve and Restore Riparian Buffers

Waterfront Lawn

vs. Natural or Created Buffer



Nothing to intercept wave action or floodwaters

Runoff of lawn fertilizers and pesticides

Storm and flood buffering

Surface and groundwater interception

Guiding Principles for Living Shoreline Projects

Gradual Slopes and Connected Habitats

Disconnected habitats

Gradual loss of intertidal area

Reflected wave action and sediment re-suspension



Instead of bulkhead or revetment....

...Create or enhance integrated vegetation buffers with gradual slopes



Connected habitats

Dense plant cover

Active biological community

Maryland Shoreline Inventory

**How many miles are
hardened?**

Maryland Shoreline Inventory

- VIMS Comprehensive Coastal Inventory program (CCI)
- 4 yr project 2002 - 2006
- All navigable tidal streams and tributaries surveyed from boats
- Remote sensing for inaccessible waterways
- Total shoreline surveyed = 4,118 miles



VIMS Contact: Marcia Berman marcia@vims.edu 804.684.7188

Maryland Shoreline Inventory

Separate report and maps for each county

Three plates for each map area
Riparian Land Use
Bank & Buffers
Shoreline Features

GIS data available

Web Site Links

Maryland Shorelines Online

VIMS

http://ccrm.vims.edu/gis_data_maps/shoreline_inventories/index.html

GIS Data & Maps: Shoreline Inventories

Users may place their cursor over the desired county location and click to select or scroll to the bottom of the map and select a particular county name.



Maryland Shoreline Inventory

- **Riparian Land Uses**
 - e.g. forest, agriculture, commercial, residential, etc.
- **Bank and Buffer Conditions**
 - height, vegetation cover, erosion, tidal marshes, beaches, *Phragmites*
- **Shoreline features (number)**
 - docks, marinas, boat ramps, groins, jetties, breakwaters
- **Shoreline features (miles)**
 - bulkheads, revetments, debris (haphazard), unconventional (intentional)

Maryland Shoreline Inventory Sample Map & Legend

Queen Anne's County
Plate 26c

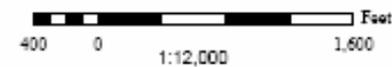
Shoreline Features

Legend

-  breakwater
-  bulkhead
-  debris
-  dilapidated bulkhead
-  groinfield
-  jetty
-  marina, <50 slips
-  marina, >50 slips
-  riprap
-  unconventional
-  wharf
-  boat house
-  dilapidated pier
-  outfall
-  pier
-  private boat ramp
-  public boat ramp



Scale



Comprehensive Coastal Inventory
Center for Coastal Resources Management
Virginia Institute of Marine Science



Chesapeake Bay



	Survey Dates	Miles Surveyed	Miles Bulkhead + Dilapidated Bulkhead	Miles Revetment	Miles Unconventional + Debris + Misc.
Anne Arundel County	2002 2005	471.15	111.97	86.64	6.13
Baltimore County & City of Baltimore	2002 2003	253.04	72.2	44.41	13.49
Calvert County	2004 2005	162.81	14.85	21.15	1.23
Caroline County	2003 2004	63.52	1.89	3.66	0.47
Cecil County	2004	155.27	14.88	28.01	4.93
Charles County	2003 2005	166.97	15.95	8.9	0.99
Dorchester County	2003	522.7	20.1	44.71	8.12
Harford County	2004 2005	44.97	8.47	5.81	0.75
Kent County	2004	262.75	11.31	23.87	4.33
Prince George's County	2004 2005	58.17	1.67	3.27	0.57
Queen Anne's County	2004	339.42	34.44	54.97	4.03
St. Mary's County	2002 2003	359.95	32.46	46.9	4.61
Somerset County	2003	391.89	9.08	8.69	4.26
Talbot County	2003 2004	535.85	33.38	135.23	9.43
Wicomico County	2003	99.3	6.05	7.99	0.63
Worcester County	2003 - 2006	230.17	73.24	19.64	1.13

	Miles Surveyed	Miles Hardened	% Total Hardened
Baltimore Co. and City of Baltimore	253.04	130.1	51%
Anne Arundel County	471.15	204.74	43%
Worcester County	230.17	94.01	41%
Harford County	44.97	15.03	33%
Talbot County	535.85	178.04	33%
Cecil County	155.27	47.82	31%
Queen Anne's County	339.42	93.44	28%
St. Mary's County	359.95	83.97	23%
Calvert County	162.81	37.23	23%
Charles County	166.97	25.84	15%
Kent County	262.75	39.51	15%
Wicomico County	99.3	14.67	15%
Dorchester County	522.7	72.93	14%
Caroline County	63.52	6.02	9%
Prince George's County	58.17	5.51	9%
Somerset County	391.89	22.03	6%
TOTAL	4117.93	1070.89	26%

Summary

- Standard shoreline practices have adverse impacts on beneficial ecosystem services
- Cumulative impacts of multiple projects on living resources are now evident beyond the footprint of development
- Recent shoreline inventory revealed the extent of shoreline hardening in Maryland

This is why more living shoreline projects are needed....

Thanks for your Interest in Living Shorelines

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Visit our living shorelines web site
(updates coming soon)

http://ccrm.vims.edu/coastal_zone/living_shorelines/index.html