A Decade Later- A Retrospective Investigation of Design Elements used to Develop Successful Living Shorelines in Alabama

Kari P. Servold¹, Scott L. Douglass¹, and Becky Roland Prado

¹University of South Alabama
Dept. of Civil Engineering
kpservold@ua.edu
Presentation Outline

• Discuss past shore protection alternatives to bulkheads (called Living Shorelines today)
• Discuss what engineering judgment was used in design decisions
• Discuss the project performances of these methods
• Discuss insights gained from investigating past projects
Shoreline Alternatives to Bulkheads in Alabama

**Site 1: Dog River, AL**
- Sand bag breakwater
- Biotube breakwater
- Timber wave fence

**Site 2: Western Shore, Mobile Bay**
- Anchored logs
- Headland beach

**Site 3: Eastern Shore, Mobile Bay**
- Alternative bulkhead design
- Pocket beach
“Hard” infrastructure like bulkheads abruptly severs the ecological connection between the coast and the water

- Steep drop off from land to water
- Erosion in front and behind bulkhead
- Little to no wildlife along waters edge

Living Shorelines defend land against destructive waves but also provide crucial habitat for fish and wildlife

- Easy access to water from land
- Gentle slope from land to water
- Much more wildlife along water’s edge

http://www.delawareestuary.org/living-shorelines
Defined project goals:

1. To experiment with alternatives to bulkheading that would provide urban shorelines with some higher level of ecosystem function and value

2. To educate the citizens of the community about the value of fringe wetlands that are natural to the area

Projects developed by:

- NOAA Restoration Center’s Community-based Restoration Program (CRP)
- University of South Alabama
- Dog River Clearwater Revival
Dog River Project:
Sand Bags

Aerial view of project location

Mobile Register Graphic

Breakwater Profile at Cross-section A

PLANTING BED BEHIND SANDBAG BREAKWATER
Dog River Project: Sand Bags

Project Design: SUCCESSFUL

September 2003

September 2014
Dog River Project: Biotube

Breakwater Profile at Cross-section A

NEW BIOTUBE BREAKWATER
6' WIDE x 1.5' HIGH

NEW FILL AND PLANTING AREA

22 FEET

MHW +0.9'

MLW -0.5'

6 FEET

EXISTING RIP RAP BULKHEAD

PLANTING BEHIND A BIOTUBE BREAKWATER
Dog River Project: Biotube

Project Design: Unsuccessful

September 2003

September 2014
Dog River Project: Wave Fence

Aerial view of project location

Mobile Press Graphic

Breakwater Profile at Cross-section A

New Timber Fence Breakwater

New Fill and Planting Area

Existing Stone or Masonry Bulkhead

Planting Bed Behind Wooden Breakwater

Broome et al. 2002
Dog River Project: Wave Fence

Project Design: SUCCESSFUL
Mobile Bay: Alternatives to Bulkheads

   (Part of CBR & Dog River Projects)

   (Built to protect Gulf Pines Golf Course’s 2nd green)

   (homeowner response to repeated hurricane damage)

4. Sandy Pocket Beach (2001) 
   (built to provide hotel guests beach access to the bay)
Mobile Register Graphic

4th project attempted in 2003 CBR as alternative to bulkheads

Failed: slack in lines allowed for vibrations from wave forces

Today: Bulkhead protects property
Western Shore Project: Brookley Headland Beach (1998)

September 2003

Consists of 2 rock headland breakwaters

1,400 cubic yards of sand fill

Survived every major hurricane since 1998

Static Equilibrium Bay Model (Silvester and Hsu 1993)

Project Design: SUCCESSFUL

Project Design: SUCCESSFUL
Eastern Shore Project: Sandy Pocket Beach (2001)

Consists of 3 rock headland breakwaters
6,000 m³ sand fill (beneficial reuse of dredge spoil)
Design extended in 2003 (lengthened breakwaters and added sand fill)
Dog River Projects: What was learned?

Must understand breakwater design performances & site characteristics!!!

- Use existing planting guidance
- Diffraction coefficients & diagrams
- Wave transmission coefficients

Goda (2000) Diffraction Diagrams:

The contour where 80% of the incoming wave height is reduced, *Juncus roemerianus* has maintained establishment

- Dixon 2010
Mobile Bay Projects: What was Learned?

Coastal engineering tools can be appropriate & effective for living shoreline projects on estuarine and bay shorelines

- Hudson’s Equation to determine rock size
- Hindcasting historical data to determine incident wave approach
- CERC Equation model longshore sediment transport

Future Needs

- Increase knowledge regarding breakwater performances & interactions
- More inclusion of long-term project monitoring
- Change & update coastal policies and practices
- Develop living shoreline designs which better incorporate engineering knowledge
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