

Living Shorelines



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A Brief History of Living Shorelines

- The modern living shoreline concept was developed in the mid-1970s by Dr. Edgar Garbisch Jr.
- His design (Marsh Sill) became the template for further nature based erosion control projects in the Chesapeake Bay
- In the years since, the living shoreline concept has expanded
 - Different regions
 - Multiple techniques



Examples – Marsh Sill

Before



15 Years After Treatment

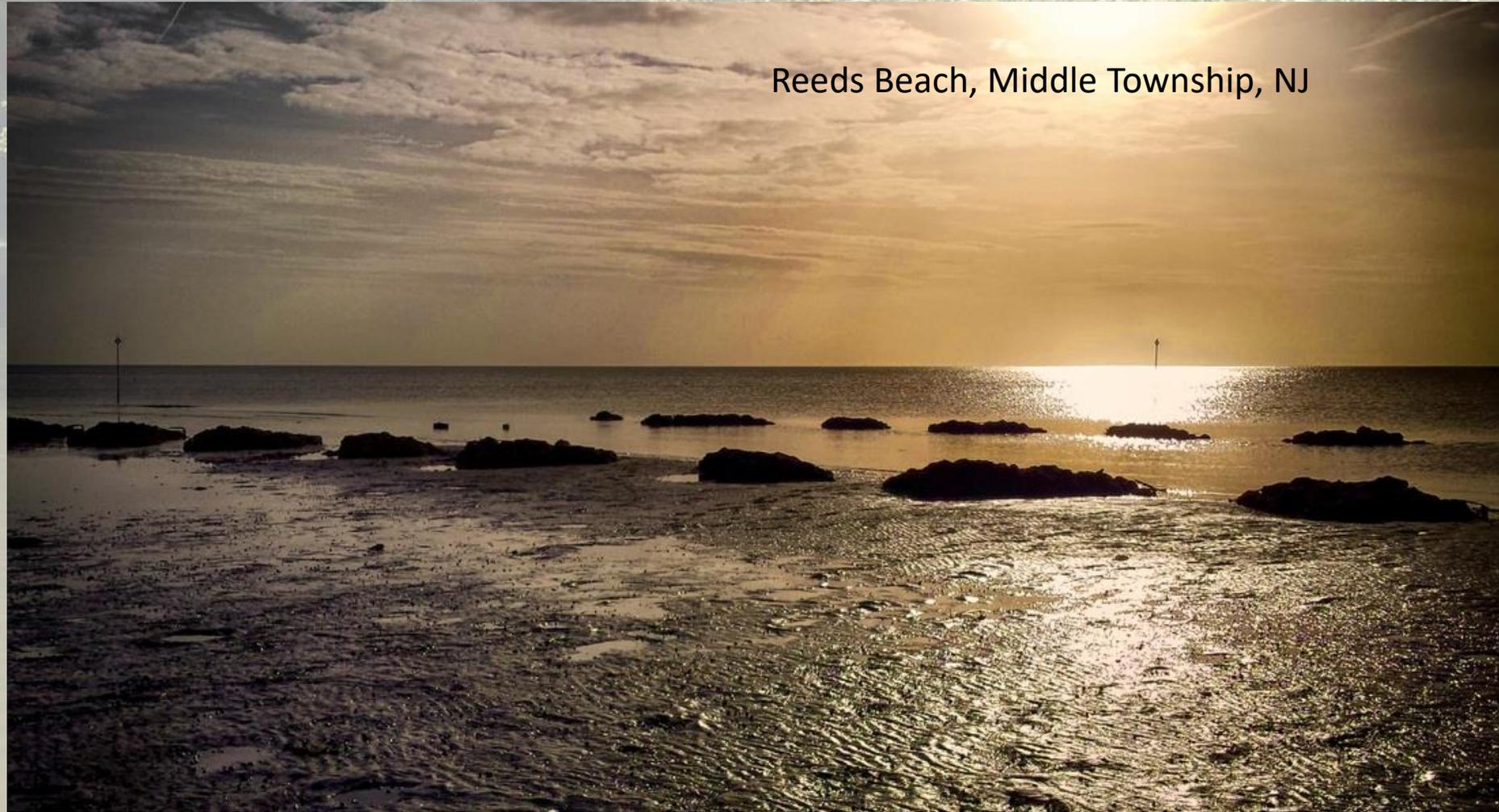


Chesapeake Bay, Virginia

Examples – Nature-Based Living Shoreline Using Coir Logs



Examples – Living Reef Breakwater



Living Shorelines - A Definition

- A living shoreline is a method of land stabilization that protects the shoreline from erosion while also preserving, enhancing, or creating habitat.
- Living shorelines maintain the connectivity between land and water, and recreate the natural functions of a shoreline ecosystem.
- There are many different living shorelines techniques, yet they all generally employ natural or biodegradable materials such as stone, sand, oyster shells, or coconut fiber (coir) logs that are used in conjunction with the planting of native species.



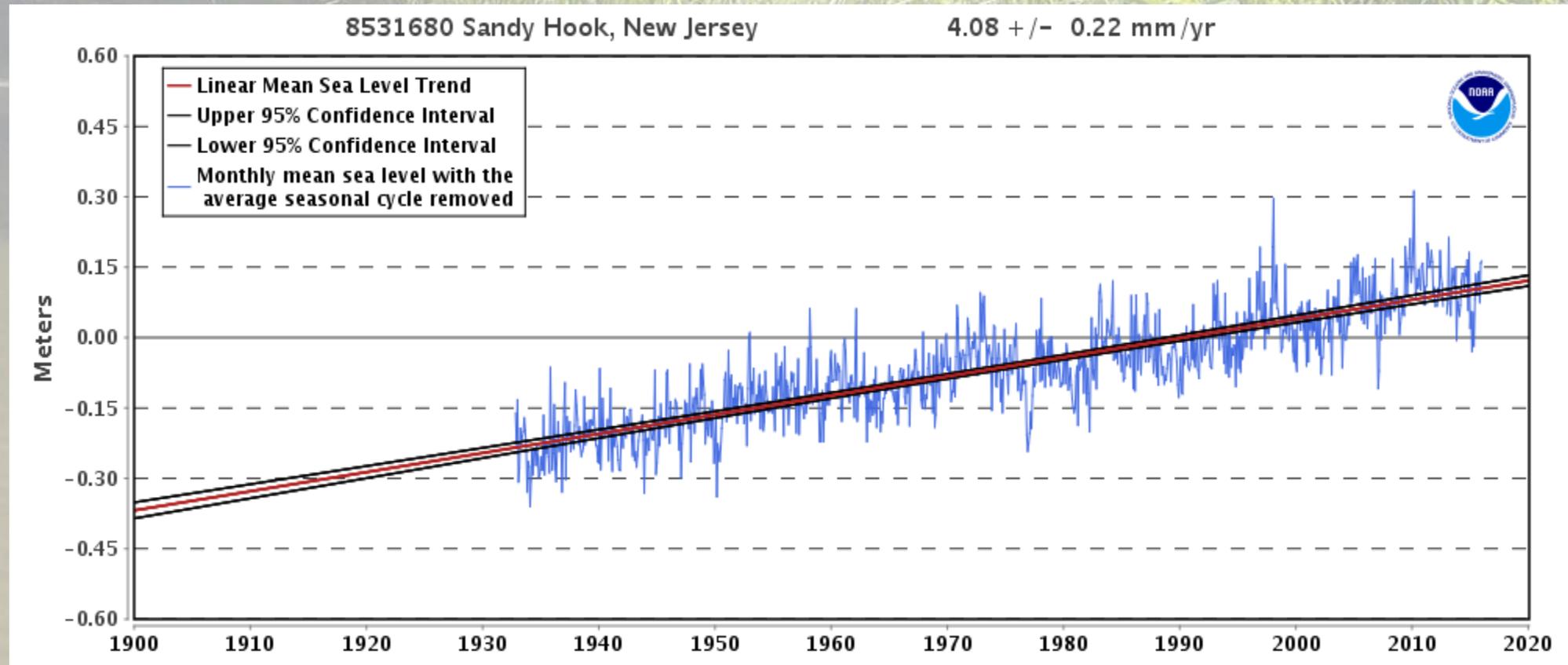
Why Do We Need Living Shorelines?

- Living Shorelines are a better alternative to dealing with shoreline erosion than traditional “hard” structure
- Erosion is a natural process
- Problems appear when we encroach on erosion prone areas (e.g. river banks, coastal beaches) or when human impacts accelerate the rate of erosion, or both.
 - Increased Development
 - Poor Stormwater Management
 - Deforestation and Destruction of Wetlands and Riparian Zones
 - Climate Change



Climate Change and the Future of NJ

- Average annual temperatures in NJ have increased by 2°F since 1900, and average winter temperatures have increased by 4°F since 1970
- The sea level along the New Jersey coastline has risen at a rate of about 1.5 inches every 10 years during the past 100 years, which is nearly twice the global average.



Climate Change and the Future of NJ

- Future Projections:

- Sea levels are expected to rise 2-4 feet during the 21st century
 - A 1 foot rise in sea level along the New Jersey coast will advance the shoreline inward 120 feet
- Increased Precipitation
 - Precipitation is predicted to increase by 10 percent to 20 percent, with more rainfall in the winter and less in the spring and summer.
- Increased Frequency of Large storms
 - The NJDEP predicts that large storms that currently occur every 20 years will occur every five years by 2050, increasing the potential for coastal damage



- Increased Flooding
- Increased Erosion
- Loss of Shoreline

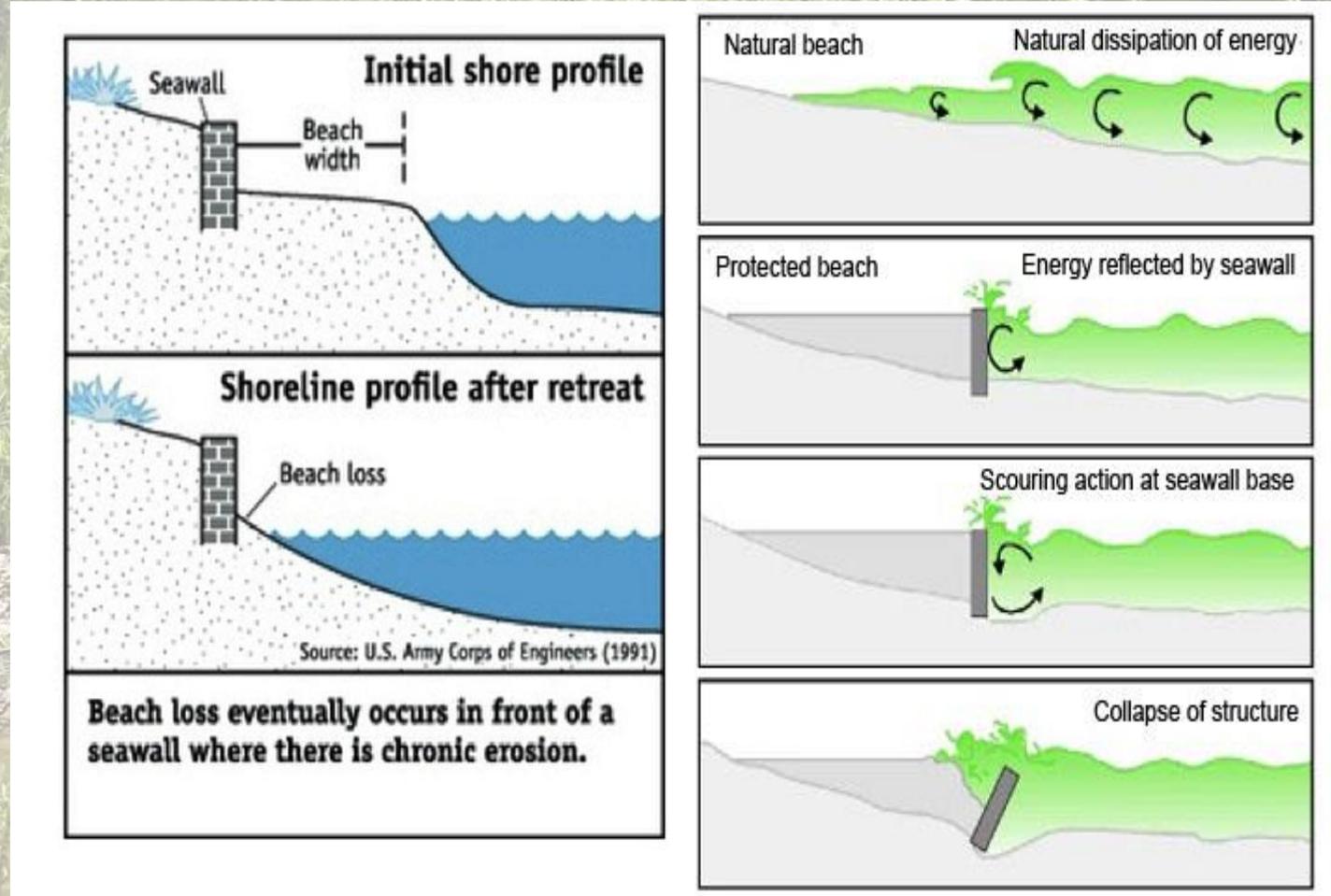
How Do We Respond?

- Hard Armoring/Structures
 - Bulkheads, Seawalls
- A study published last August by one team of academic researchers estimates that more than 14,000 miles – 14 percent of continental U.S. coastline — has been armored with hardened structures.
- NOAA predicts that 1/3rd of nation's contiguous estuarine shoreline will be hardened by 2100 if the structures continue to be built at the current rate



Hard Structures

- Redirect energy not reduce it
 - Increased erosion in front of structure
 - Erosion to adjacent structures (at both ends)
- Loss of intertidal habitat
 - Critical habitat for fish, invertebrates, ect.
 - Highly productive
- Require maintenance/replacement
 - Average bulkhead life expectancy is approx. 25 years



Living Shorelines As Alternatives

- Living shorelines provide as much or more protection than riprap or bulkheads
- Habitat creation/enhancement
 - Increased abundance of juvenile fish, crabs, and waterfowl
- Improved water quality - filtration of storm water runoff
- Flood mitigation and reduction of flood risk
- Aesthetics
- Recreation

A recent Nature Conservancy study found that a restoration of a freshwater wetland, beach and dune in Cape May brings in about \$313 million a year from birders visiting the area.



Advantages of Living Shorelines

Resiliency and Storm Protection

- A recent study evaluated landward erosion and damage in three North Carolina coastal regions following Hurricane Irene (a 2011 Category 1 storm).
- Marsh Sites (natural and living shoreline) vs Bulkhead
 - 76% of bulkheads showed damage ranging from landward erosion to complete collapse
 - No erosion was seen at marsh sites

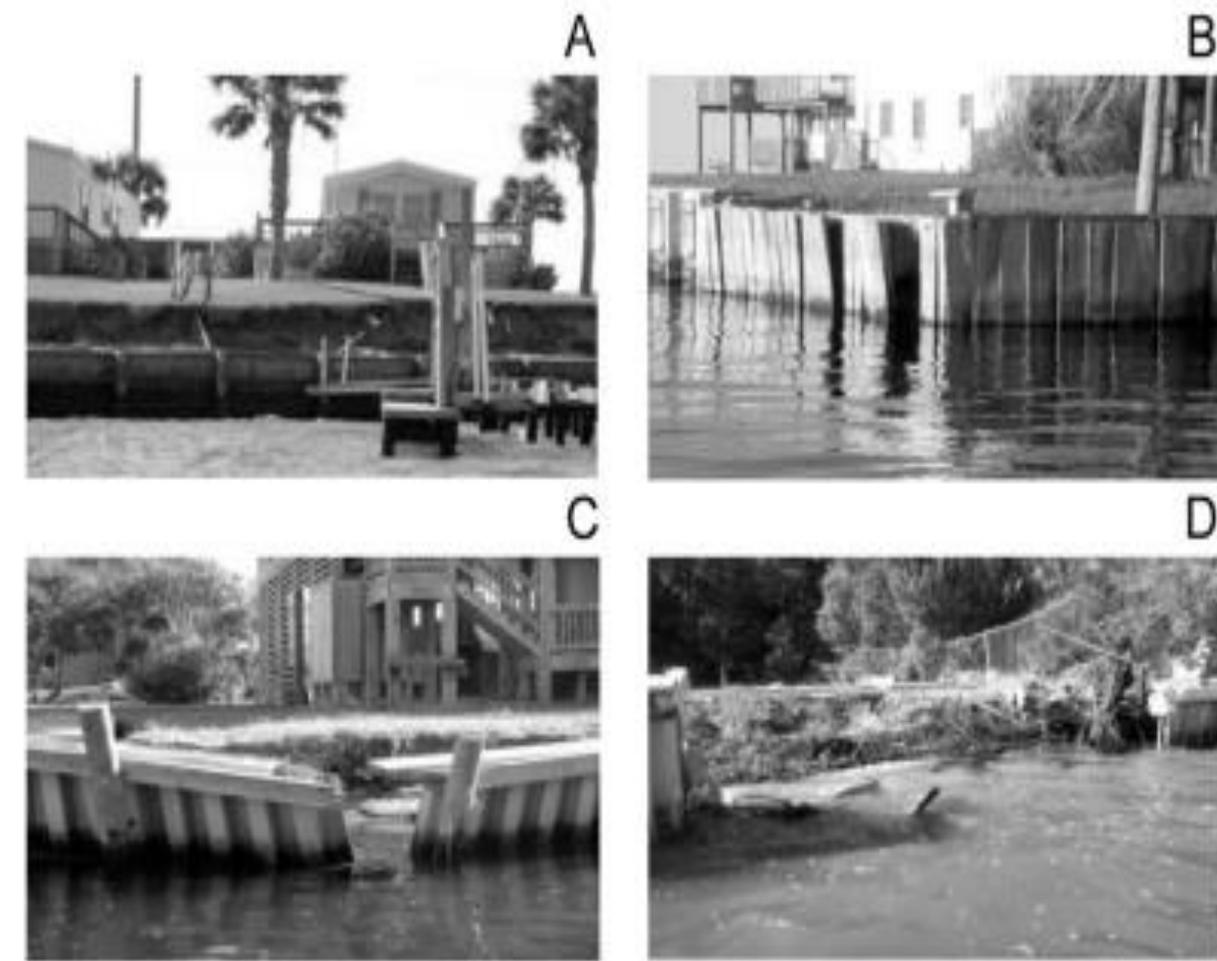


Fig. 3. Bulkhead damage classifications: A) Landward erosion; B) Structural damage; C) Breach; and D) Collapse.

Advantages of Living Shorelines

Resiliency and Storm Protection

- \$23.2 billion per year in storm protection benefits
 - Model incorporated data from 34 hurricanes that hit the US since 1980.
 - A loss of 1 hectare of wetland corresponded with an increased average storm damages of \$33,000
- In Louisiana, researches found a 0.1 increase in the ratio of wetland to open water resulted in saving 3 to 5 properties from a given storm. A cost savings of \$590,000 to \$792,000.



Advantages of Living Shorelines

Adaptable and Self Maintaining



- A recent study showed that oyster reefs can grow in height as quickly as would be needed to keep pace with climate change through 2100

Limitations

- Require technical skill – engineering is site specific
- Need maintenance
- May not be applicable in all situations – better suited to lower energy environments
- Need more long term data

Retrofit Existing Hard Structures

- Concrete Flower Pots
 - Mimic Tide Pools
 - 25 species not normally found on sea walls including algae, sponges, snails, starfish, and crabs



In Summary:

- A living shoreline is an effective method of shoreline stabilization and erosion control that also creates habitat, and provides ecosystem services in the form of improved water quality, flood control, and recreation, among others.
- Living shorelines make economic sense as they provide ecosystem services that have both direct and indirect monetary values.
- With future anticipated sea level rise, increased precipitation, and increased severe storm frequency brought on by climate change, it is important we make smart choices now in how we deal with future erosion and changing landscapes.

Questions?



Photo Credit

- <http://www.d2lwr.com/reservoir-shoreline-bioengineering-utilizing-rock-roll-wave-break-with-vegetated-coir-logs/> (Background)
- <http://floridalivingshorelines.com/wp-content/uploads/2015/04/GTM-LSL-SARP-project.jpg>
- http://www.ernstseed.com/files/general_images/biomass/bioengineering/11_pg-4-of-bioeng.jpg
- <http://www.austintexas.gov/blog/restoring-lake-austin-shores-coir-logs-are-you-coconuts>
- http://ccrm.vims.edu/livingshorelines/design_options/marsh_sill_planted.html
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